Endangered Species Act Section 7 Consultation
Magnuson-Stevens Act Essential Fish Habitat Consultation
Biological Opinion

Lead Agency: National Marine Fisheries Service, NW Region, Protected Resources Division

Activity: Issuance and Funding of 27 Section 10(a)(1)(A) Permits, Permit Modifications, and Permit Amendments for Takes of Endangered and Threatened Snake River Salmon and Steelhead for Scientific Research and Enhancement Purposes

Conducted By: National Marine Fisheries Service, NW Region, Protected Resources Division

Consultation Number: F/NWR/1999/01858

Signature: D. Robert Lohn **Date Issued:** February 19, 2002

Expiration Date: December 31, 2006

This biological opinion constitutes the National Marine Fisheries Service's (NMFS) review of 27 Endangered Species Act (ESA) section 10(a)(1)(A) permit actions (nine permits that are currently active, 11 applications for new permits, four requests for modifications to permits that are currently active, and three amendments of active permits). It has been prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). It is based on information provided in the applications for the proposed permits and permit modifications, published and unpublished scientific information on the biology and ecology of endangered and threatened salmon and steelhead in the action area, and other sources of information. A complete administrative record for this opinion is on file with the Protected Resources Division, National Marine Fisheries Service in Portland, Oregon.

CONSULTATION HISTORY

Consultations under section 7 of the ESA on the issuance of section 10(a)(1)(A) permits for takes of endangered Snake River (SnR) sockeye salmon (*Oncorhynchus nerka*), threatened SnR spring/summer chinook salmon (*Oncorhynchus tshawytscha*), and threatened SnR fall chinook salmon (*Oncorhynchus tshawytscha*) for the purpose of scientific research were previously issued on March 15, 1993; April 13, 1993; June 9, 1993; June 24, 1993; March 4, 1994; April 7, 1995; and March 28, 1996 (NMFS 1996). The March 28, 1996 consultation was a five-year consultation which expired on December 31, 2000.

A consultation under section 7 of the ESA on the issuance of ESA section 10(a)(1)(A) permits for takes of threatened SnR steelhead (*Oncorhynchus mykiss*) for the purpose of scientific research was previously issued on April 10, 1998 (NMFS 1998). However, since the final rule promulgating take prohibitions for threatened SnR steelhead was not published in the *Federal Register* until July 10, 2000 (NOAA 2000b), with an effective date of September 8, 2000, some

permit actions under the scope of the April 10, 1998 consultation have yet to be issued.

The proposed actions in this consultation are to allow the continuation of the existing permits, to issue the proposed new permits, and to issue the proposed permit modifications and amendments and thereby authorize annual takes of endangered SnR sockeye salmon, threatened SnR spring/summer chinook salmon, threatened SnR fall chinook salmon, and threatened SnR steelhead for scientific research and/or enhancement purposes. The NWR's Protected Resources Division decided to group these actions in a single consultation pursuant to 50 CFR 402.14(c) because they are similar in nature, they involve takes of ESA-listed species found within common or overlapping geographic boundaries, and they may result in effects to those species simultaneously. The specific purpose of this consultation is to replace the March 28, 1996 consultation and any other active consultations that address the issuance of ESA section 10(a)(1)(A) permits for annual takes of ESA-listed Snake River salmonids for the purpose of scientific research. This consultation supersedes the previous consultations (if applicable) and is proposed to be valid for approximately a five-year period ending on December 31, 2006.

Some of the proposed research activities may affect ESA-listed species under the jurisdiction of the U.S. Fish and Wildlife Service (e.g., threatened bull trout (*Salvelinus confluentus*)). Permit applicants are required to obtain a take authorization from the U.S. Fish and Wildlife Service (USFWS) if ESA-listed species under its jurisdiction are expected to be encountered.

The consultation histories for each of the proposed permit actions are described below:

Active Permits

Permit 1056—Northwest Fisheries Science Center, NMFS.

Permit 1056 was issued to the Fish Ecology Division, Northwest Fisheries Science Center (NWFSC), NMFS on August 11, 1997 and is currently due to expire on December 31, 2001.

Permit 1102—Washington Department of Fish and Wildlife.

Permit 1102 was issued to the Washington Department of Fish and Wildlife (WDFW) on April 24, 1998 and is currently due to expire on January 31, 2003.

Permit 1124—Idaho Department of Fish and Game.

Permit 1124 was issued to the Idaho Department of Fish and Game (IDFG) on May 19, 1998 and is currently due to expire on December 31, 2002.

Permit 1126—Washington Department of Fish and Wildlife.

Permit 1126 was issued to WDFW on August 11, 1998 and is currently due to expire on December 31, 2002.

Permit 1127—Shoshone-Bannock Tribes.

Permit 1127 was issued to the Shoshone-Bannock Tribes (SBT) on May 19, 1998 and is currently due to expire on December 31, 2002.

Permit 1134—Columbia River Inter-Tribal Fish Commission.

Permit 1134 was issued to the Columbia River Inter-Tribal Fish Commission (CRITFC) on May 27, 1998 and is currently due to expire on December 31, 2002.

Permit 1140—Northwest Fisheries Science Center, NMFS.

Permit 1140 was issued to the Environmental Conservation Division of NWFSC, NMFS on June 12, 1998 and is currently due to expire on December 31, 2002.

Permit 1152—Oregon Department of Fish and Wildlife.

Permit 1152 was issued to the Oregon Department of Fish and Wildlife (ODFW) on August 26, 1998 and is currently due to expire on December 31, 2002.

Permit 1156—U.S. Environmental Protection Agency.

Permit 1156 was issued to the U.S. Environmental Protection Agency (USEPA) on August 14, 1998 and is currently due to expire on December 31, 2002.

Permit Modifications/Amendments

Permit 1056, Modification 3—Northwest Fisheries Science Center, NMFS.

This permit action is the combined issuance of Modification 1 and Modification 3 to NWFSC's Permit 1056. The consultation period for Modification 1 to Permit 1056 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on March 24, 1998. Modification 1 is a request to add annual takes of juvenile, threatened, SnR steelhead associated with NWFSC's scientific research activities. The issuance of Modification 1 was delayed because the final rule that established take prohibitions for threatened SnR steelhead was not promulgated until July 10, 2000 (with an effective date of September 8, 2000). The consultation period for Modification 3 to Permit 1056 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on March 22, 2000.

Permit 1124, Amendment—Idaho Department of Fish and Game.

The proposed amendment of IDFG's scientific research Permit 1124 to include annual takes of ESA-listed fish species associated with fish salvage operations was not subjected to a 30-day public comment period.

Permit 1126, Amendment—Washington Department of Fish and Wildlife.

The proposed amendment of WDFW's scientific research Permit 1126 to include annual takes of ESA-listed fish species associated with fish salvage operations was not subjected to a 30-day public comment period.

Permit 1134, Amendment—Columbia River Inter-Tribal Fish Commission

The proposed amendment of CRITFC's scientific research Permit 1134 was not subjected to a 30-day public comment period.

Permit 1152, Modification 1—Oregon Department of Fish and Wildlife.

The consultation period for Modification 1 to ODFW's scientific research Permit 1152 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on April 7, 2000.

Permit 1156, Modification 1—U.S. Environmental Protection Agency.

The consultation period for Modification 1 to USEPA's Permit 1156 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day comment period) on April 7, 2000.

Permit 1205, Modification 1—Oregon Department of Environmental Quality.

The consultation period for Modification 1 to the Oregon Department of Environmental Quality's (ODEQ's) scientific research Permit 1205 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 20, 2001.

<u>New Permits</u>

Permit 1229—Northern Wasco County People's Utility District.

The consultation period for Northern Wasco County People's Utility District's (PUD) proposed scientific research Permit 1229 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on January 14, 2000.

Permit 1290—Northwest Fisheries Science Center, NMFS.

The consultation period for NWFSC's proposed scientific research Permit 1290 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on February 21, 2001.

Permit 1291—Columbia River Research Laboratory, U.S. Geological Survey.

The consultation period for U.S. Geological Survey's (USGS) proposed scientific research Permit 1291 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on February 21, 2001.

Permit 1322—Northwest Fisheries Science Center, NMFS.

The consultation period for NWFSC's proposed scientific research Permit 1322 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 25, 2001.

Permit 1339—Columbia River Inter-Tribal Fish Commission.

The consultation period for CRITFC's proposed scientific research Permit 1339 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 20, 2001.

Permit 1340—Department of Fisheries and Wildlife, Oregon State University.

The consultation period for Oregon State University's (OSU) proposed scientific research Permit 1340 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 20, 2001.

Permit 1341—Shoshone-Bannock Tribes.

The consultation period for SBT's proposed scientific research Permit 1341 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 20, 2001.

Permit 1342—School of Biological Sciences, Washington State University.

The consultation period for Washington State University's (WSU) proposed scientific research Permit 1342 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 20, 2001.

Permit 1343—Thompson Creek Mining Company.

The consultation period for Thompson Creek Mining Company's (TCM) proposed scientific research Permit 1343 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 20, 2001.

Permit 1344—Hecla Mining Company.

The consultation period for Hecla Mining Company's (HMC) proposed scientific research Permit 1344 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 25, 2001.

Permit 1345—Washington Department of Fish and Wildlife.

The consultation period for WDFW's proposed scientific research Permit 1345 began when NMFS published a Notice of Receipt in the *Federal Register* (initiating a 30-day public comment period) on July 25, 2001.

DESCRIPTION OF THE PROPOSED ACTIONS

Common Elements among the Proposed Actions

NMFS proposes to continue, issue, modify, or amend 20 permits, pursuant to section 10(a)(1)(A) of the ESA. All of the permits would authorize take of any combination of the following ESA-listed species: Endangered SnR sockeye salmon; threatened, naturally-produced and artificially-propagated,[1] SnR spring/summer chinook salmon; threatened SnR fall chinook salmon; and threatened SnR steelhead. Some of the activities identified in the proposed permit actions will be funded by several Federal agencies including NMFS, Bonneville Power Administration, the U.S. Army Corps of Engineers, USGS, USFWS, the U.S. Forest Service (USFS), and USEPA. Although these agencies are also responsible for complying with section 7 of the ESA because they are funding activities that may affect ESA-listed species or their designated critical habitats, this consultation considers the activities they propose to fund and will fulfill their section 7 consultation requirement.

For the most part, the Applicants request multi-year permits to expire on December 31, 2006. The permits for which modifications are pending will expire on December 31, 2001, 2002, or 2003. NMFS expects that the holders of those permits will request extensions through

[1] Under NMFS policy, the progeny of hatchery and wild crosses are generally considered listed species for purposes of the ESA (58 FR 17573, April 5, 1993). Artificially-propagated SnR spring/summer chinook salmon qualifies as an ESA-listed species under this policy and are therefore considered in the analyses throughout this consultation.

December 31, 2006 or apply for new permits when the existing permits expire. Because the proposed activities will affect the same species and be conducted in the same general areas, NMFS intends that this opinion be valid until December 31, 2006. If the status of any of the species changes, new information is received, or other circumstances contemplated by the reinitiation provisions arise, NMFS will update this consultation. NMFS may also modify or suspend permits based on new or different conditions and can alter take authorizations as needed.

Under section 10(d) of the ESA, NMFS is prohibited from issuing a section 10(a)(1)(A) permit unless NMFS finds that the permit (1) was applied for in good faith; (2) if granted and exercised, will not operate to the disadvantage of the endangered and/or threatened species that is/are the subject of the permit; and (3) is consistent with the purposes and policy of section 2 of the ESA. In addition, NMFS does not issue a section 10(a)(1)(A) permit unless the proposed activities are likely to result in a net benefit to the ESA-listed species that is/are the subject of the permit. Benefits to ESA-listed species accrue from the acquisition of scientific information. For example, juvenile fish trapping efforts have enabled the production of population inventories, PIT-tagging efforts have increased the knowledge of anadromous fish migration timing and survival, and fish passage studies have provided an enhanced understanding of fish behavior and survival when moving past dams and through reservoirs. By issuing section 10(a)(1)(A) scientific research permits, NMFS will cause information to be acquired that will enhance the ability of resource managers to make more effective and responsible decisions to sustain anadromous salmon and steelhead populations that are at risk of extinction, to mitigate impacts to endangered and threatened salmon and steelhead, and to implement recovery efforts. The resulting data will improve the knowledge of the species' life histories, specific biological requirements, genetic attributes, migration timing, responses to anthropogenic impacts, and survival in the river systems.

In general, the Applicants propose the following types of scientific research and monitoring activities: (1) Physiological testing of fish condition during collection, bypass, and transportation around hydropower dams; (2) determining fish distribution and habitat requirements through juvenile and adult salmonid surveys; (3) monitoring the condition of juvenile salmon and steelhead and investigating the migration timing and requirements of juvenile and adult salmonids; (4) determining adult escapement and juvenile production in tributaries; (5) monitoring adult and juvenile salmon and steelhead passage through dams and reservoirs; (6) determining the efficiency of the juvenile bypass facilities; (7) conducting habitat restoration studies; (8) conducting genetic monitoring studies using tissue or scale samples; (9) determining the status of supplementation efforts and their impact on the recovery of naturally-produced salmon and steelhead; (10) identifying factors contributing to juvenile salmon and steelhead stranding; (11) assessing the prevalence of disease; and (12) determining the biological effects of gas supersaturation. A number of research projects will focus on monitoring and evaluating management actions that are recommended for the recovery of ESA-listed salmon and steelhead populations. In addition, some of the permits will include takes of

ESA-listed species associated with enhancement activities such as salvage/rescue operations.

The proposed activities involve harassing (e.g., passive observation by snorkeling or video camera, spawning ground surveys, or delaying adult fish at barriers), capturing, trapping, handling, tagging, marking, holding, transporting, and/or sacrificing ESA-listed salmon and steelhead. Methods of capturing fish include trapping in a weir, trap box, or other containment associated with a fish barrier, seining or netting, and electrofishing. The types of tags and/or marks likely to be used include passive integrated transponders (PIT), radio transmitters, fin clips, cheek tags, and/or balloon tags. Researchers will collect tissues and scale samples from live fish and fish carcasses and those tissues and scale samples will be transferred to a number of designated laboratories for archival and/or analysis.

The permits will include Special Conditions that Permit Holders are required to observe while conducting the proposed activities. These conditions are intended to (a) manage the interaction between scientists and ESA-listed salmonids by requiring that research activities be coordinated among Permit Holders and between Permit Holders and NMFS, (b) require measures to minimize and mitigate the impacts on the target species, (c) require Permit Holders to notify NMFS in the event of excessive or unauthorized takes of ESA-listed species, and (d) require Permit Holders to report to NMFS annually on their activities and the effect that those activities have on the species concerned. The following Special Conditions will be included in the permits unless NMFS determines that a specific condition is not applicable:

1. Each ESA-listed fish handled out-of-water must be anesthetized. Anesthetized fish must be allowed to recover (e.g., in a recovery tank) before being released. Fish that are simply counted must remain in water and do not need to be anesthetized.

2. ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during sampling and processing procedures. Adequate circulation and replenishment of water in holding units is required. When using gear that capture a mix of species, ESA-listed fish must be processed first to minimize the duration of handling stress. The transfer of ESA-listed fish must be conducted using a sanctuary net that holds water during transfer, whenever necessary to prevent the added stress of an out-of-water transfer.

3. If any ESA-listed adult fish are captured incidental to sampling for juveniles, they must be released without further handling and such take must be reported.

4. ESA-listed fish must not be handled if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, ESA-listed fish may only be identified and counted.

5. To minimize the lateral transfer of pathogens, a sterilized needle must be used for each

individual injection when PIT-tagging ESA-listed fish.

6. The Permit Holder must not intentionally kill or cause to be killed any ESA-listed species authorized to be taken by the permit, unless the permit allows a lethal take of the ESA-listed species.

7. Due caution must be exercised during spawning ground surveys to avoid disturbing, disrupting, or harassing ESA-listed adult salmonids when they are spawning. Whenever possible, walking in the stream must be avoided, especially in areas where ESA-listed salmonids are likely to spawn.

8. Visual observation protocols must be used instead of intrusive sampling methods whenever possible. This is especially appropriate when ascertaining whether anadromous fish are merely present. Snorkeling and streamside surveys will replace electrofishing procedures whenever possible.

9. Researchers using backpack electroshocking equipment to collect ESA-listed fish must comply with NMFS' backpack electrofishing guidelines (NMFS 2000c).

10. The Permit Holder must provide plans for future undefined projects or changes in sampling locations or research protocols and obtain approval from NMFS prior to implementation.

11. Prior to each research sampling season, the Permit Holder must identify the personnel designated to act under the authority of the permit and confirm their experience through résumés or other evidence of their qualifications.

12. The Permit Holder must provide notice of intended activities at least two weeks in advance of each research sampling season to enable a NMFS official(s), or any other person(s) duly designated, to accompany researchers. The required notification shall include a detailed outline of coordination measures that will be undertaken with other researchers to ensure that no unnecessary duplication and/or adverse cumulative impacts occur as a result of the research activities.

13. The Permit Holder must report whenever the authorized level of take is exceeded, or if circumstances indicate that such an event is imminent. Notification should be made as soon as possible, but no later than two days after the authorized level of take is exceeded. The Permit Holder must then submit a detailed written report. Pending review of these circumstances, NMFS may suspend research activities or amend the permit to allow research activities to continue.

14. The Permit Holder must report the take of any ESA-listed species not included in the permit, when it is killed, injured, or collected during the course of research activities.

Notification should be made as soon as possible, but no later than two days after the unauthorized take. The Permit Holder must then submit a detailed written report. Pending review of these circumstances, NMFS may suspend research activities or amend the permit to allow research activities to continue.

15. For the duration of the permit, work in each succeeding year is contingent upon submission and approval of a report on the preceding year's activities. The report must include:

    (a) A detailed description of activities conducted under the permit including the total number of fish taken from each salmonid run, an estimate of the number of ESA-listed fish taken from each salmonid run, the manner of take, and the dates/locations of take;

    (b) Measures taken to minimize disturbances to ESA-listed fish and the effectiveness of these measures, the condition of ESA-listed fish taken and used for the research, a description of the effects of research activities on the subject species, the disposition of ESA-listed fish in the event of mortality, and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities;

    (c) Any problems that may have arisen during the research activities and a statement as to whether or not the research activities had any unforeseen effects;

    (d) A description of how all take estimates were derived;

    (e) Any preliminary analyses of the data;

    (f) Steps that have been and will be taken to coordinate the research with that of other researchers; and

    (g) If an electroshocker was used for fish collection, a copy of the logbook must be included with the report.

NMFS may also include additional conditions in a permit based on unique circumstances or the specific mitigation measures proposed by an Applicant. Additional conditions to be included in the permits, if applicable, are identified in the following descriptions of the proposed activities for each individual permit action.

The Individual Permits

The permit applications contain specific information related to each of the proposed activities, including citations of literature, that discuss some of the impacts of proposed activities and

methodologies on ESA-listed anadromous salmon and steelhead. A general description of the activities associated with each proposed permit action follows.

Active Permits

Permit 1056

Permit 1056 authorizes the Fish Ecology Division of the NWFSC, NMFS annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with two scientific research studies conducted in various tributaries of the Salmon River in Idaho, the Grande Ronde River in Oregon, and the Imnaha River in Oregon. The objective of Study 1 is to characterize the run-timing of naturally-produced chinook salmon over a period of years to determine if consistent patterns are apparent, and to use this information for real-time management decisions regarding water allocation during the smolt outmigrations. ESA-listed juvenile chinook salmon are captured (using seines, rotary screw traps, or electrofishing), sampled for biological information, and released or captured (using seines, rotary screw traps, or electrofishing), PIT-tagged, and released. ESA-listed juvenile fish indirect mortalities are authorized. The long-term objectives of Study 2 are to monitor the nature and extent of genetic change over time in supplemented and unsupplemented populations and to correlate the genetic changes with measures of productivity. ESA-listed juvenile chinook salmon are captured (using seines, rotary screw traps, or electrofishing), sampled for fin tissues, and released or lethally taken. In addition, ESA-listed adult chinook salmon carcasses are authorized to be collected and sampled for tissues (NWFSC 1997). ESA-listed fish carcasses and/or tissue samples are authorized to be transferred to NWFSC, USGS, the University of Washington at Seattle, WA, and the University of Alaska at Fairbanks, AK for archival and/or analysis. The following Special Conditions are included in Permit 1056:

1. Whenever possible, ESA-listed juvenile fish indirect mortalities that occur during the conduct of research activities must be used in place of intentional lethal takes.

2. Take of ESA-listed fish must be directed at strong runs, or the take reduced substantially if directed at a weak run.

Permit 1102

Permit 1102 authorizes WDFW annual takes of adult, threatened, SnR spring/summer chinook salmon; adult, threatened, SnR fall chinook salmon; and adult, threatened, SnR steelhead associated with two scientific research studies conducted at Bonneville Dam on the Columbia River (Study 1) and throughout the lower Columbia River Basin (Study 2). The purpose of Study 1 is to determine the number and timing of wild and hatchery steelhead adults that pass Bonneville Dam on the Columbia River. ESA-listed adult steelhead are collected from the adult fish ladders at Bonneville Dam, sampled for biological information and tissues, and released (WDFW 1997). A proportion of the adult steelhead handled by WDFW are also PIT-tagged as

part of the research effort to develop and evaluate adult PIT tag interrogation systems at the hydropower dams on the mainstem Columbia and Snake Rivers under Research Action 1194 (NMFS 2000d). Personnel form NMFS' Northwest Fisheries Science Center are authorized to act as agents of WDFW in conducting the PIT tag research associated with Study 1. The purpose of Study 2 is to determine the genetic stock identification of anadromous adult fish harvested in Columbia River fisheries including fisheries conducted by Native Americans on the river. Data will be used to determine the fishery impacts to ESA-listed stocks and if possible, to shape fisheries to reduce impacts to ESA-listed or depressed stocks while focusing harvest on healthy stocks. Tissue analysis by starch-gel electrophoresis will be the genetic stock identification tool used to differentiate fish by Evolutionarily Significant Unit (ESU). Current accounting methods (date or fork length) are insufficient to differentiate the passage, timing, and harvest impacts on specific ESUs, stocks, or genetic groups. For Study 2, tissue samples and scales are collected from ESA-listed adult salmon and steelhead carcasses and transferred to WDFW's Genetic Stock Identification Laboratory and/or NMFS' Northwest Fisheries Science Center for archival and/or analysis (ODFW/WDFW 1998). ODFW and CRITFC are also authorized to act as agents of WDFW under Permit 1102.

Permit 1124

Permit 1124 authorizes IDFG annual takes of adult and juvenile, endangered, SnR sockeye salmon; adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; and juvenile, threatened, SnR fall chinook salmon associated with seven research tasks conducted throughout the Salmon and Clearwater River Basins in Idaho: Task 1 - General fish population inventory; Task 2 - Spring/summer chinook salmon natural production monitoring and evaluation; Task 3 - Spring/summer chinook salmon supplementation research; Task 4 - Redfish Lake, Pettit Lake, Alturas Lake kokanee/sockeye research; Task 5 - Salmon and steelhead fish health monitoring; Task 6 - Steelhead natural production monitoring and evaluation; and Task 7 - Steelhead supplementation research. ESA-listed adult and juvenile salmon are observed/harassed during fish population and production monitoring surveys. ESA-listed adult and juvenile salmon are also captured (using seines, trawls, traps, hook-and-line, or electrofishing), sampled for biological information and tissue samples or PIT-tagged or tagged with radiotransmitters or other identifiers, and released. ESA-listed adult and juvenile salmon indirect mortalities are authorized. Annual lethal takes of juvenile, endangered, SnR sockeye salmon and juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon are also authorized (IDFG 1997). The following Special Condition shall be included in Permit 1124:

> Whenever possible, ESA-listed juvenile fish indirect mortalities that occur during the conduct of research activities must be used in place of intentional lethal takes.

Permit 1126

Permit 1126 authorizes WDFW annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon associated with scientific research conducted in the Snake River Basin and its tributaries including the Tucannon River, the Grande Ronde River, and Asotin Creek in WA. The purpose of the research is to monitor and evaluate the success of hatchery supplementation programs in the region, as well as naturally-produced fish populations, and to identify factors that are limiting ESA-listed salmon productivity. WDFW will conduct three classes of research activities: (1) Juvenile fish instream production monitoring, (2) juvenile fish migrant monitoring, and (3) adult fish monitoring. ESA-listed adult and juvenile salmon are observed/harassed during spawning ground surveys and snorkeling surveys. ESA-listed juvenile salmon are also captured (using traps, seines, electrofishing, or hook-and-line), sampled for biological information and/or sampled for tissue and scale samples and/or PIT-tagged, and released. ESA-listed juvenile salmon indirect mortalities are authorized. In addition, adult, threatened, SnR spring/summer chinook salmon are captured, sampled for biological information and/or tagged with radiotransmitters, and released. Also, ESA-listed adult salmon carcasses are collected and sampled for tissues and scales. Also, annual lethal takes of ESA-listed juvenile salmon are authorized for morphometric, meristic, pathologic, and electrophoretic studies (WDFW 1998). The following Special Condition shall be included in Permit 1126:

> Whenever possible, ESA-listed juvenile fish indirect mortalities that occur during the conduct of research activities must be used in place of intentional lethal takes.

Permit 1127

Permit 1127 authorizes SBT annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and adult and juvenile, threatened, SnR steelhead associated with scientific research conducted throughout the Salmon River Basin in the state of Idaho. SBT conducts six research tasks: (1) Snorkel surveys, (2) spawning ground surveys, (3) juvenile chinook salmon outmigrant monitoring in the East Fork and the West Fork Yankee Fork, (4) juvenile fish migration timing and movement at the Yankee Fork, (5) juvenile chinook salmon and steelhead abundance and condition factor estimates at the Yankee Fork, and (6) juvenile chinook salmon parr monitoring. ESA-listed adult and juvenile salmon and steelhead are observed/harassed during spawning ground surveys and snorkeling surveys. ESA-listed juvenile salmon and steelhead are also captured (using nets, seines, traps, or electrofishing), sampled for biological information and tissue samples, and released or captured (using hook and line, nets, seines, traps, or electrofishing), PIT-tagged, and released. ESA-listed juvenile salmon and steelhead indirect mortalities are authorized (SBT 1998).

Permit 1134

Permit 1134 authorizes CRITFC annual takes of adult and juvenile, threatened, naturally-

produced and artificially-propagated, SnR spring/summer chinook salmon; adult and juvenile, threatened, SnR fall chinook salmon; and adult and juvenile, threatened, SnR steelhead associated with nine research projects that occur throughout the Snake River Basin and on the mainstem lower Columbia River: (1) Juvenile chinook salmon, steelhead, and coho salmon surveys, (2) juvenile anadromous salmonid outmigration studies, (3) chinook salmon and steelhead escapement surveys, (4) chinook salmon scale sampling at Bonneville Dam, (5) cryopreservation of chinook salmon and steelhead gametes, (6) gas bubble trauma sampling at the hydropower dams on the mainstem Columbia River (this project ended in 2000 and the takes of ESA-listed anadromous fish associated with this project are therefore omitted from this consultation), (7) subyearling fall chinook salmon research, (8) westslope cutthroat trout genetic inventory (this project ended in 1999 and the takes of ESA-listed anadromous fish associated with this project are therefore omitted from this consultation), and (10) beneficial use reconnaissance project (Note: Project 9 is omitted from this consultation since the research occurs in the middle Columbia River and does not involve takes of ESA-listed SnR salmon or steelhead). CRITFC will observe/harass ESA-listed salmon and steelhead during spawning ground surveys and redd counts; collect tissue/scale samples and biological information from ESA-listed fish during escapement and carcass surveys; collect gametes from post-spawned ESA-listed adult salmon and steelhead; and employ seines, traps, and electrofishing to capture ESA-listed juvenile fish to apply PIT tags, coded wires, and other identifiers for migration studies. A lethal take of juvenile, threatened, SnR fall chinook salmon is authorized for Project 7 to verify genetic lineage. A lethal take of juvenile, threatened, SnR steelhead is authorized for Project 10. Tissue and/or scale samples collected from ESA-listed fish will be provided to WDFW's Olympia Laboratory, IDFG, USFWS, the University of Idaho at Moscow, Washington State University at Pullman, and/or NMFS' Northwest Fisheries Science Center for archival and/or analysis. WDFW is authorized to act as an agent of CRITFC in the conduct of Project 4 (CRITFC 1998). The following Special Conditions shall be included in Permit 1134:

1. Whenever possible, ESA-listed juvenile fish indirect mortalities that occur during the conduct of research activities must be used in place of intentional lethal takes.

2. Project 5 must involve only post-spawned (spent) SnR spring/summer chinook salmon adults and SnR steelhead adults that have completed annual spawning unless an alternative sampling strategy is approved by NMFS. The ESA-listed adult fish may be collected by hand, dipnet, seine, or screw trap only. Captured females must not be anesthetized and must be released without further handling upon being captured.

3. The traps for Project 2 must be monitored several times daily when in use to prevent debris build-up or other adverse conditions. In periods of high debris build-up, the traps must also be checked during the night. The drums must be removed from the water when the traps are not in use.

Permit 1140

Permit 1140 authorizes the Environmental Conservation Division of the NWFSC, NMFS annual takes of juvenile, endangered, SnR sockeye salmon; juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with a research study designed to assess the relationship between environmental variables, selected anthropogenic stresses, and bacterial and parasitic pathogens on disease-induced mortality in juvenile salmon in selected coastal estuaries in Oregon and Washington. The results of the study will benefit ESA-listed species by providing a better understanding of how environmental factors influence disease. ESA-listed Snake River salmon and steelhead juveniles are captured with seines and fyke nets in the Columbia River estuary, sampled for biological information, and released. Juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon are authorized to be taken lethally for pathogen prevalence and intensity, biochemical composition, histopathological attributes, and stomach content analyses. Carcasses of ESA-listed juvenile salmon are transferred to USFWS's Disease Diagnostic Laboratory at Olympia, WA for the analyses (NWFSC 1998a).

Permit 1152

Permit 1152 authorizes ODFW annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with scientific research conducted in the Imnaha and Grande Ronde River Basins in the state of Oregon. ODFW conducts five research tasks: (1) Spring chinook salmon spawning ground surveys, (2) spring chinook salmon early life history, (3) habitat and fish inventory surveys, (4) passage and irrigation screening, and (5) monitoring of residual hatchery steelhead. ODFW observe/harass ESA-listed adult and juvenile salmon during spawning ground surveys and redd counts. Also, ESA-listed juvenile salmon are captured (using nets, seines, traps, and electrofishing) to acquire biological information and/or tissue samples or to apply PIT tags or other marks for the migration research. ESA-listed adult and juvenile chinook salmon carcasses are also collected and sampled for tissues and scales. Tissues and scales are transferred to ODFW's pathology laboratory and/or NMFS' NWFSC for archival and/or analysis (ODFW 1998).

Permit 1156

Permit 1156 authorizes the USEPA and Dynamac Corporation annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon associated with research designed to assess status and trends in randomly-selected river systems in Oregon, Washington, and Idaho in a statistically and ecologically rigorous manner as mandated by the Clean Water Act. USEPA/Dynamac conduct annual surveys for fish, macroinvertebrate, algae, and microbial assemblages as well as physical and chemical habitat conditions in the Grande Ronde River Basin in Oregon. During the course of the surveys, ESA-listed juvenile fish are captured by

electrofishing (using backpack or raft-mounted gear), sampled for biological information, and released. The research will benefit the ESA-listed species by providing baseline information to support enforcement of the Clean Water Act in freshwater river systems where ESA-listed fish are present. Dynamac Corporation is a cooperator with the scientific research and its biologists are authorized to act as agents of USEPA in conducting the research (USEPA/Dynamac 1998).

Permit Modifications/Amendments

Permit 1056, Modification 3

For this permit modification, NWFSC requests annual takes of adult and juvenile, threatened, SnR steelhead associated with the research (see Permit 1056 under "Active Permits" above for a description of the scientific research activities). ESA-listed juvenile steelhead are proposed to be captured, sampled for biological information, and released or captured, PIT-tagged, and released. ESA-listed juvenile steelhead indirect mortalities associated with the research are also requested. A lethal take of juvenile, threatened, SnR steelhead is also requested. Also for the permit modification, NWFSC requests to conduct a new study designed to investigate marine-derived nutrients in freshwater streams in the Snake River Basin. The study will allow researchers to determine the impacts that reductions in adult salmonid carcasses (and thus marine nutrients) have on subsequent salmonid productivity. The new study will not require any additional ESA-listed fish takes beyond the chinook salmon take levels authorized in the current permit or the steelhead take levels that have been requested. ESA-listed chinook salmon and steelhead juveniles are proposed to be captured, sampled for biological information and tissues (including stomach contents), and released or taken lethally. Also for the permit modification, the use of some new methods for capturing ESA-listed juvenile fish (dip nets, minnow traps, and angling) is requested. Also for the permit modification, ESA-listed adult and juvenile salmon and steelhead are proposed to be observed/harassed during snorkel surveys. NWFSC also requests to transfer tissues collected from ESA-listed fish and/or stomach contents of ESA-listed juvenile fish and/or ESA-listed juvenile fish carcasses to IDFG, SBT, or the Nez Perce Tribe for archival and/or analyses. The permit modification is requested to be valid for the duration of the permit (NWFSC 1998b, NWFSC 1998c, and NWFSC 1999).

Permit 1124, Amendment

NMFS is proposing to amend IDFG's scientific research Permit 1124 to include annual takes of adult and juvenile, endangered, SnR sockeye salmon; adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; and adult and juvenile, threatened, SnR fall chinook salmon associated with potential fish salvage and rescue operations in the Salmon and Clearwater River Basins in Idaho.

Permit 1126, Amendment

NMFS is proposing to amend WDFW's scientific research Permit 1126 to include annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; and adult and juvenile, threatened, SnR fall chinook salmon associated with potential fish salvage and rescue operations in the Snake and Tucannon River Basins in Washington.

Permit 1134, Amendment

NMFS is proposing to amend CRITFC's scientific research Permit 1134 to allow CRITFC biologists to collect gametes from pre-spawned and partially-spawned adult, threatened, SnR spring/summer chinook salmon males and adult, threatened, SnR steelhead males associated with Project 5, the cryopreservation of chinook salmon and steelhead gametes project. Currently, the permit allows the collection of gametes from post-spawned adult male salmon and steelhead only. Project 5 is a gene conservation effort, conducted by the Nez Perce Tribe, that seeks to preserve a representative sample of the genetic diversity contained within the remaining anadromous salmonid populations. From intensive spawning ground survey information collected during past research efforts, Nez Perce Tribe biologists state that male salmon die off throughout the spawning season. By missing earlier spawning fish, Nez Perce Tribe biologists are not preserving the genetic diversity contained within that portion of the respective runs. The current sampling strategy may skew sample collections toward late-spawning fish (CRITFC 2001b). The ability to collect male gametes across the spectrum of the spawning periods would enhance sample size collection and gene banking from naturally reproducing salmon and steelhead. Only males disassociated with active spawning would be sampled. Initiation of sampling would occur at or just after peak spawning in each spawning aggregate. No increase in take levels is necessary for the permit amendment. The amendment would be valid for the duration of the permit. NMFS proposes to include the following Special Condition in the permit:

> The collection of gametes from pre-spawned and partially-spawned ESA-listed adult salmon and steelhead males associated with Project 5 is subject to annual approval by NMFS.

Permit 1152, Modification 1

For Modification 1, ODFW requests an increase in the annual take of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon associated with Study 2, the spring chinook salmon early life history study (see Permit 1152 under "Active Permits" above for a description of the scientific research activities). Production levels of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon have increased in the Imnaha and Grande Ronde River Basins for 2001 and is expected to continue for 2002. ESA-listed juvenile salmon are proposed to be observed/harassed during spawning ground surveys and snorkel surveys. ESA-listed juvenile salmon are also proposed to be captured (using seines, traps, or electrofishing), sampled for biological information and/or PIT-tagged, and released. Also for

Modification 1, ODFW proposes to apply temporary marks to captured juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon to determine trap efficiencies. An associated increase in juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon indirect mortalities is also requested. Also for Modification 1, ODFW requests annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with salvage/rescue operations. Modification 1 is requested to be valid for the duration of the permit (ODFW 2000).

Permit 1156, Modification 1

For Modification 1, USEPA/Dynamac requests an annual take of juvenile, threatened, SnR steelhead associated with the research (see Permit 1156 under "Active Permits" above for a description of the scientific research activities). ESA-listed SnR steelhead juveniles are proposed to be captured by electrofishing (using backpack or raft-mounted gear), sampled for biological information, and released. Also for Modification 1, USEPA/Dynamac requests an increase in the annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon associated with the research. Annual indirect mortalities of ESA-listed juvenile fish are requested. Also for Modification 1, USEPA/Dynamac requests annual takes of adult, threatened, SnR spring/summer chinook salmon; adult, threatened, SnR fall chinook salmon; and adult, threatened, SnR steelhead associated with the research. ESA-listed salmon and steelhead adults are proposed to be captured by electrofishing (using backpack or raft-mounted gear), sampled for biological information, and released. Modification 1 is requested to be valid for the duration of the permit (USEPA/Dynamac 2000).

Permit 1205, Modification 1

Permit 1205 authorizes ODEQ an annual take of juvenile, threatened, Southern Oregon/Northern California Coast coho salmon (Oncorhynchus kisutch) associated with research designed to assess the condition of randomly selected streams in southwestern Oregon. The research involves collecting samples or data on a range of parameters including benthic macroinvertebrates, periphyton, non-native and invasive riparian plant species, chemical water quality, bacteriological water quality, stream habitat condition, fish and amphibian assemblages, and water temperature. ODEQ's research is coordinated with the USEPA and is mandated by the Clean Water Act. For Modification 1, ODEQ requests annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with an expansion of the research effort to the Snake River Basin. ESA-listed juvenile salmon and steelhead are proposed to be captured using electrofishing, examined, measured, and released. ESA-listed juvenile fish indirect mortalities are also requested. Modification 1 is requested to be valid for the duration of the permit (ODEQ 2001).

New Permits

Permit 1229

Northern Wasco County PUD requests a permit for annual takes of juvenile, endangered, SnR sockeye salmon; juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with scientific research/monitoring activities at The Dalles Dam on the lower Columbia River. Permit 1229 will replace Permit 948 which expired on September 30, 1999. Northern Wasco County PUD is required to monitor the effectiveness of their fish passage facility at The Dalles Dam by the Federal Energy Regulatory Commission. The purpose of this ongoing monitoring effort is to examine the condition of juvenile fish passing through the facility, to maintain passage efficiency and minimize injury. Continued observation of individual fish passing through the screened intake channel during the smolt migration season provides specific information on possible unsuitable passage conditions below the water surface which are not directly observable. The PUD proposes to intercept ESA-listed juvenile salmonids in the screened turbine intake channel at the dam and convey them through a screened chute into an overflow screened tank. The juvenile salmonids will then be examined for external injuries and released. ESA-listed juvenile fish indirect mortalities associated with the research/monitoring are also requested (Northern Wasco County PUD 1999).

Permit 1290

The Fish Ecology Division, NWFSC, NMFS requests a permit for annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with two scientific research studies to be conducted in the Columbia River estuary. The purpose of Study 1 is to determine the prevalence and intensity of pathogens in juvenile salmonids. The study will benefit ESA-listed salmonids by contributing information on the extent to which diseases affect the growth and survival of juvenile salmonids in the estuarine and early ocean environments (NWFSC 2000). Study 1 is intended to complement the pathogen research that is being conducted by the Environmental Conservation Division, NWFSC under scientific research Permit 1140. The purpose of Study 2 is to evaluate the importance of the Columbia River estuary to baitfish populations and salmonid survival. Study 2 will benefit ESA-listed salmonids by providing information on the relative relationship between baitfish (northern anchovy and pacific sardine) abundance and salmonid survival in the estuary and marine environments (NWFSC 2001a). ESA-listed juvenile fish are proposed to be captured by purse seine or beach seine, handled (anesthetized, identified, and measured), and released or taken lethally. ESA-listed juvenile fish indirect mortalities are also requested. However, any juvenile salmon indirect mortalities are proposed to be retained for Study 1 in the place of intentional lethal takes. NWFSC also requests the use of the juvenile bypass system at Bonneville Dam as a backup sampling location for Study 1 should the researcher not be able to

collect enough test fish in the estuary or should sampling in the estuary not be possible. The following Special Condition shall be included in Permit 1290:

> Whenever possible, ESA-listed juvenile fish indirect mortalities that occur during the conduct of research activities must be used in place of intentional lethal takes.

Permit 1291

The Columbia River Research Laboratory, USGS requests a permit for annual takes of juvenile, endangered, SnR sockeye salmon; juvenile, threatened, naturally-produced; and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with a scientific research project to be conducted at John Day, The Dalles, and Bonneville Dams on the lower Columbia River in the Pacific Northwest. The purpose of the research is to monitor juvenile fish movement, distribution, behavior, and survival from John Day Dam downstream past Bonneville Dam using radiotelemetry technology. The research will benefit ESA-listed fish species by providing information on spill effectiveness, forebay residence times, and guidance efficiency under various flow regimes that will allow Federal resource managers to make adjustments to bypass/collection structures to optimize downriver migrant survival at the hydropower projects (USGS 2001). The proposed research is intended to complement the research that is being conducted by USGS under Research Action 1130 contained in the biological opinion entitled "Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin" that was issued on December 21, 2000 (NMFS 2000d). ESA-listed juvenile fish are proposed to be captured by Smolt Monitoring Program (SMP) personnel at Bonneville and/or John Day Dams, sampled for biological information, and released or captured by SMP personnel, provided to USGS personnel, implanted with radio transmitters, transported, held for as long as 24 hours, released, and tracked electronically. USGS requests that SMP personnel be allowed to act as an agent of USGS under the proposed permit. USGS also requests ESA-listed juvenile fish indirect mortalities associated with the research.

Permit 1322

The Fish Ecology Division, NWFSC, NMFS requests a five year permit for annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with a scientific research project proposed to occur in the lower Columbia River and estuary. The objective of the research is to identify associations between salmon and habitat. The approach will be to (1) determine the relationship between habitat and the presence, use, and benefit to juvenile salmon, with an emphasis on subyearling chinook salmon, and (2) understand the relationships between changes in flow, sediment input, and availability of habitat in the lower Columbia River and estuary. The need to develop effective restoration strategies requires that

the benefits of estuarine habitats to juvenile salmon be identified by evaluating habitat-salmon linkages. The long history of wetland loss in the Columbia River estuary coupled with changes in flow patterns suggests that restoration of these habitats may benefit depressed salmon stocks. Information obtained from the research will serve as the basis for developing habitat restoration and preservation plans. NWFSC proposes to sample for the presence and abundance of salmon species in the estuary and lower Columbia River at monthly intervals throughout each annual period. ESA-listed juvenile salmon and steelhead are proposed to be captured with beach seines and trapnets, sampled for biological information, and released. ESA-listed juvenile fish indirect mortalities associated with the research are requested. In addition, NWFSC is also requesting intentional lethal takes of ESA-listed juvenile salmon for stomach content identification and the collection of scales and otoliths (NWFSC 2001b).

Permit 1339

CRITFC requests a five year permit for annual takes of adult, threatened, SnR steelhead and adult, threatened, SnR spring/summer chinook salmon associated with scientific research to be conducted in the following tributaries of the Imnaha River in OR: Cow, Lightning, Horse, Camp, Grouse, and Gumboot Creeks. The purpose of the research is to acquire information on the status (escapement abundance, genetic structure, life history traits) of steelhead in the Imnaha River Basin. The research will benefit the ESA-listed species by providing information that fisheries managers can use to determine if recovery actions are increasing wild and natural Snake River salmonid populations. Establishing baseline information on steelhead population status in the Imnaha River Basin will aid in guiding future management actions. ESA-listed adult salmon and steelhead are proposed to be collected using temporary/portable picket weirs, sampled for biological information, sampled for fin tissues and scales, marked with opercular punches, tagged with Tyvek disc tags, and released. ESA-listed adult fish indirect mortalities associated with the research are also requested. ESA-listed adult steelhead carcasses are also proposed to be collected and sampled for tissues and/or scales and biological information (CRITFC 2000).

Permit 1340

The Department of Fisheries and Wildlife, OSU requests a three year permit for takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and adult and juvenile, threatened, SnR steelhead associated with research to be conducted in tributaries of the Imnaha River, the Grande Ronde River, and in Joseph Creek (a tributary of the Snake River) in Oregon. The research is designed to determine how salmonid fishes respond to riparian diversity and how riparian diversity changes over time. The research will build a framework for designing riparian restoration programs in northeast Oregon. The researchers will survey both in-stream and riparian zone characteristics where riparian litter, terrestrial insects, aquatic insects, and fish will be quantified. ESA-listed adult and juvenile salmon and steelhead are proposed to be observed/harassed during snorkel surveys. In addition, ESA-listed salmon and steelhead juveniles are proposed to be captured with hook-and-line with

barbless flies, sampled for biological information and stomach contents, and released. ESA-listed juvenile fish indirect mortalities associated with the research are also requested (OSU 2000).

Permit 1341

SBT requests a five year permit for annual takes of juvenile, endangered, SnR sockeye salmon associated with a study designed to evaluate the annual sockeye salmon smolt emigration from Pettit and Alturas Lakes in ID. The information is needed to estimate overwinter survival, downstream migration survival, and downstream migration timing. The research will also allow SBT researchers to evaluate various release strategies and to calculate smolt-to-adult return rates. The proposed research will benefit the species by providing managers with information on the relative success of the Pettit and Alturas Lakes sockeye salmon reintroduction program. The research will also provide information that resource managers can use to make decisions on future releases of sockeye salmon from IDFG's captive broodstock program in areas where sockeye salmon have been extirpated. Sockeye salmon smolts are proposed to be captured using a rotary screw trap on Alturas Lake Creek and a weir on Pettit Lake Creek. After being captured, the ESA-listed sockeye salmon juveniles are proposed to be sampled for biological information and released or PIT-tagged and released. In addition, to determine trap efficiencies, a portion of the ESA-listed juvenile sockeye salmon to be captured are proposed to be marked with a small cut on the caudal fin, released upstream of the traps, captured at the traps a second time, inspected for the caudal fin mark, and released. Juvenile, threatened, naturally produced, SnR spring/summer chinook salmon are also proposed to be captured at the Alturas Lake location, sampled for biological information, and released during the research. ESA-listed juvenile fish indirect mortalities associated with the research are also requested (SBT 2001). Takes of ESA-listed species associated with SBT's research activities were previously authorized under scientific research permit 998 which expired on December 31, 2000.

Permit 1342

Dr. Gary Thorgaard of the School of Biological Sciences, WSU requests a three year permit for a research project involving the use of small quantities of sperm collected from adult, threatened, SnR spring/summer chinook salmon and adult, threatened, SnR steelhead. The objective of the research is to assess the impact of hatchery rearing on the genetic makeup of salmonid fishes, which may in turn influence their behavior, physiology, and ability to survive in nature. The research seeks to determine the extent to which wild and hatchery salmon and steelhead may differ in their behavioral and physiological responses. If differences are detected, it is possible that hatchery rearing methods could be adjusted to reduce those differences over time by altering selection patterns in the hatcheries. Hybrid fish are proposed to be produced in a laboratory setting using ESA-listed fish sperm and eggs acquired from non-listed hatchery fish. The hybrid fish are proposed to be reared to the parr life stage; subjected to standardized tests designed to analyze the behavioral, physiological, and genetic changes that occur during domestication; and

euthanized at the completion of the experiment. The behavioral and physiological traits of the hybrid fish will then be compared to those of hatchery fish produced using the same eggs. Dr. Thorgaard proposes to acquire the ESA-listed fish sperm from Nez Perce Tribe biologists, who are authorized to collect male gametes from ESA-listed salmon and steelhead for cryopreservation purposes under a separate authorization issued to CRITFC (WSU 2001). The following Special Condition shall be included in Permit 1342:

> All of the hybrid fish produced using sperm from ESA-listed salmon and steelhead must be euthanized at the completion of the research and not released into the wild.

Permit 1343

TCM requests a five year permit for annual takes of juvenile, threatened, naturally produced, SnR spring/summer chinook salmon associated with research designed to monitor the aquatic fish populations in the Thompson Creek and Squaw Creek drainages in the vicinity of Thompson Creek Mine. Thompson Creek Mine is a large, open pit molybdenum mine operation located in the Salmon River subbasin, Custer County, Idaho. The mine currently discharges runoff into Thompson and Squaw Creeks, tributaries to the Salmon River. Annual biological monitoring is proposed to determine the effects of mine operations on the aquatic life in Thompson and Squaw Creeks. The monitoring is required by the Idaho Department of Environmental Quality and USEPA under a National Pollutant Discharge Elimination System permit. The biomonitoring project will benefit all aquatic species, including chinook salmon and steelhead, in that annual monitoring will detect any adverse impacts to the aquatic species as a result of mining operations. ESA-listed juvenile salmon are proposed to be observed/harassed during snorkel surveys. ESA-listed juvenile fish are also proposed to be captured using electrofishing, sampled for biological information, and released. ESA-listed juvenile fish indirect mortalities associated with the research are also requested. TCM also requests that Chadwick Ecological Consultants, Inc. be authorized to act as an agent of TCM under the proposed permit (TCM 2001).

Permit 1344

HMC requests a five year permit for annual takes of juvenile, threatened, naturally produced and artificially propagated, SnR spring/summer chinook salmon associated with research designed to monitor the aquatic fish populations in Jordan Creek and the Yankee Fork of the Salmon River in the vicinity of HMC's Grouse Creek Mine. Grouse Creek Mine is an open pit gold/silver mine operation located adjacent to Jordan Creek, a tributary of the Yankee Fork of the Salmon River. In early 2000, the operations at Grouse Creek Mine were permanently suspended. Annual biological monitoring is proposed to determine the effects of mine operations on the aquatic life in Jordan Creek and the Yankee Fork. The monitoring is required by USFS and USEPA under a National Pollutant Discharge and Elimination System permit and an Administrative Order of Consent. The biomonitoring project will benefit all aquatic species, including chinook salmon and steelhead, in that annual monitoring will detect any adverse

impacts to the aquatic species as a result of mining operations. ESA-listed juvenile salmon are proposed to be observed/harassed during snorkel surveys. ESA-listed juvenile fish are also proposed to be captured using electrofishing, sampled for biological information, and released. ESA-listed juvenile fish indirect mortalities associated with the research are also requested. HMC also requests that Chadwick Ecological Consultants, Inc. be authorized to act as an agent of HMC under the proposed permit (HMC 2001).

Permit 1345

WDFW requests a five year permit for annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR steelhead associated with a scientific research project that is proposed to occur in selected rivers and tributaries within the Snake River Basin in Washington. The objective of the project is to conduct annual warmwater fish stock assessment surveys necessary for inland fish management purposes. Surveys of warmwater fish species are usually conducted in the backwater sloughs, oxbow lakes, and ponds associated with major river systems. Boat electrofishing is a critical component of WDFW's standardized sampling methodology for warmwater fish species. ESA-listed salmon and steelhead juveniles are proposed to be captured using boat electrofishing, sampled for biological information, and released. Indirect mortalities of ESA-listed salmon and steelhead juveniles are also requested (WDFW 2001b). WDFW also requests annual takes of adult, threatened, SnR spring/summer chinook salmon and adult, threatened, SnR steelhead associated with the research. ESA-listed salmon and steelhead adults are proposed to be captured using boat electrofishing, sampled for biological information, and released.

The Action Areas

The action area for endangered SnR sockeye salmon is the Stanley River subbasin in Idaho including the species' designated critical habitat (NOAA 1993b). The action area for the species includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams). Included are adjacent riparian zones, as well as mainstem river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); and Alturas Lake Creek and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 510 square miles in Idaho. The watersheds lie partially or wholly within the following counties: Blaine and Custer.

The action area for threatened SnR spring/summer chinook salmon is the mainstem Snake River,

the Tucannon River subbasin, the Grande Ronde River subbasin, the Imnaha River subbasin, the Salmon River subbasin, and includes the species' designated critical habitat (NOAA 1993b and NOAA 1999). The action area for the species includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams). Included are adjacent riparian zones, as well as mainstem river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence of the Columbia and Snake Rivers and all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 22,390 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Umatilla, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

The action area for threatened SnR fall chinook salmon is the mainstem Snake River, the Tucannon River subbasin, the Grande Ronde River subbasin, the Imnaha River subbasin, the Salmon River subbasin, the Clearwater River subbasin, and includes the species' designated critical habitat (NOAA 1993b). The action area for the species includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams). Included are adjacent riparian zones, as well as mainstem river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence of the Columbia and Snake Rivers; the Snake River including all river reaches from the confluence of the Columbia River upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; and the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Clearwater, Idaho, Latah, Lemhi, Lewis, and Nez Perce; Oregon - Baker, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

The action area for threatened SnR steelhead is the Snake River Basin of southeast Washington, northeast Oregon, and Idaho, and includes the species' designated critical habitat (NOAA 2000a). The action area for the species includes river reaches presently or historically accessible in the Snake River and its tributaries in Idaho, Oregon, and Washington. Included are adjacent riparian zones, as well as mainstem river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence of the Columbia and Snake Rivers. Excluded are tribal lands and areas above specific dams (such as

Dworshak and Hells Canyon Dams) and areas above longstanding, naturally impassable barriers (i.e., Napias Creek Falls and other natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 29,282 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Blaine, Boise, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, and Valley; Oregon - Baker, Umatilla, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

STATUS OF SPECIES INCLUDED IN THIS CONSULTATION

The actions considered in this biological opinion will affect endangered SnR sockeye salmon, threatened SnR spring/summer chinook salmon, threatened SnR fall chinook salmon, and threatened SnR steelhead

Snake River Sockeye Salmon

The SnR sockeye salmon ESU, listed as endangered on November 20, 1991 (NOAA 1991), includes populations of sockeye salmon from the Snake River Basin, Idaho (extant populations occur only in the Salmon River subbasin). Under NMFS' interim policy on artificial propagation (NOAA 1993a), the progeny of fish from a listed population that are propagated artificially are considered part of the ESA-listed species and are protected under ESA. Thus, although not specifically designated in the 1991 listing, SnR sockeye salmon produced in IDFG's captive broodstock program are included in the ESA-listed ESU. Given the dire status of the wild population under any criteria (16 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000), NMFS considers the captive broodstock and its progeny essential for recovery. Critical habitat was designated for SR sockeye salmon on December 28, 1993 (NOAA 1993b).

Information on the status and distribution of endangered SnR sockeye salmon is found in the status review prepared by the Northwest Fisheries Science Center, NMFS (Waples *et al*. 1991a). More recent information on the status and distribution of the sockeye salmon ESU, including hatchery components, is provided in the status review update prepared by the Northwest Fisheries Science Center, NMFS (Gustafson *et al.* 1997). Information on critical habitat for endangered SnR sockeye salmon is found in the *Federal Register* notice that designates critical habitat for this species (NOAA 1993b).

Snake River sockeye salmon adults enter the Columbia River primarily during June and July. Arrival at Redfish Lake, which now supports the only remaining run of Snake River sockeye salmon, peaks in August, and spawning occurs primarily in October (Bjornn *et al.* 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean (Bell 1986).

Migrants leave Redfish Lake during late April through May (Bjornn *et al.* 1968) and travel almost 900 miles to the Pacific Ocean. Smolts reaching the ocean remain inshore or within the influence of the Columbia River plume during the early summer months. Later, they migrate through the northeast Pacific Ocean (Hart 1973, Hartt and Dell 1986). Snake River sockeye salmon spend 2 to 3 years in the Pacific Ocean and return in their fourth or fifth year of life.

Historically, Snake River sockeye salmon were produced in the Salmon River subbasin in Alturas, Pettit, Redfish, and Stanley lakes and in the South Fork Salmon River subbasin in Warm Lake. Sockeye salmon may have been present in one or two other Stanley basin lakes (Bjornn *et al.* 1968). Elsewhere in the Snake River Basin, sockeye salmon were produced in Big Payette Lake on the North Fork Payette River and in Wallowa Lake on the Wallowa River (Evermann 1895, Toner 1960, Bjornn *et al.* 1968, Fulton 1970).

Escapement of sockeye salmon to the Snake River has declined dramatically in the last several decades, primarily because the construction of hydropower dams made it difficult for sockeye salmon to have access to traditional spawning areas. Adult counts at Ice Harbor Dam declined from 3,170 in 1965 to zero in 1990 (ODFW and WDFW 1999). The Idaho Department of Fish and Game counted adults at a weir in Redfish Lake Creek during 1954 through 1966; adult counts dropped from 4,361 in 1955 to fewer than 500 after 1957 (Bjornn *et al.* 1968). A total of 16 wild sockeye salmon returned to Redfish Lake between 1991 and 1999. During 1999, seven hatchery-produced, age-3 adults returned to the Sawtooth Hatchery. Three of these adults were released to spawn naturally, and four were taken into the IDFG captive broodstock program. In 2000, 257 hatchery-produced, age-4 sockeye salmon returned to the Stanley basin (weirs at the Sawtooth Hatchery and Redfish Lake Creek). Adults numbering 243 were handled and redistributed to Redfish (120), Alturas (52), and Pettit (28) lakes, with the remaining 43 adults incorporated into the IDFG captive broodstock program.

Low numbers of adult Snake River sockeye salmon preclude a quantitative analysis of the status of this ESU. However, because only16 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000, NMFS considers the status of this ESU to be dire under any criteria.

Chinook Salmon

The chinook salmon is the largest of the Pacific salmon. The species' distribution historically ranged from the Ventura River in California to Point Hope, Alaska, in North America, and in northeastern Asia from Hokkaido, Japan, to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit the most diverse and complex life history strategies. Healey (1986) described 16 age categories for chinook salmon, combinations of seven total ages with three possible freshwater ages. This level of complexity is roughly comparable to that seen in sockeye salmon, although the latter species has a more extended freshwater residence period and uses different freshwater habitats (Miller

and Brannon 1982, Burgner 1991). Gilbert (1912) initially described two generalized freshwater life-history types: "stream-type" chinook salmon, which reside in freshwater for a year or more following emergence, and "ocean-type" chinook salmon, which migrate to the ocean within their first year. Healey (1983, 1991) has promoted the use of broader definitions for ocean-type and stream-type to describe two distinct races of chinook salmon. Healey's approach incorporates life-history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations.

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in freshwater; migration to the ocean; and the subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. The juvenile rearing period in freshwater can be minimal or extended. Additionally, some male chinook salmon mature in freshwater, thereby not emigrating to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions to varying degrees. Although salmon exhibit a high degree of variability in life-history traits, there is considerable debate regarding the degree to which this variability is shaped by local adaptation or results from the general plasticity of the salmonid genome (Ricker 1972, Healey 1991, Taylor 1991).

Snake River Spring/Summer Chinook Salmon

The SnR spring/summer chinook salmon ESU, listed as threatened on April 22, 1992 (NOAA 1992), includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. Some or all of the fish returning to several of the hatchery programs are also listed including those returning to the Tucannon River, Imnaha River, and Grande Ronde River hatcheries, and to the Sawtooth, Pahsimeroi, and McCall hatcheries on the Salmon River. Critical habitat was designated for SnR spring/summer chinook salmon on December 28, 1993 (NOAA 1993b), and was revised on October 25, 1999 (NOAA 1999).

Information on the status and distribution of SnR spring/summer chinook salmon is found in the status review prepared by the Northwest Fisheries Science Center, NMFS (Matthews and Waples 1991). More recent information on the status and distribution of the chinook salmon ESU, including hatchery components of the respective populations, is provided in the Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California prepared by the West Coast Chinook Salmon Biological Review Team (Myers *et al.* 1998) and the Evaluation of the Status of Chinook and Chum Salmon and Steelhead Hatchery Populations for ESUs Identified in Final Listing Determinations prepared by the Conservation Biology Division of the NWFSC (NMFS 1999a). Information on critical habitat for threatened SnR spring/summer chinook salmon is found in the *Federal Register* notice that designates critical habitat for this species (NOAA 1993b) and the *Federal Register* notice that revised the critical habitat designation for the species (NOAA 1999).

The present range of spawning and rearing habitat for naturally spawned SnR spring/summer

chinook salmon is primarily limited to the Salmon, Grande Ronde, Imnaha, and Tucannon River subbasins. Most SnR spring/summer chinook salmon enter individual subbasins from May through September. Juvenile SnR spring/summer chinook salmon emerge from spawning gravels from February through June (Peery and Bjornn 1991). Typically, after rearing in their nursery streams for about 1 year, smolts begin migrating seaward in April and May (Bugert *et al.* 1990, Cannamela 1992). After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit nearshore areas before beginning their northeast Pacific Ocean migration, which lasts 2 to 3 years.

Bevan *et al.* (1994) estimated the number of wild adult SnR spring/summer chinook salmon in the late 1800s to be more than 1.5 million fish annually. By the 1950s, the population had declined to an estimated 125,000 adults. Escapement estimates indicate that the population continued to decline through the 1970s. Returns varied through the 1980s, but have declined further in recent years. Record low returns were observed in 1994 and 1995. Dam counts were modestly higher from 1996 through 1998, but declined in 1999. For management purposes, the spring and summer chinook salmon in the Columbia River Basin, including those returning to the Snake River, have been managed as separate stocks. Historical databases, therefore, provide separate estimates for the spring and summer chinook salmon components.

NMFS set an interim recovery level for SnR spring/summer chinook salmon (31,400 adults at Ice Harbor Dam) in its proposed recovery plan (NMFS 1995). The SnR spring/summer chinook salmon ESU consists of 39 local spawning populations (subpopulations) spread over a large geographic area (Lichatowich *et al.* 1993). The number of fish returning to Lower Granite Dam is, therefore, divided among these subpopulations. The relationships between these subpopulations, and particularly the degree to which individuals may intermix, are unknown. It is unlikely that all 39 are independent populations per the definition in McElhany *et al.* (2000), which requires that each be isolated such that the exchange of individuals between populations does not substantially affect population dynamics or extinction risk over a 100-year time frame. Nonetheless, monitoring the status of subpopulations provides more detailed information on the status of the species than would an aggregate measure of abundance.

For 2000, the preliminary final aggregate count for upriver spring chinook salmon at Bonneville Dam was 178,000. This is the second highest return in 30 years (after the 1972 return of 179,300 adults). Although only a small portion of these fish is expected to be natural-origin spring chinook salmon destined for the Snake River (5,800), the aggregate estimate for natural-origin SnR spring chinook salmon is substantially higher than the contributing brood year escapements. The 2000 forecast for the upriver summer chinook salmon stocks is 33,300, which is the second highest return in over 30 years, but with only a small portion (2,000) being natural-origin fish destined for the Snake River. The return of natural-origin fish compares to brood year escapements in 1995 and 1996 of 534 and 3,046 and is generally lower than the average returns over a recent 5- year period (3,466).

The probability of meeting survival and recovery objectives for SnR spring/summer chinook salmon under various future operation scenarios for the Federal Columbia River Power System (FCRPS) was analyzed through a process referred to as PATH (Plan for Analyzing and Testing Hypotheses). The scenarios analyzed focused on status quo management and options that emphasized either juvenile transportation or hydro-project drawdown. A 70 percent probability of exceeding the threshold escapement levels was used to assess survival. Recovery potential was assessed by comparing the projected abundance to the recovery abundance levels after 48 years. A 50 percent probability of exceeding the recovery abundance levels was used to evaluate recovery by comparing the 8-year mean projected abundance. In general, the survival and recovery standards were met for operational scenarios involving drawdown, but were not met under status quo management or for the scenarios that relied on juvenile transportation (Marmorek and Peters 1998). If the most conservative harvest rate schedule was assumed, transportation scenarios came very close to meeting the survival and recovery standards.

For the SnR spring/summer chinook salmon ESU as a whole, NMFS estimates that the median population growth rate over the base period[2] ranges from 0.96 to 0.80, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to the effectiveness of fish of wild origin (McClure *et al.* 2000b). NMFS has also estimated median population growth rates and the risk of absolute extinction for seven spring/summer chinook salmon index stocks,[3] using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years for the wild component ranges from zero for Johnson Creek to 0.78 for the Imnaha River (McClure *et al.* 2000b). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years ranges from zero for Johnson Creek to 1.00 for the wild component in the Imnaha River (McClure *et al.* 2000b).

Snake River Fall Chinook Salmon

The SnR fall chinook salmon ESU, listed as threatened on April 22, 1992 (NOAA 1992), includes all natural-origin populations of fall chinook in the mainstem Snake River and several tributaries including the Tucannon, Grande Ronde, Salmon, and Clearwater Rivers. Fall chinook salmon from the Lyons Ferry Hatchery are included in the ESU but are not listed. Critical habitat was designated for SnR fall chinook salmon on December 28, 1993 (NOAA 1993b).

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[2]Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1999 adult returns. Population trends are projected under the assumption that all conditions will stay the same into the future.

[3] McClure et al. (2000c) have calculated population trend parameters for additional SnR spring/summer chinook salmon stocks.

Information on the status and distribution of SnR fall chinook salmon is found in the status review prepared by the Northwest Fisheries Science Center, NMFS (Waples *et al.* 1991b). More recent information on the status and distribution of the chinook salmon ESU is provided in the Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California prepared by the West Coast Chinook Salmon Biological Review Team (Myers *et al.* 1998). Information on critical habitat for threatened SnR fall chinook salmon is found in the *Federal Register* notice that designates critical habitat for this species (NOAA 1993b).

The spawning grounds between Huntington (RM 328) and Auger Falls (RM 607) on the mainstem Snake River were historically the most important for this species. Only limited spawning activity was reported downstream from RM 273 (Waples *et al.* 1991b), about 1 mile upstream of Oxbow Dam. Since then, irrigation and hydrosystem projects on the mainstem Snake River have blocked access to or inundated much of this habitat causing the fish to seek out less preferable spawning grounds wherever they are available. Natural fall chinook salmon spawning now occurs primarily in the Snake River below Hells Canyon Dam and the lower reaches of the Clearwater, Grand Ronde, Salmon, and Tucannon Rivers.

Adult SnR fall chinook salmon enter the Columbia River in July and migrate into the Snake River from August through October. Fall chinook salmon generally spawn from October through November, and fry emerge from March through April. Downstream migration generally begins within several weeks of emergence (Becker 1970, Allen and Meekin 1973), and juveniles rear in backwaters and shallow water areas through mid-summer before smolting and migrating to the ocean—thus they exhibit an ocean-type juvenile history. Once in the ocean, they spend 1 to 4 years (though usually, 3 years) before beginning their spawning migration. Fall returns in the Snake River system are typically dominated by 4-year-old fish.

No reliable estimates of historical abundance are available. Because of their dependence on mainstem habitat for spawning, however, fall chinook salmon probably have been affected by the development of irrigation and hydroelectric projects to a greater extent than any other species of salmon. It has been estimated that the mean number of adult SnR fall chinook salmon declined from 72,000 in the 1930s and 1940s to 29,000 during the 1950s. Despite this decline, the Snake River remained the most important natural production area for fall chinook salmon in the entire Columbia River Basin through the 1950s. The number of adults counted at the uppermost Snake River mainstem dams averaged 12,720 total spawners from 1964 to 1968, 3,416 spawners from 1969 to 1974, and 610 spawners from 1975 to 1980 (Waples *et al.* 1991b).

Counts of natural-origin adult fish continued to decline through the 1980s, reaching a low of 78 individuals in 1990. Since then, the return of natural-origin fish to Lower Granite Dam has varied, but has generally increased, reaching a recent year high of 797 in 1997. The 1998 return declined to 306. This was not anticipated and is of particular concern because it is close to the low threshold escapement level of 300 that indicates increased risk (BRWG 1994). The low return in 1998 may have been due to severe flooding in 1995.

The recovery standard identified in the 1995 Proposed Recovery Plan (NMFS 1995) for SnR fall chinook salmon was a population of at least 2,500 naturally produced spawners (to be calculated as an 8-year geometric mean). Before the adult counts at Lower Granite Dam can be compared to the natural spawner escapement, adults that may fall back below the dam after counting must be accounted for, as well as prespawning mortality. A preliminary estimate suggested that a Lower Granite Dam count of 4,300 would be necessary to meet the 2,500-fish escapement goal (NMFS 1995). For comparison, the geometric mean of the Lower Granite Dam counts of natural-origin fall chinook salmon over a recent 8-year period was 481.

A further consideration regarding the status of SnR fall chinook salmon is the existence of the Lyons Ferry Hatchery stock which is considered part of the ESU. Several hundred adults have returned to the Lyons Ferry Hatchery in recent years. More recently, supplementation efforts designed to accelerate rebuilding were initiated, beginning with smolt outplants from the 1995 brood year. The existence of the Lyons Ferry program has been an important consideration in evaluating the status of the ESU, because it reduces the short-term risk of extinction by providing a reserve of fish from the ESU. Without the hatchery program, the risk of extinction would be considered high because the ESU would otherwise be comprised of a few hundred individuals from a single population, in marginal habitat, with a demonstrated record of low productivity. Although the supplementation program probably contributes to the population of natural-origin spawners, it does little to change the productivity of the system upon which a naturally spawning population must rely. Supplementation is, therefore, not a long-term substitute for recovery.

Recent analyses conducted through the PATH process considered the prospects for survival and recovery given several future management options for the hydrosystem and other mortality sectors (Marmorek and Peters 1998, Peters *et al.* 1999). That analysis indicated that the prospects of survival for SnR fall chinook salmon were good, but that full recovery was relatively unlikely except under a very limited range of assumptions, or unless drawdown was implemented for at least the four lower Snake River dams. Consideration of the drawdown options led to a high likelihood that both survival and recovery objectives could be achieved.

For the SnR fall chinook salmon ESU as a whole, NMFS estimates that the median population growth rate over the base period[4] ranges from 0.94 to 0.86, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000b). NMFS has also estimated the risk of absolute extinction for the aggregate SnR fall chinook salmon population, using the same range of assumptions about the relative effectiveness

[4] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1996 adult returns. Population trends are projected under the assumption that all conditions will stay the same into the future.

of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.40 (McClure *et al.* 2000b). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years is 1.00 (McClure *et al.* 2000b).

Steelhead

Steelhead can be divided into two basic run types based on the level of sexual maturity at the time of river entry and the duration of the spawning migration (Burgner *et al.* 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in fresh water to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, whereas others only have one run type.

In the Pacific Northwest, summer steelhead enter fresh water between May and October (Busby *et al.* 1996). During summer and fall, before spawning, they hold in cool, deep pools. They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration to natal streams in early spring, and then spawn (Meehan and Bjornn 1991). Winter steelhead enter fresh water between November and April in the Pacific Northwest (Nickelson *et al.* 1992), migrate to spawning areas, and then spawn in late winter or spring. Some adults do not, however, enter coastal streams until spring, just before spawning (Meehan and Bjornn 1991). Difficult field conditions (snowmelt and high stream flows) and the remoteness of spawning grounds contribute to the lack of specific information on steelhead spawning.

Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying, and most that do so are females (Nickelson *et al.* 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996). Multiple spawnings for steelhead range from 3 percent to 20 percent of runs in Oregon coastal streams.

Steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation. Cover, in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity (Giger 1973), is required to reduce disturbance and predation of spawning steelhead. Summer steelhead usually spawn further upstream than winter steelhead (Withler 1966, Behnke 1992).

Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (NOAA 1996) before hatching. Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs at lower

densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson *et al.* 1992). Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as smolts. Winter steelhead populations generally smolt after 2 years in fresh water (Busby *et al.* 1996). Steelhead typically reside in marine waters for 2 or 3 years before returning to their natal stream to spawn at 4 or 5 years of age. Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north, but age-2-ocean steelhead generally remain dominant (Busby *et al.* 1996).

Based on purse seine catches, juvenile steelhead tend to migrate directly offshore during their first summer, rather than migrating along the coastal belt as do salmon. During fall and winter, juveniles move southward and eastward (Hartt and Dell 1986). Oregon steelhead tend to be north-migrating (Nicholas and Hankin 1988, Pearcy *et al.* 1990, Pearcy 1992).

Snake River Steelhead

The longest consistent indicator of steelhead abundance in the Snake River Basin is derived from counts of natural-origin steelhead at the uppermost dam on the lower Snake River. According to these estimates, the abundance of natural-origin summer steelhead at the uppermost dam on the Snake River has declined from a 4-year average of 58,300 in 1964 to a 4-year average of 8,300 ending in 1998. In general, steelhead abundance declined sharply in the early 1970s, rebuilt modestly from the mid-1970s through the 1980s, and declined again during the 1990s.

These broad-scale trends in the abundance of steelhead were reviewed through the PATH process. The PATH report indicated that the initial, substantial decline coincided with the declining trend in downstream passage survival through the Federal hydrosystem. The more recent decline in abundance, observed over the last decade or more, does not coincide with declining passage survival, but can be at least partially be accounted for by a shift in climatic regimes that has affected ocean survival (Marmorek and Peters 1998).

The abundance of A-run versus B-run components of Snake River steelhead can be distinguished in data collected since 1985. Both components have declined through the 1990s, but the decline of B-run steelhead has been more significant. The 4-year average counts at Lower Granite Dam declined from 18,700 to 7,400 beginning in 1985 for A-run steelhead and from 5,100 to 900 for B-run steelhead. Recent counts have been stable for A-run steelhead and without apparent trend. Counts for B-run steelhead have been low and highly variable, but also without apparent trend.

A comparison of recent dam counts with escapement objectives provides perspective regarding the status of the ESU. The management objective for SnR steelhead stated in the Columbia River Fisheries Management Plan was to return 30,000 natural/wild steelhead to Lower Granite Dam. The All Species Review (TAC 1997) further clarified that this objective was subdivided into 20,000 A-run and 10,000 B-run steelhead. Idaho has reevaluated these escapement

objectives using estimates of juvenile production capacity. This alternative methodology led to revised estimates of 22,000 for A-run and 31,400 for B-run steelhead.

The state of Idaho has conducted redd count surveys in the major subbasins since 1990. The surveys can be used as indicators of relative trends. The redd counts in natural-origin B-run production subbasins declined from 467 in 1990 to 59 in 1998. The declines are evident in all four of the primary B-run production areas. Index counts in the natural-origin A-run production areas have not been conducted with enough consistency to permit similar characterization.

Idaho has also conducted surveys for juvenile abundance in index areas throughout the Snake River Basin since 1985. Parr densities of A-run steelhead have declined from an average of about 75 percent of carrying capacity in 1985 to an average of about 35 percent in recent years through 1995. Further declines were observed in 1996 and 1997. Parr densities of B-run steelhead have been low, but relatively stable since 1985, averaging 10 percent to 15 percent of carrying capacity through 1995. Parr densities in B-run tributaries declined further in 1996 and 1997 to 11 percent and 8 percent, respectively.

The Snake River historically supported more than 55 percent of total natural-origin production of steelhead in the Columbia River Basin. It now has approximately 63 percent of the basin's natural production potential (Mealy 1997). B-run steelhead occupy four major subbasins, including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork), areas that are for the most part not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives of 10,000 (Columbia River Fisheries Management Plan) and 31,400 (Idaho) for B-run steelhead. B-run steelhead, therefore, represent at least 1/3 and as much as 3/5 of the production capacity of the ESU.

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger fish with a later run timing, returning primarily to the South Fork Salmon, Middle Fork Salmon, Selway, and Lochsa Rivers. The recent review by the *U.S. v. Oregon* Technical Advisory Committee (TAC), a group that monitors adult salmon and steelhead escapement in the Snake River Basin, indicated that different populations of steelhead do have different size structures, with populations dominated by larger fish (i.e., greater than 77.5 cm) occurring in the traditionally defined B-run basins (TAC 1999). Larger fish occur in other populations throughout the basin, but at much lower rates. Evidence suggests that fish returning to the Middle Fork Salmon River and Little Salmon River have a more equal distribution of large and small fish. B-run steelhead also are generally older. A-run steelhead are predominately 1-ocean fish, whereas most B-run steelhead generally spend 2 or more years in the ocean before spawning. The differences in ocean age are primarily responsible for the differences in the size of A- and B-run steelhead. However, B-run steelhead are also thought to be larger at any given age than A-run fish. This may be due, at least in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence when growth rates are thought to be greatest.

Historically, a distinctly bimodal pattern of freshwater entry could be used to distinguish A-run and B-run fish. A-run steelhead were presumed to cross Bonneville Dam from June to late August, whereas B-run steelhead entered from late August to October. The *U.S. v. Oregon* TAC reviewed the available information on timing and confirmed that most large fish still have a later timing at Bonneville; 70 percent of the larger fish crossed the dam after August 26, the traditional cutoff date for separating A- and B-run fish (TAC 1999). However, the timing of the early part of the A-run has shifted somewhat later, thereby reducing the distinction that was so apparent in the 1960s and 1970s. The timing of the larger, natural-origin, B-run fish has not changed.

No recent genetic data are available for B-run steelhead populations in the South and Middle Forks of the Salmon River. The Dworshak National Fish Hatchery (NFH) stock and natural populations in the Selway and Lochsa Rivers are, thus far, the most genetically distinct populations of steelhead in the Snake River Basin (Waples *et al.* 1993). In addition, the Selway and Lochsa River populations from the Middle Fork Clearwater River appear to be very similar to each other genetically, and naturally produced rainbow trout from the North Fork Clearwater River (above Dworshak Reservoir) clearly show an ancestral genetic similarity to Dworshak NFH steelhead. The existing genetic data, the restricted geographic distribution of B-run steelhead in the Snake (Columbia) River Basin, and the unique life history attributes of these fish (i.e., larger, older adults with a later distribution of run timing compared to A-run steelhead in other portions of the Columbia River Basin) clearly support the conservation of B-run steelhead as a biologically significant component of the Snake River ESU.

NMFS also considers the status of the component populations as an indicator of the status of the ESU. Because populations are relatively isolated, it is biologically meaningful to evaluate the risk of extinction of one population independently from any other. Although NMFS has not formally reviewed all the available information, it is reasonable to conclude that each of the major subbasins in the ESU represents a population within the context of this discussion. A-run populations would include at least the tributaries to the lower Clearwater River, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde River, Imnaha River, and possibly the Snake River's mainstem tributaries below Hells Canyon Dam. B-run populations would be identified in the Middle Fork and South Fork Salmon Rivers, the Lochsa and Selway Rivers (major tributaries of the upper Clearwater River), and the mainstem Clearwater River. These basins are, for the most part, large geographical areas and there probably is additional population structure within some of these basins. However, because that hypothesis has not been confirmed, NMFS assumes that there are at least five populations of A-run steelhead and five populations of B-run steelhead in the SnR steelhead ESU.

Hatchery populations, if genetically similar to their natural-origin counterparts, provide a hedge against extinction of the ESU or the gene pool. The Imnaha River and Oxbow hatcheries produce A-run stocks that are currently included in the SnR steelhead ESU. The Pahsimeroi and Wallowa hatchery stocks may also be appropriate and available for use in developing supplementation programs. In its recent biological opinion on Columbia River Basin hatchery

operations, NMFS required that the Pahsimeroi hatchery program begin to transition to a local-origin broodstock to provide a source for future supplementation efforts in the lower Salmon River (NMFS 1999b). Although other stocks provide more immediate opportunities to initiate supplementation programs within some subbasins, it may also be necessary and desirable to develop additional broodstocks that can be used for supplementation in other natural production areas. Despite uncertainties, these hatchery stocks provide a safeguard against the further decline of natural-origin populations.

The Dworshak NFH is unique in the Snake River Basin because it produces a B-run hatchery stock. The Dworshak stock was developed from natural-origin steelhead within the North Fork Clearwater River, was largely free of introductions from other areas, and was, therefore, included in the ESU, although not as part of the ESA-listed component. However, past hatchery practices and possible changes in flow and temperature conditions related to Dworshak Dam have led to substantial divergence in spawn timing of the hatchery stock compared to what was observed historically in the North Fork Clearwater River and compared to the natural-origin populations in other parts of the Clearwater River Basin. Because the spawn timing of the hatchery stock is now much earlier than it was historically, the success of supplementation efforts using these stocks may be limited. In fact, past supplementation efforts in the South Fork Clearwater River using Dworshak NFH stock have been largely unsuccessful, although improvements in out-planting practices have the potential to yield different results. The unique genetic character of Dworshak NFH steelhead will limit the use of the stock for supplementation in other parts of the Clearwater River subbasin and in the Salmon River B-run basins.

For the SnR steelhead ESU as a whole, NMFS estimates that the median population growth rate over the base period[5] ranges from 0.91 to 0.70, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000b). NMFS has also estimated the risk of absolute extinction for the A- and B-runs, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.01 for A-run steelhead and 0.93 for B-run fish (McClure *et al.* 2000b). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years is 1.00 for both runs (McClure *et al.* 2000b).

ENVIRONMENTAL BASELINE

The environmental baseline for this consultation is the result of several forms of activities, summarized below, that affect the survival and recovery of SnR sockeye salmon, SnR

[5] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1997 adult returns. Population trends are projected under the assumption that all conditions will stay the same into the future.

spring/summer chinook salmon, SnR fall chinook salmon, and SnR steelhead. The biological requirements of SnR sockeye salmon, SnR spring/summer chinook salmon, SnR fall chinook salmon, and SnR steelhead are currently not being met under their respective environmental baselines. Their status is such that there must be a significant improvement in the environmental conditions of the species' respective habitats (over those currently available under the environmental baselines). Any further degradation of the environmental conditions would have a significant impact due to the amount of risk the species presently face under the environmental baselines. In addition, there must be improvements to minimize impacts due to hydropower dams, incidental harvest, hatchery practices, and unfavorable estuarine and marine conditions.

The best scientific information presently available suggests that a multitude of factors, past and present, have contributed to the decline of West Coast salmonids. NMFS reviewed much of that information in its recent consultation "Reinitiation of Consultation on Operation of the Federal Columbia River Power System (FCRPS), Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin" (NMFS 2000d), and that review is summarized here. NMFS recognizes that natural environmental fluctuations have likely played a role in the species' recent declines. However, NMFS believes that other human-induced impacts (e.g., harvest in certain fisheries, artificial propagation, water diversions, and widespread habitat modification) have played an equally significant role in the decline of these species. While at-risk salmonid stocks may benefit from a reversal in the current climate/ocean regime, resource managers need to focus on reducing impacts from harvest and artificial propagation and improving freshwater and estuarine habitats.

The Species' Biological Requirements in the Action Areas

SnR sockeye salmon, SnR spring/summer chinook salmon, SnR fall chinook salmon, and SnR steelhead reside in, or migrate through, the action areas considered in this consultation. The biological requirements during the species' life history stages can be obtained by identifying the essential features of their critical habitat. Essential features include adequate: (1) substrate (especially spawning gravel), (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) migration conditions (NOAA 2000a). As discussed below there are numerous factors affecting these requirements in the action areas.

Factors Affecting the Species in the Action Areas

Hydropower System Effects on the Baseline

Anadromous salmonids in the Columbia River Basin have been dramatically affected by the development and operation of the FCRPS on the lower Snake and Columbia Rivers. Storage dams have eliminated spawning and rearing habitat and have altered the natural hydrograph of the Snake and Columbia Rivers, decreasing spring and summer flows and increasing fall and winter flows. Power operations cause flow levels and river elevations to fluctuate, affecting fish

movement through reservoirs and riparian ecology, and stranding fish in shallow areas. The dams in the migration corridor alter smolt and adult migrations. Smolts experience a high level of mortality passing the dams. The dams also have converted the once-swift river into a series of slow-moving reservoirs, slowing the smolts' journey to the ocean and creating habitat for predators. Water velocities throughout the migration corridor now depend far more on volume runoff than before the development of the mainstem reservoirs.

There have been numerous changes in the operation and configuration of the FCRPS as a result of ESA consultations between NMFS and the Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers (Corps), USFWS, and the Bureau of Reclamation (BOR). The changes have improved survival for the ESA-listed fish migrating through the Snake and Columbia Rivers. Increased spill at the dams allows smolts to avoid both turbine intakes and bypass systems. Increased flow in the mainstem Snake and Columbia Rivers provides better inriver conditions for smolts. The transportation of smolts from the Snake River has also been improved by the addition of new barges and modification of existing barges. In addition to spill, flow, and transportation improvements, the Corps implemented numerous other improvements to project operations and maintenance at all FCRPS dams on the Snake and Columbia Rivers.

It is possible to quantify the survival benefits accruing from many of these strategies for each of the ESA-listed anadromous fish ESUs. For Snake River spring/summer chinook salmon smolts migrating inriver, the estimated survival through the hydrosystem is now between 40 percent and 60 percent, compared with an estimated survival rate during the 1970s of 5 percent to 40 percent. Snake River steelhead have probably received a similar benefit because their life history and run timing are similar to those of spring/summer chinook salmon (NMFS 2000b). It is more difficult to obtain direct data and compare survival improvements for fish transported from the Snake River, but there are likely to be improvements for transported fish as well. It is reasonable to expect that the improvements in operation and configuration of the FCRPS will benefit all ESA-listed Columbia River Basin salmonids and that the benefits will be greater the farther upriver the ESU. However, further improvements are necessary because the Federal hydrosystem continues to cause a significant level of mortality for some ESUs.

Habitat Effects on the Baseline

The quality and quantity of freshwater habitat in much of the Columbia River Basin have declined dramatically in the last 150 years. Forestry, agriculture, road construction, hydrosystem development, mining, and urbanization have radically changed the historical habitat conditions of the basin. With the exception of fall chinook, which generally spawn and rear in the mainstem rivers, salmon and steelhead spawning and rearing habitat is found in the tributaries to the Snake and Columbia Rivers. Anadromous fish typically spend from a few months to three years rearing in freshwater tributaries. Depending on the species, they spend from a few days to one or two years in the Columbia River estuary before migrating out to the ocean and another one to four years in the ocean before returning as adults to spawn in their natal streams.

Water quality in streams throughout the Columbia River Basin has been degraded by human activities such as dams and diversion structures, water withdrawals, farming and animal grazing, road construction, timber harvest activities, mining activities, and urbanization. Over 2,500 streams and river segments and lakes do not meet Federally-approved, state and Tribal water quality standards and are now listed as water-quality-limited under Section 303(d) of the Clean Water Act. Tributary water quality problems contribute to poor water quality where sediment and contaminants from the tributaries settle in mainstem reaches and the estuary.

Most of the water bodies in Oregon, Washington, and Idaho that are on the 303(d) list do not meet water quality standards for temperature. Temperature alterations affect salmonid metabolism, growth rate, and disease resistance, as well as the timing of adult migrations, fry emergence, and smoltification. Many factors can cause high stream temperatures, but they are primarily related to land-use practices rather than point-source discharges. Some common actions that result in high stream temperatures are the removal of trees or shrubs that directly shade streams, excessive water withdrawals for irrigation or other purposes, and warm irrigation return flows. Loss of wetlands and increases in groundwater withdrawals have contributed to lower base-stream flows, which in turn contribute to temperature increases. Channel widening and land uses that create shallower streams also cause temperature increases.

Pollutants also degrade water quality. Salmon require clean gravel for successful spawning, egg incubation, and the emergence of fry. Fine sediments clog the spaces between gravel and restrict the flow of oxygen-rich water to the incubating eggs. Excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH also directly affect the water quality for salmon and steelhead.

Water quantity problems are also a significant cause of habitat degradation and reduced fish production. Millions of acres of land in the basin are irrigated. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September) and restoring it to surface streams and groundwater in ways that are difficult to measure. Withdrawing water for irrigation, urban, and other uses can increase temperatures, smolt travel time, and sedimentation. Return water from irrigated fields can introduce nutrients and pesticides into streams and rivers.

On a larger landscape scale, human activities have affected the timing and amount of peak water runoff from rain and snowmelt. Forest and range management practices have changed vegetation types and density, which can affect the timing and duration of runoff. Many riparian areas, flood plains, and wetlands that once stored water during periods of high runoff have been developed. Urbanization paves over or compacts soil and increases the amount and pattern of runoff reaching rivers and streams.

Blockages that stop the downstream and upstream movement of fish exist at many agricultural,

hydrosystem, municipal/industrial, and flood control dams and barriers. Highway culverts that are not designed for fish passage also block upstream migration. Migrating fish are diverted into unscreened or inadequately screened water conveyances or turbines, resulting in unnecessary mortality. While many fish-passage improvements have been made in recent years, manmade structures continue to block migrations or kill fish throughout the basin.

Land ownership has played a part in habitat and land-use changes. Federal lands, which compose 50 percent of the basin, are generally forested and influence upstream portions of the watersheds. While there is substantial habitat degradation across all ownerships, in general, habitat in many headwater stream sections is in better condition than in the largely non-Federal lower portions of tributaries (Doppelt *et al*. 1993, Frissell 1993, Henjum *et al*. 1994, Quigley and Arbelbide 1997). In the past, valley bottoms were among the most productive fish habitats in the basin (Stanford and Ward 1992, Spence *et al*. 1996, ISG 1996). Today, agricultural and urban land development and water withdrawals have significantly altered the habitat for fish and wildlife. Streams in these areas typically have high water temperatures, sedimentation problems, low flows, simplified stream channels, and reduced riparian vegetation.

Mainstem habitats of the Columbia and Snake Rivers have been affected by impoundments that have inundated large amounts of spawning and rearing habitat. Historically, fall chinook salmon spawned in the mainstem near The Dalles, Oregon, upstream to the Pend Oreille River in Washington and the Kootenai River in Idaho and in the Snake River downstream of Shoshone Falls. Current mainstem production areas for fall chinook salmon are mostly confined to the Hanford Reach of the mid-Columbia River and to the Hells Canyon Reach of the Snake River, with minor spawning populations elsewhere in the mid-Columbia River, below the lower Snake River dams, and below Bonneville Dam. Mainstem habitat in the Columbia and Snake Rivers has been reduced, for the most part, to a single channel, floodplains have been reduced in size, off-channel habitat features have been lost or disconnected from the main channel, and the amount of large woody debris (large snags/log structures) in rivers has been reduced. Most of the remaining habitats are affected by flow fluctuations associated with reservoir management.

The Columbia River estuary has also been changed by human activities. Navigation channels have been dredged, deepened and maintained, jetties and pile-dike fields have been constructed to stabilize and concentrate flow in navigation channels, marsh and riparian habitats have been filled and diked, and causeways have been constructed across waterways. These actions have decreased the width of the mouth of the Columbia River to two miles and increased the depth of the Columbia River channel at the bar from less than 20 to more than 55 feet. More than 50 percent of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreational, agricultural, or urban uses. More than 3,000 acres of intertidal marsh and spruce swamps have been converted to other uses since 1948 (LCREP 1999). Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Furthermore, water storage and release patterns from reservoirs upstream of the estuary have changed the seasonal

pattern and volume of discharge. The peaks of spring/summer floods have been reduced, and the amount of water discharged during winter has increased.

The Basinwide Recovery Strategy (Federal Caucus 2000) outlines a broad range of current programs designed to improve habitat conditions for anadromous fish. Because most of the basin's anadromous fish spawning habitat is in Federal ownership, Federal land management programs are of primary importance. Examples of Federal actions likely to affect salmonids in the ESA-listed ESUs include authorized land management activities of the USFS and Bureau of Land Management (BLM). Federal actions, including the Corps' section 404 permitting activities under the Clean Water Act, the Corps' permitting activities under the River and Harbors Act, National Pollution Discharge Elimination System permits issued by EPA, highway projects authorized by the Federal Highway Administration, Federal Energy Regulatory Commission licenses for non-Federal development and operation of hydropower, and Federal hatcheries may result in impacts to ESA-listed anadromous fish.

Several recovery efforts are underway that may slow or reverse the decline of salmon and steelhead populations. Notable efforts within the range of the Snake River salmonid ESUs are the Northwest Forest Plan (NFP), PACFISH, Washington Wild Stock Restoration Initiative, and Washington Wild Salmonid Policy. PACFISH is an ecosystem-based aquatic habitat and riparian-area management strategy that covers the majority of the basin accessible to anadromous fish and includes specific prescriptions designed to halt habitat degradation. PACFISH provides objectives, standards, and guidelines that are applied to all Federal land management activities such as timber harvest, road construction, mining, grazing, and recreation. USFS and BLM implemented PACFISH beginning in 1995. Several other efforts are also being carried forward by NMFS, USFS, and BLM. These components include (but are not limited to) implementation monitoring and accountability, a system of watersheds that are prioritized for protection and restoration, improved and monitored grazing systems, road system evaluation and planning requirements, mapping and analysis of unroaded areas, multi-year restoration strategies, and batching and analyzing projects at the watershed scale.

The most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy (ACS), a regional-scale aquatic ecosystem conservation strategy that includes: (1) Special land allocations (such as key watersheds, riparian reserves, and late-successional reserves) to provide aquatic habitat refugia; (2) special requirements for project planning and design in the form of standards and guidelines; and (3) new watershed analysis, watershed restoration, and monitoring processes. These components collectively ensure that Federal land management actions achieve ACS objectives that strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and to restore currently degraded habitats.

The Basinwide Recovery Strategy also outlines a large number of non-Federal habitat programs. Because non-Federal habitat is managed predominantly for private rather than public purposes,

expectations for non-Federal habitat are harder to assess. Degradation of habitat for ESA-listed fish from activities on non-Federal lands is likely to continue to some degree, although at a reduced rate due to state, tribal, and local recovery plans. Because a substantial portion of land in the ESA-listed salmonid ESUs is in state or private ownership, conservation measures on these lands will be key to protecting and recovering ESA-listed salmon and steelhead populations. NMFS recognizes that strong conservation benefits will accrue from specific components of many non-Federal conservation efforts, however, some of those conservation efforts are very recent and few address salmon conservation at a scale that is adequate to protect and conserve entire ESUs. NMFS will continue to encourage non-Federal landowners to assess the impacts of their actions on ESA-listed salmonids. In particular, NMFS will encourage state and local governments to use their existing authorities and programs, and will encourage the formation of watershed partnerships to promote conservation in accordance with ecosystem principles.

Hatchery Effects on the Baseline

For more than 100 years, hatcheries in the Pacific Northwest have been used to replace natural production lost as a result of the construction of hydropower dams and other development, not to protect and rebuild naturally-produced salmonid populations. As a result, most salmonid populations in the region are primarily hatchery fish. In 1987, for example, 95 percent of the coho salmon, 70 percent of the spring chinook salmon, 80 percent of the summer chinook salmon, 50 percent of the fall chinook salmon, and 70 percent of the steelhead returning to the Columbia River Basin originated in hatcheries (CBFWA 1990). While hatcheries certainly have contributed greatly to the overall numbers of salmonids, only recently has the effect of hatcheries on native wild populations been demonstrated. In many cases, these effects have been substantial. For example, the production of hatchery fish, among other factors, has contributed to the 90 percent reduction in wild coho salmon runs in the lower Columbia River over the past 30 years (Flagg *et al.* 1995).

NMFS has identified four primary categories of risk that hatcheries can pose on wild-run salmon and steelhead: (1) ecological effects, (2) genetic effects, (3) overharvest effects, and (4) masking effects (NMFS 2000a). Ecologically, hatchery fish can increase predation on, displace, and/or compete with wild fish. These effects are likely to occur when fish are released in poor condition and do not migrate to marine waters, but rather remain in the streams for extended rearing periods during which they may prey on or compete with wild fish. Hatchery fish also may transmit hatchery-borne diseases, and hatcheries themselves may release diseases into streams via water effluents. Genetically, hatchery fish can affect the genetic variability of native fish via interbreeding, either intentionally or accidentally. Interbreeding can also result from the introduction of native stocks from other areas. Theoretically, interbred fish are less adapted to and productive within the unique local habitats where the original native stock evolved.

Hatcheries have traditionally focused on providing fish for harvest, with less attention given to

identifying and resolving factors causing declines of native runs. However, when wild fish mix with hatchery stock, fishing pressure can lead to overharvest of smaller or weaker wild stocks. Further, when migrating adult hatchery and wild fish mix on the spawning grounds, the health of the wild runs and the condition of the habitat's ability to support runs can be overestimated, because the hatchery fish mask surveyors' ability to discern actual wild run conditions.

The role of hatcheries in the future of Pacific Northwest salmon and steelhead is presently unclear; it will depend on the values people place on fish production and biological diversity. Clearly, conservation of biological diversity is gaining support, and the future role of hatcheries may shift toward judicial use of hatcheries to meet these goals rather than opposing them. One of the prime recommendations in the National Research Council's study of salmon in the Pacific Northwest is that hatchery use "should occur within the context of fully implemented adaptive-management programs that focus on watershed management, not just on the fish themselves" (NRC 1996).

Harvest Effects on the Baseline

Commercial fishing developed rapidly with the arrival of European settlers and the advent of canning technologies in the late 1800s. The development of non-Indian fisheries began in about 1830; by 1861, commercial fishing was an important economic activity. The early commercial fisheries used gill nets, seines hauled from shore, traps, and fish wheels. Later, purse seines and trolling (using hook and line) fisheries developed. Recreational (sport fishing) began in the late 1800s, occurring primarily in tributary locations (ODFW and WDFW 1999).

Initially, the non-Indian fisheries targeted spring and summer chinook salmon, and these runs dominated the commercial harvest during the 1800s. Eventually the combined ocean and freshwater harvest rates for Columbia River spring and summer chinook salmon exceeded 80 percent and sometimes 90 percent of the run, contributing to the species' decline (Ricker 1959). From 1938 to 1955, the average harvest rate dropped to about 60 percent of the total spring chinook salmon run and appeared to have a minimal effect on subsequent returns (NMFS 1991). Until the spring of 2000, when a relatively large run of hatchery spring chinook salmon returned and provided a small commercial Tribal fishery, the last commercial season for spring chinook salmon had occurred in 1977. The summer chinook salmon run could not sustain the average harvest rate of 88 percent that was applied between 1938 to 1944 and produced lower returns between 1942 and 1949 (NMFS 1991). From 1945 through 1949, the Columbia River harvest rate on summer chinook salmon was reduced to about 47 percent, and subsequently, the run size increased. The construction of Grand Coulee Dam in 1941, with the resulting inundation of summer chinook salmon spawning areas, was a primary factor influencing this species' declining abundance. In the 1950s and 1960s, harvest rates further declined to about 20 percent (Raymond 1988). This species has not been the target of any commercial harvest since 1963.

Following the sharp declines in spring and summer chinook salmon in the late 1800s, fall

chinook salmon became a more important component of the catch. Fall chinook salmon have provided the greatest contribution to Columbia River salmon catches in most years since 1890. The peak year of commercial sales was 1911, when 49.5 million pounds of fall chinook salmon were landed. Columbia River chinook salmon catches were generally stable from the beginning of commercial exploitation until the late 1940s, when landings declined by about two-thirds to a level that remained stable from the 1950s through the mid-1980s (ODFW and WDFW 1999). Since 1938, total salmonid landings have ranged from a high of about 2,112,500 fish in 1941 to a low of about 68,000 fish in 1995 (ODFW and WDFW 1999).

Whereas freshwater fisheries in the basin were declining during the first half of this century, ocean fisheries were growing, particularly after World War II. This trend occurred up and down the West Coast as fisheries with new gear types leapfrogged over the others to gain first access to the migrating salmon runs. Large, mixed-stock fisheries in the ocean gradually supplanted the freshwater fisheries, which were increasingly restricted or eliminated to protect spawning escapements. By 1949, the only freshwater commercial gear types remaining were gill nets, dip nets, and hoop nets (ODFW and WDFW 1999). Ocean trolling peaked in the 1950s; recreational fishing peaked in the 1970s. The ocean harvest has declined since the early 1980s as a result of declining fish populations and increased harvest restrictions (ODFW and WDFW 1999).

The construction of The Dalles Dam in 1957 had a major effect on Tribal fisheries. The Dalles Reservoir flooded Celilo Falls and inundated the site of a major Indian fishery that had existed for millennia. Commercial Indian landings at Celilo Falls from 1938 through 1956 ranged from 0.8 to 3.5 million pounds annually, based primarily on dip netting (ODFW and WDFW 1999). With the elimination of Celilo Falls, salmon harvest in the area declined dramatically. In 1957, in a joint action, the states of Oregon and Washington closed the Tribal fishery above Bonneville Dam to commercial harvesters. Treaty Indian fisheries that continued during 1957 through 1968 were conducted under Tribal ordinances. In 1968, with the Supreme Court opinion on the appeal of the *Puyallup v. Washington* case, the states reopened the area to commercial fishing by treaty Indians (ODFW and WDFW 1999). For the next 6 years, until 1974, only a limited Tribal harvest occurred above Bonneville Dam.

The capacity of salmonids to produce more adults than are needed for spawning offers the potential for sustainable harvest of naturally-produced fish. This potential can be realized only if two basic management requirements are met: (1) enough adults return to spawn and perpetuate the run, and (2) the productive capacity of the habitat is maintained. Catches may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events. However, as long as the two management requirements are met, fishing can be sustained indefinitely. Unfortunately, both prerequisites for sustainable harvest have been violated routinely in the past. The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase catches or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low. At the same time, habitat has been increasingly degraded, reducing the capacity of the salmon

stocks to produce numbers in excess of their spawning escapement requirements.

For years, the response to declining catches was hatchery construction to produce more fish. Because hatcheries require fewer adults to sustain their production, harvest rates in the fisheries were allowed to remain high, or even increase, further exacerbating the effects of overfishing on the naturally-produced (non-hatchery) runs. More recently, harvest managers have instituted reforms including weak stock, abundance-based, harvest rate, and escapement-goal management.

Effects of Natural Conditions on the Baseline

Changes in the abundance of salmonid populations are substantially affected by changes in the freshwater and marine environments. Recent evidence suggests that marine survival of salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare *et al*. 1999). This phenomenon has been referred to as the Pacific Decadal Oscillation. For example, large-scale climatic regimes, such as El Niño, appear to affect changes in ocean productivity. During the first part of the 1990s much of the Pacific Coast was subject to a series of very dry years. In more recent years, severe flooding has adversely affected some stocks. Thus, the survival and recovery of these species will depend on their ability to persist through periods of low natural survival rates.

A key factor affecting many West Coast stocks has been the general pattern of a 30-year decline in ocean productivity. The mechanism whereby stocks are affected is not well understood. The pattern of response to these changing ocean conditions has differed among stocks, presumably due to differences in their ocean timing and distribution. It is presumed that survival is driven largely by events occurring between ocean entry and recruitment to a subadult life stage. One indicator of early ocean survival can be computed as a ratio of coded-wire tag (CWT) recoveries of subadults relative to the number of CWTs released from that brood year. Time-series of survival rate information for upper Willamette River spring chinook salmon, Lewis River fall chinook salmon, and Skagit River fall chinook salmon show highly variable or declining trends in early ocean survival, with very low survival rates in recent years (NMFS 1999b).

Salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation may also contribute to significant natural mortality, although the levels of predation are largely unknown. In general, salmonids are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebound of seal and sea lion populations, following their protection under the Marine Mammal Protection Act of 1972, has resulted in substantial mortality for salmonids. In recent years, for example, sea lions have learned to target upper Willamette River spring chinook salmon in the fish ladder at Willamette Falls.

Studies begun in 1997 by the Oregon Cooperative Fish and Wildlife Research Unit, USGS, and CRITFC have shown that fish-eating birds that nest on islands in the Columbia River estuary

(Caspian terns, double-crested cormorants, and glaucous-winged gulls) are significant avian predators of juvenile salmonids. Researchers estimated that the tern population on Rice Island (16,000 birds in 1997) consumed 6 to 25 million outmigrating smolts during 1997 (Roby *et al*.1998) and 7 to 15 million outmigrating smolts during 1998 (Collis *et al*. 1999). The observed levels of predation prompted the regional fish and wildlife managers to investigate the feasibility of management actions to reduce the impacts. Early management actions appear to have reduced predation rates; researchers estimate that terns consumed 7.3 million smolts during 1999 (Columbia Bird Research 2000).

Finally, it should be noted that the unusual drought conditions in 2001 warrant additional consideration. The available water in the Columbia River Basin is 50-60 percent of normal and will result in some of the lowest flow conditions on record. These conditions will have the greatest effect on upriver stocks such as the ones being discussed in this opinion. The juveniles that must pass down river during the 2001 spring and summer out-migration will likely be affected and this, in turn, will affect adult returns primarily in 2003 and 2004, depending on the stock and species. At this time, it is impossible to ascertain what those effects will be, but NMFS is carefully monitoring the situation and will take the drought condition into account in any management decision, including amending take authorizations and other permit conditions.

Effects of Scientific Research, Monitoring, and Enhancement on the Baseline

Snake River salmon and steelhead, like other ESA-listed fish, are the subject of scientific research, monitoring, and enhancement activities. Most biological opinions that NMFS issues recommend specific monitoring, evaluation, and research projects to gather information to aid in the survival of the ESA-listed fish. In addition, NMFS has issued numerous research and/or enhancement permits authorizing takes of ESA-listed fish over the past eight years. Each authorization for take by itself would not lead to decline of the species. However the sum of the authorized takes indicate a high level of research effort in the action area, and as anadromous fish stocks have continued to decline, the proportion of fish handled for research/monitoring purposes relative to the total number of fish has increased. The effect of these activities is difficult to assess, nevertheless, the potential benefits to ESA-listed salmon and steelhead from the scientific information is likely to be greater than the potential risk to the species due to those efforts. Potential benefits include enhancing the scientific knowledge base for the species, answering questions or contributing information toward resolving difficult resource management issues, and directly enhancing the survival of the species. The information gained during research and monitoring activities is essential to assist resource managers in making more informed decisions regarding recovery measures. Moreover, scientific research, monitoring, and enhancement efforts are not considered to be a factor for the decline of salmon and steelhead populations.

To reduce adverse effects from research and enhancement activities on the species, NMFS imposes conditions in its permits so that Permit Holders are required to conduct their activities in

such a way as to minimize adverse effects on the ESA-listed species, including keeping mortalities as low as possible. Also, researchers are encouraged to use non-listed fish species and/or ESA-listed hatchery fish, instead of ESA-listed, naturally-produced fish, for scientific research purposes when possible. In addition, researchers are required to share sample fish, as well as the results of the scientific research, with other researchers as a way to avoid duplicative efforts and to acquire as much information as possible from the ESA-listed fish sampled. NMFS works with other agencies to coordinate research to prevent duplication of effort.

In general, for research and enhancement projects that require a section 10(a)(1)(A) permit, applicants will provide NMFS with high take estimates to compensate for potential inseason changes to research protocols, accidental catastrophic events, and the annual variability in ESA-listed fish numbers. Also, most research projects depend on annual funding and the availability of other resources. So, a specific research project for which take of ESA-listed species is authorized by a permit may be suspended in a year when funding or resources are not available. Therefore, the actual take in a given year for most research and enhancement projects, as provided to NMFS in post-season annual reports, is usually less than the authorized level of take in the permits and the related NMFS consultation on the issuance of those permits. Therefore, because actual take levels tend to be lower than authorized takes, the severity of effects to the ESA-listed species are usually less than the effects analyzed in a typical consultation.

A substantial amount of the annual take of ESA-listed salmon and steelhead is related to assessing the impact of the hydropower dams on the mainstem Snake and Columbia Rivers. Scientific research, monitoring, and enhancement activities are required by the Reasonable and Prudent Alternative of the "Reinitiation of Consultation on Operation of the FCRPS, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin" (NMFS 2000d). The Corps' Juvenile Fish Transportation Program results in a substantial amount of annual take of ESA-listed Snake River salmon and steelhead for enhancement purposes (to get the outmigrating juvenile fish past the concrete dams). For a description of the annual takes of ESA-listed Snake River salmon and steelhead associated with the hydropower dams on the mainstem Snake and Columbia Rivers, refer to the December 21, 2000 FCRPS biological opinion (NMFS 2000d) and the biological opinion on the *"Issuance of an Amendment of ESA Section 10(a)(1)(A) Permit 1237 for Takes of Six Endangered or Threatened Species for the Purpose of Enhancement"* issued on April 26, 2001 (NMFS 2001).

ANALYSIS OF THE EFFECTS OF THE PROPOSED ACTIONS

Description of Effects on Critical Habitat

In general, the types of activities that could result in impacts to critical habitat include streamside surveys, instream surveys, and the use of nets, seines, smolt traps, and electrofishing to obtain fish for research purposes. There will be a minimal amount of disturbance to vegetation, and no harm to spawning or rearing habitat, or to water quantity and water quality. Many of these

activities will be of short duration, during limited field opportunities linked to migration patterns of the targeted populations. Thus, there will be minimal effects on the species' respective critical habitats from the actions discussed in this consultation. Additionally, the effects are not likely to be substantial enough to contribute to a decline in the values of the habitat.

Description of Effects on Snake River Salmon and Steelhead

The purpose of this section is to identify the effects on endangered SnR sockeye salmon, threatened SnR spring/summer chinook salmon, threatened SnR fall chinook salmon, and threatened SnR steelhead due to the issuance of scientific research and/or enhancement permits. For some of the research activities, the takes of ESA-listed salmon and steelhead occur on the mainstem rivers and/or at the hydropower dams on the mainstem rivers. Researchers are not able to distinguish between the respective species' populations when working outside of the tributary watersheds from which the fish originate. As such, for research that occurs on the mainstem rivers, the analyses are not sensitive enough to evaluate the effects of proposed activities on the ESA-listed species at the population level because of insufficient information. To the extent currently possible, this consultation will include analyses of effects at the population level. Where information on ESA-listed salmon and steelhead at the population level does not exist, this consultation assumes that the status of each affected population is the same as the respective ESU as a whole. The general effects of scientific research activities are discussed first followed by detailed analyses of permit specific effects.

ESA-listed juvenile salmon and steelhead abundance can vary considerably from year-to-year based on levels of adult escapement, natural fluctuations in environmental conditions, or anthropogenic effects. In addition, the number of ESA-listed juvenile fish impacted by the scientific research that occurs on the mainstem Snake and Columbia Rivers is directly related to the proportion of fish transported by barge and truck around the hydropower dams each year as part of the Corps' Juvenile Fish Transportation Program. In an effort to estimate juvenile salmon and steelhead abundance, the Northwest Fisheries Science Center, NMFS has developed an algorithm that is used each year to calculate juvenile salmon and steelhead outmigration levels at the hydropower dams on the mainstem Snake and Columbia Rivers. These estimates have become a standardized tool that is used by virtually all the Permit Holders in the region to estimate annual ESA-listed juvenile fish takes associated with their respective activities. Schiewe (2001) provides the ESA-listed juvenile salmon and steelhead outmigration estimates for 2001. **For the analyses in this consultation, the estimates under the full transportation/no spill scenario from Schiewe (2001) will be used since that was the applicable scenario for the 2001 outmigration season.**

The various proposed activities would cause many types of take, and while there is some blurring of the lines between what constitutes an activity (e.g., electrofishing) and what constitutes a take category (e.g., harm), it is important to keep the two concepts separate. The reason for is this is that the effects being measured here are those which the activity itself has on

the ESA-listed species. They may be expressed in terms of the take categories (e.g., how many SnR spring/summer chinook salmon are harmed, or harassed, or even killed), but the actual mechanisms of the effects themselves (i.e., the activities) are the causes of whatever take arises and, as such, they bear examination. Therefore, the first part of this section is devoted to a discussion of the general effects known to be caused by the proposed activities.

The following subsections describe the types of activities being proposed. Because they would all be carried out by trained professionals using established protocols and have widely recognized specific impacts, each activity is described in terms broad enough to apply to every proposed permit action. This is especially true in light of the fact that the researchers would not receive a permit unless their activities (e.g., electrofishing) incorporate NMFS' uniform, pre-established set of mitigation measures. These measures are described in the *Description of the Proposed Actions* section above. They are incorporated (where relevant) into every permit as part of the terms and conditions to which a researcher must adhere.

Observation/Harassment

Harassment is a primary form of take associated with the proposed activities, and includes stress and other sub-lethal effects from observation and capture/handling. The ESA does not define harassment nor has NMFS defined this term through regulation pursuant to the ESA. However, USFWS defines "harassment 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 17.4]. For the purposes of this analysis, NMFS adopts this definition of harassment.

For some studies, ESA-listed fish will be observed in-water (e.g., snorkel surveys). Direct observation is the least disruptive and simplest method for determining presence/absence of the species and estimating the relative abundance. Typically, a cautious observer is effective in obtaining data without disrupting the normal behavior of a fish. Fry and juveniles frightened by the water turbulence and sound created by observers are likely to seek temporary refuge behind rocks, vegetation, and deep water areas. In extreme cases, some individuals may temporarily leave the particular pool or habitat type when observers are in their area. Researchers minimize disturbance to fish by moving through streams slowly thus allowing ample time for fish to reach escape cover. During some research activities, redds may be visually inspected, but no redds will be walked on. Harassment is the primary form of take associated with these observation activities, and few if any injuries or deaths are expected to occur. Based on prior research experience, the proposed observation/harassment of ESA-listed fish should not have any long-term, adverse effects on any of the species' populations or the species as a whole.

Capture/Handling

All sampling, handling, and tagging procedures carry an inherent potential for causing stress, disease transmission, injury, or death. Based on prior experience with the research techniques and protocols to be used to conduct the scientific research, unintentional mortality of ESA-listed

juvenile salmon and steelhead expected to occur from the capture and handling procedures is not likely to exceed five percent of the fish subjected to handling, and in most cases, unintentional mortality of ESA-listed juvenile fish will not exceed two percent. Based on prior experience with the research techniques and protocols to be used to conduct the scientific research, unintentional mortality of ESA-listed adult salmon and steelhead expected to occur from the capture and handling procedures is not likely to exceed one percent of the fish subjected to handling. ESA-listed adult and juvenile fish indirect mortalities may be retained as reference specimens or used for analytical research purposes.

The handling process is likely to cause some stress on ESA-listed fish. Typically, fish recover rapidly from handling procedures. The primary factors that contribute to stress and mortality from handling are excessive doses of anesthetic, differences in water temperatures, dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Wet hands and keeping fish submersed while acquiring scientific information will minimize scale and slime removal. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Also, stress can occur if there are more than a few degrees difference in water temperature between the stream/river and the holding tank. Study protocols would include only handling fish during appropriate water temperatures to avoid adding any additional stress and ensuring revival prior to release.

Fish can experience stress and injury from overcrowding in traps if the traps are not emptied on a regular basis. Debris buildup at traps can also cause injuries and mortalities if the traps are not monitored and cleared on a regular basis. Traps are proposed to be checked each morning or more frequently as necessitated by increased water flows or debris movement. Traps would not be fished during time periods when they cannot be adequately checked and maintained. Checking traps during the morning would ensure handling fish during the coolest water temperatures to reduce stress and potential mortality.

Fish that are transferred to holding tanks could experience trauma if care is not taken in the transfer process. Fish will be transferred from the traps to recovery tanks by the use of dip nets or sanctuary nets. The use of nets avoids human handling and reduces the potential for descaling or other netting injuries and potential post-handling mortality. All researchers that propose to handle and transfer fish will be required to use sanctuary nets that hold water during transfer whenever necessary to prevent the added stress of an out-of-water transfer.

Tagging/Marking

The use of PIT tags, coded-wire tags, fin clips, and radio tags are common to many scientific research efforts involving ESA-listed anadromous fish species. All tagging and marking procedures have an inherent potential to stress, injure, or even kill the test fish.

A PIT tag is an electronic device that relays signals to a radio receiver. It allows salmonids to be identified whenever they pass a location containing such a receiver (e.g., any of several dams)

without researchers having to handle the fish again. The tag is inserted into the body cavity of the fish just in front of the pelvic girdle. The tagging procedure requires that the fish be captured and extensively handled, therefore, any researchers using PIT tags are required to use standardized methods and techniques to ensure that the operation takes place in the safest possible manner. In general, tagging operations take place where there is cold water, a carefully controlled environment for administering anesthesia, sanitary conditions, quality control checking, and a carefully regulated holding environment where the fish are allowed to recover.

PIT tags have very little effect on growth, mortality, or behavior. The few reported studies of PIT tags have shown no effect on growth or survival (Prentice *et al.* 1987; Jenkins and Smith 1990; Prentice *et al.* 1990). For example, in a study between the tailraces of Lower Granite and McNary Dams (225 km), Hockersmith *et al.* (2000) concluded that the performance of yearling chinook salmon was not adversely affected by gastrically- or surgically-implanted sham radio tags or PIT tags. Additional studies have shown that growth rates among PIT-tagged Snake River fall chinook salmon juveniles in 1992 (Rondorf and Miller 1994) were similar to growth rates for salmon that were not tagged (Conner *et al.* 2001). Prentice and Park (1984) also found that PIT-tagging did not substantially affect survival in juvenile salmonids.

The use of one needle to tag multiple fish has the potential to transmit diseases to the fish that are tagged. To reduce potential risks to ESA-listed fish, all Permit Holders will be required to use state-of-the-art handling and tagging techniques including the use of a sterilized needle for each individual injection to minimize the lateral transfer of pathogens.

Coded-wire tags (CWTs) are made of magnetized, stainless-steel wire. They bear distinctive notches that can be coded for such data as species, brood year, hatchery of origin, and so forth (Nielson 1992). The tags are intended to remain within the animal indefinitely, consequently making them ideal for making long-term, population-level assessments of Pacific Northwest salmon. The tag is injected into the nasal cartilage of a salmon and therefore causes little direct tissue damage (Bergman *et al.* 1968; Bordner *et al.* 1990). The conditions under which CWTs may be inserted are similar to those required for applying PIT tags. A major advantage to using CWTs is the fact that they have a negligible effect on the biological condition or response of tagged salmon; however, if the tag is placed too deeply in the snout of a fish, it may kill the fish, reduce its growth, or damage olfactory tissue (Fletcher *et al.* 1987; Peltz and Miller 1990). This latter effect can create problems for species like salmon because they use olfactory clues to guide their spawning migrations (Morrison and Zajac 1987).

In order for researchers to be able to determine later (after the initial tagging) which fish possess CWTs, it is necessary to mark the fish externally—usually by clipping the adipose fin—when the CWT is implanted (see text below for information on fin clipping). One major disadvantage to recovering data from CWTs is that the fish must be killed in order for the tag to be removed. However, this is not a significant problem because researchers generally recover CWTs from salmon that have been taken during the course of commercial and recreational harvest (and are

therefore already dead).

The other primary method for tagging fish is to implant them with radio tags. There are two main ways to accomplish this and they differ in both their characteristics and consequences. First, a tag can be inserted into a fish's stomach by pushing it past the esophagus with a plunger. Stomach insertion does not cause a wound and does not interfere with swimming. This technique is benign when salmon are in the portion of their spawning migrations during which they do not feed (Nielson 1992). In addition, for short-term studies, stomach tags allow faster post-tagging recovery and interfere less with normal behavior than do tags attached in other ways.

The second method for implanting radio tags is to place them within the body cavities of (usually juvenile) salmonids. These tags do not interfere with feeding or movement. However, the tagging procedure is difficult, requiring considerable experience and care (Nielson 1992). Because the tag is placed within the body cavity, it is possible to injure a fish's internal organs. Infections of the sutured incision and the body cavity itself are also possible, especially if the tag and incision are not treated with antibiotics (Chisholm and Hubert 1985; Mellas and Haynes 1985). Fish with internal radio tags often die at higher rates than fish tagged by other means because radio tagging is a complicated and stressful process. Mortality is both acute (occurring during or soon after tagging) and delayed (occurring long after the fish have been released into the environment). Acute mortality is caused by trauma induced during capture, tagging, and release. It can be reduced by handling fish as gently as possible. Delayed mortality occurs if the tag or the tagging procedure harms the animal in direct or subtle ways. Tags may cause wounds that do not heal properly, may make swimming more difficult, or may make tagged animals more vulnerable to predation (Howe and Hoyt 1982; Matthews and Reavis 1990; Moring 1990). Tagging may also reduce fish growth by increasing the energetic costs of swimming and maintaining balance. As with the other forms of tagging and marking, researchers will keep the harm caused by radio tagging to a minimum by following the permit conditions described in the *Description of the Proposed Actions* section above, as well as any other permit-specific requirements.

Fin clipping is the process of removing part or all of one or more fins to alter a fish's appearance and thus make it identifiable. When entire fins are removed, it is expected that they will never grow back. Alternatively, a permanent mark can be made when only a part of the fin is removed or the end of a fin or a few fin rays are clipped. Although researchers have used all fins for marking at one time or another, the current preference is to clip the adipose, pelvic, or pectoral fins. Marks can also be made by punching holes or cutting notches in fins, severing individual fin rays (Welch and Mills 1981), or removing single prominent fin rays (Kohlhorst 1979). Many studies have examined the effects of fin clips on fish growth, survival, and behavior. The results of these studies are somewhat variable; however, it can be said that fin clips do not generally alter fish growth. Studies comparing the growth of clipped and unclipped fish generally have shown no differences between them (e.g., Brynildson and Brynildson 1967). Moreover, wounds

caused by fin clipping usually heal quickly—especially those caused by partial clips.

Mortality among fin-clipped fish is also variable. Some immediate mortality may occur during the marking process, especially if fish have been handled extensively for other purposes (e.g., stomach sampling). Delayed mortality depends, at least in part, on fish size; small fishes have often been found to be susceptible to it and Coble (1967) suggested that fish shorter than 90 mm are at particular risk. The degree of mortality among individual fishes also depends on which fin is clipped. Studies show that adipose- and pelvic-fin-clipped coho salmon fingerlings have a 100 percent recovery rate (Stolte 1973). Recovery rates for steelhead were 60 percent when the adipose fin was clipped and 52 percent when the pelvic fin was clipped and dropped markedly when the pectoral, dorsal, and anal fins were clipped (Nicola and Cordone 1973). Clipping the adipose and pelvic fins probably kills fewer fish because these fins are not as important as other fins for movement or balance (McNeil and Crossman 1979). Mortality is generally higher when the major median and pectoral fins are clipped. Mears and Hatch (1976) showed that clipping more than one fin may increase delayed mortality, but other studies have been less conclusive. Regardless, any time researchers clip or remove fins, it is necessary that the fish be handled. Therefore, the same safe and sanitary conditions required for tagging operations also apply to clipping activities.

All tagging and handling procedures require anesthetics to calm the fish subjected to handling, especially if the fish are to be handled out-of-water. Because temperature, turbidity, fish condition, and other factors can alter a fish's reaction to an anesthetic, the concentration of an anesthetic will be adjusted for the ambient environmental conditions based on the manufacturers specifications to achieve proper sedation and minimize the risk of harming fish. Dosages will also vary by body size but would be kept at minimum levels. After the collection of biological data, captured fish will be allowed to fully recover before being released back into the stream and will be released only in slow water areas.

Electrofishing

The effects of electrofishing on ESA-listed anadromous salmon and steelhead within the action areas would be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river. It has long been recognized that overexposure of fish to a strong electric field can cause injury and death. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise and experience of the technician. The effects of electrofishing on adults can be severe. Spinal injuries in adult salmonids from forced muscle contraction have been documented. Sharber and Carothers (1988) reported that electrofishing caused a 50 percent mortality level in adult rainbow trout. Habera *et al*. (1996) reported overall mortality rates of 20 percent for rainbow trout less than 100 mm in length and 6 percent for those over 100 mm using a three pass depletion method. Habera *et al*. also reported an overall injury rate of 6 percent. The long-term effects on both juvenile and adult salmon and steelhead are not well understood,

but it is assumed that most impacts from electrofishing occur at the time of sampling.

Most of the studies on the effects of electrofishing on fish have been conducted on adult fish greater than 300 mm in length (Dalbey *et al.* 1996). The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury is substantially lower than in large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers 1988) and may therefore be subject to lower injury rates (e.g., Hollender and Carline 1994, Dalbey *et al.* 1996, Thompson *et al.* 1997). The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988, McMichael 1993, Dalbey *et al.* 1996, Dwyer and White 1997). Continuous direct current (DC) or low-frequency (≤30 Hz) pulsed DC have been recommended for electrofishing (Fredenberg 1992, Snyder 1992, 1995, Dalbey *et al.* 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg 1992, Taube 1992, McMichael 1993, Sharber *et al.* 1994, Dalbey *et al.* 1996). Only a few recent studies have examined the long-term effects of electrofishing on survival and growth of salmonids (Ainslie *et al.* 1998, Dalbey *et al.* 1996, Taube 1992). These studies indicate that although relatively large percentages of the fish suffered spinal injury, long-term mortality was very low. However, severely injured fish grew at slower rates or showed no growth compared to control or minimally damaged fish (Dalbey *et al.* 1996).

The potential for unexpected injuries or mortalities to ESA-listed fish as a result of the use of electrofishing will be mitigated in a number of ways. NMFS' electrofishing guidelines (NMFS 2000c) will be followed. These guidelines include training field crews in observing animals for signs of stress and how to adjust electrofishers to minimize stress. Electrofishing is used only when other survey methods are not feasible. All areas for stream and special needs surveys are visually searched for fish prior to the application of an electrical current. Electrofishing is not done in the vicinity of redds or where fish are visually observed. All people operating electroshocking equipment are trained by qualified personnel to be familiar with equipment handling, settings, care, and safety. Operators work in pairs to increase visual detection of fish and fish identification with minimal or no netting. Working in pairs also allows the netter to intercept and net fish before they are attracted to water with higher electrical fields. Only DC units will be used, and the equipment will be regularly maintained to ensure proper operating condition. Voltage, pulse width, and rate will be kept at minimal levels. At the start of every electrofishing session, water conductivity will be tested, and settings will be set at minimum rates. Settings will be kept below levels which cause immobilization. Due to the low settings used, shocked fish are normally instantaneously revived. Fish requiring reviving will receive immediate, adequate care.

The preceding discussion focused on the effects of using a backpack unit for electrofishing and the ways those effects will be mitigated. It should be noted, however, that in larger streams and rivers, electrofishing units are sometimes mounted on boats. These units often use more current than backpack electrofishing equipment because they need to cover larger (and deeper) areas

and, as a result, can have a greater impact on fish. In addition, the environmental conditions in larger, more turbid streams can limit the researchers' ability to minimize impacts on fish. For example, in areas of lower visibility it is difficult for researchers to detect the presence of adults and thereby take steps to avoid them. Because of its greater potential to harm fish, and because NMFS has not published appropriate guidelines, boat electrofishing has not been given a general authorization under NMFS' recent ESA section 4(d) rules. However, it is expected that guidelines for safe boat electrofishing will be in place in the near future. All researchers intending to use boat electrofishing will use all the means at their disposal to ensure that a minimum number of fish are harmed (these means will include a number of long-established protocols that will eventually be incorporated int NMFS' guidelines).

Sacrifice

In some instances, it is necessary to kill a captured fish in order to gather whatever data a study is designed to produce. In such cases, the sacrificed fish, if juveniles, are forever removed from the ESU's gene pool; if the fish are adults, the effect depends upon whether they are killed before or after they have a chance to spawn. If they are killed after they spawn, there is very little overall effect. Essentially, it amounts to removing the nutrients their bodies would have provided to the spawning grounds. If they are killed before they spawn, not only are they removed from the ESU, but so are all their potential progeny. Thus, killing pre-spawning adults has the greatest potential to affect the ESU and, because of this, NMFS rarely allows it to happen. And, in almost every instance where it is allowed, the adults are stripped of sperm and eggs so their progeny can be raised in a controlled environment such as a hatchery—thereby greatly decreasing the potential harm posed by sacrificing the adults. Clearly, there is no way to mitigate the effects of outrightly sacrificing a fish.

Permit-Specific Effects

Active Permits

Permit 1056

Permit 1056 authorizes the Fish Ecology Division, NWFSC, NMFS annual takes of adult and juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with two scientific research studies. ESA-listed juvenile fish are observed/harassed during snorkel surveys. ESA-listed juvenile fish are captured (using seines, rotary screw traps, or electrofishing), sampled for biological information and/or sampled for fin tissues and scales and/or PIT-tagged, and released. In addition, intentional mortalities of ESA-listed juvenile fish are authorized. Also, ESA-listed adult fish carcasses are authorized to be collected and sampled for tissues and scales. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon - Study 1

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	13,000	13,000
Capture, Tag/Mark, Release	0	15,000	15,000
Total Non-Lethal Take	**0**	**28,000**	**28,000**
Indirect Mortality	0	560	560
Total Lethal Take	**0**	**560**	**560**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with Study 1 occur throughout the Salmon River Basin in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon estimated to emigrate from the Salmon River Basin in 2001 is 265,822 (unpublished data, IDFG). Based upon NWFSC's experience with juvenile salmon outmigration research, a maximum of 2 percent of the ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon River Basin in 2001 is assumed to be typical in future years, NMFS does not believe that the annual loss of up to 560 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon River populations as a result of NWFSC's research activities will result in substantial impacts on those populations.

SnR Spring/Summer Chinook Salmon - Study 2

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	1,000	1,000
Total Non-Lethal Take	**0**	**1,000**	**1,000**
Direct Mortality	0	800	800
Indirect Mortality	0	20	20
Total Lethal Take	**0**	**820**	**820**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with Study 2 occur throughout the Salmon River Basin in Idaho, the Grande Ronde River Basin in Oregon, and the Imnaha River Basin in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival

information), the total amount of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon, Grande Ronde, and Imnaha River Basins in 2001 is 441,342 (unpublished data, IDFG and ODFW). Based upon NWFSC's experience with juvenile salmon outmigration research, a maximum of 2 percent of the ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon, Grande Ronde, and Imnaha River Basins in 2001 is assumed to be typical in future years, NMFS does not believe that the annual loss of up to 820 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon (direct + indirect mortalities) from the Salmon, Grande Ronde, and Imnaha River populations as a result of NWFSC's research activities will result in substantial impacts on those populations.

NWFSC uses the following measures to minimize and mitigate take: (1) All collection activities will cease when water temperatures reach 16°C, (2) electrofishers will be upgraded to better adjust to changing water conductivity, (3) snorkeling and spot-shocking will be used instead of multipass electrofishing, (4) downstream block seines will be used when electrofishing to minimize predation on stunned fish, (5) only trained personnel will operate electrofishing equipment, (6) water-to-water transfers will be used during collection and tagging operations, and (7) disinfected syringes/needles will be used during tagging operations (NWFSC 1997). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1102

Permit 1102 authorizes WDFW annual takes of adult, threatened, SnR steelhead associated with two scientific research studies. For Study 1, ESA-listed adult steelhead are captured at the adult fish ladders at Bonneville Dam, sampled for biological information and tissues and scales, and released. Some adult steelhead may be floy-tagged to help determine run size and distribution or PIT-tagged to evaluate adult PIT tag interrogation systems at the hydropower dams. For Study 2, tissue samples and scales are collected from ESA-listed adult steelhead carcasses throughout the lower Columbia River region. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Steelhead

Type of Take	SnR Steelhead Adults
Capture, Tag/Mark, Release	1,028
Total Non-Lethal Take	**1,028**
Indirect Mortality	10
Total Lethal Take	**10**

According to ODFW/WDFW (1998), the sampling effort at Bonneville Dam will not exceed 5

percent of the annual escapement of adult SnR summer steelhead to the dam. A recent 5-year average for adult SnR steelhead escapement to Bonneville Dam is 14,852 (ODFW/WDFW 1998). Based upon WDFW's experience with this type of research, a maximum of 1 percent of the ESA-listed adult steelhead handled may be indirectly killed. If the adult escapement of SnR steelhead to Bonneville Dam in recent years is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 10 adult, threatened, SnR steelhead as a result of WDFW's research activities will result in a substantial impact to the SnR steelhead ESU. Percent mortality of adult, threatened, SnR steelhead associated with WDFW's scientific research that occurs at Bonneville Dam is **0.07 percent (10/14,852)**.

WDFW uses the following measures to minimize and mitigate take: The sampling crew consists of trained technicians and biologists with experience handling steelhead. The trap is operated two days per week and approximately 2 to 5 percent of the weekly run is sampled. Adult fish are anesthetized prior to being sampled for tissues. After being sampled for tissues, the adult steelhead are placed into a recovery tank. After they recover, the adult steelhead are released back into the adult fish ladder at Bonneville Dam (WDFW 1997 and ODFW/WDFW 1998). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1124

Permit 1124 authorizes IDFG annual takes of adult and juvenile, endangered, SnR sockeye salmon; adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; and juvenile, threatened, SnR fall chinook salmon associated with scientific research conducted throughout the Salmon and Clearwater River Basins in Idaho. ESA-listed adult and juvenile salmon are observed/harassed during snorkel and spawning ground surveys. Adult, threatened, SnR spring/summer chinook salmon are captured, sampled for biological information and/or tagged/marked (with PITs, radiotransmitters, or other identifiers), and released associated with the spring/summer chinook salmon supplementation research (Task 3). ESA-listed juvenile salmon are captured (using seines, trawls, rotary screw traps, hook-and-line, or electrofishing), sampled for biological information and/or sampled for tissues or tagged/marked (with PITs, radiotransmitters, or other identifiers), and released. In addition, intentional mortalities of juvenile, endangered, SnR sockeye salmon are authorized for Task 4 and intentional mortalities of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon are authorized for Task 3. Also, ESA-listed adult fish carcasses are authorized to be collected and sampled for tissues and scales. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Sockeye Salmon

Type of Take	SnR Sockeye Salmon Juveniles	Totals for Species
Capture, Handle, Release	50	50
Total Non-Lethal Take	**50**	**50**

Direct Mortality	255	255
Indirect Mortality	1	1
Total Lethal Take	**256**	**256**

According to IDFG (2001), 23,886 SnR sockeye salmon pre-smolts produced from IDFG's captive broodstock program were released in Redfish Lake, 12,955 SnR sockeye salmon pre-smolts were released in Alturas Lake, and 3,430 SnR sockeye salmon pre-smolts were released in Pettit lake in October 1999. The intentional lethal take of up to 255 non-migrating juvenile, endangered, SnR sockeye salmon occurs during IDFG's mid-water trawl surveys in the three lakes each year. If the 1999 stocking levels of sockeye salmon pre-smolts from IDFG's captive broodstock program is assumed to be typical for future years, NMFS does not believe that the annual lethal take of up to 255 juvenile, endangered, SnR sockeye salmon associated with IDFG's research will result in a substantial impact to the SnR sockeye salmon ESU. However, the impact of the loss could be greater if any of the mortalities are naturally-produced fish. Percent mortality of non-migrating juvenile, endangered, SnR sockeye salmon associated with this IDFG scientific research activity is **0.63 percent (255/23,886 + 12,955 + 3,430)**.

According to IDFG (2001), 7,798 juvenile, endangered, SnR sockeye salmon are estimated to have outmigrated from Redfish, Pettit, and Alturas Lakes in 2000. This estimate represents a combination of naturally-produced smolts and smolts produced from IDFG's SnR sockeye salmon captive broodstock program. IDFG's non-lethal and indirect lethal takes of juvenile, endangered, SnR sockeye salmon usually occur during the conduct of research activities directed at other species, such as the production monitoring and evaluation research on chinook salmon. Based upon IDFG's experience with salmonid production monitoring and evaluation research, a maximum of 2 percent of the ESA-listed sockeye salmon juveniles handled may be indirectly killed. If the juvenile sockeye salmon outmigration from the Sawtooth Basin lakes in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 juvenile, endangered, SnR sockeye salmon associated with IDFG's research activities will result in a substantial impact to the SnR sockeye salmon ESU.

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	30,700	40,200	70,900
Capture, Tag/Mark, Release	820	0	45,000	45,820
Total Non-Lethal Take	**820**	**30,700**	**85,200**	**116,720**
Direct Mortality	0	0	750	750

Indirect Mortality	8	614	1,704	2,326
Total Lethal Take	**8**	**614**	**2,454**	**3,076**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with IDFG's research occur throughout the Salmon and Clearwater River Basins in Idaho. According to IDFG (2000), approximately 2,399 adult, threatened, SnR spring and summer chinook salmon returned to the Salmon and Clearwater River Basins in 2000. These fish represented a combination of naturally-produced adults and adults that originated from IDFG's hatchery supplementation programs. Based upon IDFG's experience with adult chinook salmon research, a maximum of 1 percent of the ESA-listed SnR spring/summer chinook salmon adults handled may be indirectly killed. If the adult escapement of SnR spring/summer chinook salmon to the Salmon and Clearwater River Basins in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 8 adult, threatened, SnR spring/summer chinook salmon from the Salmon and Clearwater River populations as a result of IDFG's research activities will result in substantial impacts on those populations. However, the impact of the loss could be greater if any of the mortalities are naturally-produced fish.

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with IDFG's research activities occur throughout the Salmon and Clearwater River Basins in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon and Clearwater River Basins in 2001 is 277,702 (unpublished data, IDFG); the total amount of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon River Basin in 2001 is 484,770 (unpublished data, IDFG). Based upon IDFG's experience with salmonid production monitoring and evaluation research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon from the Salmon and Clearwater River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2,454 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon (direct + indirect mortalities) and the annual loss of up to 614 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Salmon and Clearwater River populations as a result of IDFG's research activities will result in substantial impacts on those populations.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	100	100
Total Non-Lethal Take	**100**	**100**

Indirect Mortality	2	2
Total Lethal Take	**2**	**2**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with IDFG's research activities occur primarily in the mainstem reaches of the Salmon and Clearwater River Basins in Idaho. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 937,626. Based upon IDFG's experience with salmon research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2 juvenile, threatened, SnR fall chinook salmon from the Salmon and Clearwater River populations as a result of IDFG's research activities will result in substantial impacts on those populations.

IDFG uses the following measures to minimize and mitigate take: Traps are closely monitored and checked at least twice daily. Artificial cover is placed in the live boxes to provide resting habitat and protection from high velocity flows for trapped fish. Traps are pulled out of operation when flow conditions pose unacceptable risks. Electrofishing impacts are minimized by (1) using the proper equipment and settings for the water conditions, (2) avoiding habitats where ESA-listed fish are likely to concentrate, (3) curtailing shocking immediately when ESA-listed species are encountered, and (4) handling all captured fish appropriately by maintaining adequate water temperature and oxygen conditions. PIT-tagging is conducted according to standards which include factors such as fish size, health, and water temperature. Disease transmission is minimized by using individual sterilized needles for each fish (IDFG 1997). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1126

Permit 1126 authorizes WDFW annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon associated with scientific research conducted in the Snake River and its tributaries including the Tucannon River, the Grande Ronde River, and Asotin Creek in WA. ESA-listed adult and juvenile salmon are observed/harassed during snorkel surveys and spawning ground surveys. ESA-listed juvenile salmon are captured (using traps, seines, electrofishing, or hook-and-line), sampled for biological information and/or sampled for tissues and scales and/or tagged/marked (with fin clips, PITs, or other identifiers), and released. Adult, threatened, SnR spring/summer chinook salmon are captured, sampled for biological information and/or tagged with radiotransmitters, and released. In addition, intentional mortalities of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon are authorized. Also, ESA-listed adult salmon carcasses are

authorized to be collected and sampled for tissues and scales. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	13	32,500	10,500	43,013
Capture, Tag/Mark, Release	37	2,600	1,700	4,337
Total Non-Lethal Take	**50**	**35,100**	**12,200**	**47,350**
Direct Mortality	0	200	125	325
Indirect Mortality	1	702	244	947
Total Lethal Take	**1**	**902**	**369**	**1,272**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with WDFW's research occur primarily in the Tucannon River Basin in Washington. According to WDFW (2001a), approximately 339 adult, threatened, SnR spring/summer chinook salmon returned to the Tucannon River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from WDFW's hatchery supplementation program. Based upon WDFW's experience with salmon research activities, a maximum of 1 percent of the adult, threatened, SnR spring/summer chinook salmon handled may be indirectly killed. If the adult escapement of SnR spring/summer chinook salmon to the Tucannon River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR spring/summer chinook salmon from the Tucannon River population as a result of WDFW's research will result in a substantial impact on that population.

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon occur in the Snake River and its tributaries including the Tucannon River, the Grande Ronde River, and Asotin Creek in Washington. The majority of WDFW's take occurs in the Tucannon River Basin where WDFW conducts smolt trapping operations to assess the annual productivity of the Tucannon River spring chinook salmon population. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Tucannon River in 2001 is 16,000 (unpublished data, WDFW); the total amount of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Tucannon River in 2001 is 100,000 (unpublished data, WDFW). Based upon WDFW's experience with salmon research activities, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of ESA-listed

SnR spring/summer chinook salmon juveniles from the Tucannon River in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 369 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon (direct + indirect mortalities) and up to 902 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon (direct + indirect mortalities) from the Tucannon River population as a result of WDFW's research activities will result in a substantial impact on that population.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	6,500	6,500
Capture, Tag/Mark, Release	2,800	2,800
Total Non-Lethal Take	**9,300**	**9,300**
Direct Mortality	100	100
Indirect Mortality	186	186
Total Lethal Take	**286**	**286**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with WDFW's research activities occur primarily in the mainstem reaches of the Snake and Tucannon River Basins in Washington. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) in 2001 will be 102,935. Based upon WDFW's experience with salmonid production research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake and Tucannon River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 286 juvenile, threatened, SnR fall chinook salmon (direct + indirect mortalities) from the Snake and Tucannon River populations as a result of WDFW's research activities will result in substantial impacts on those populations.

WDFW uses the following measures to minimize and mitigate take: Stress related mortalities within traps have been reduced by avoiding the placement of traps in stream reaches with high water velocities. Fish are removed promptly from the traps after they have been captured. For tagging activities, care is taken not to subject fish to excessive amounts of anesthetic. Experienced biologists conduct the tagging operations. Sterilized needles are used for applying PIT-tags. Anesthetized fish are allowed to fully recover before being released (WDFW 1998). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1127

Permit 1127 authorizes SBT annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and adult and juvenile, threatened, SnR steelhead associated with scientific research conducted throughout the Salmon River Basin in ID. ESA-listed adult and juvenile salmon and steelhead are observed/harassed during snorkel surveys and spawning ground surveys. ESA-listed juvenile salmon and steelhead are captured (using nets, traps, seines, electrofishing, or hook-and-line), sampled for biological information and/or sampled for tissues and scales and/or tagged/marked (with fin clips, PITs, or other identifiers), and released. Also, ESA-listed adult salmon and steelhead carcasses are authorized to be collected and sampled for tissues and scales. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	3,900	6,700	10,600
Capture, Tag/Mark, Release	2,500	4,000	6,500
Total Non-Lethal Take	**6,400**	**10,700**	**17,100**
Indirect Mortality	128	214	342
Total Lethal Take	**128**	**214**	**342**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with SBT's research activities occur throughout the Salmon River Basin in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon estimated to emigrate from the Salmon River Basin in 2001 is 265,822 (unpublished data, IDFG); the total amount of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon River Basin and survive to Lower Granite Dam in 2001 is 484,770 (unpublished data, IDFG). Based upon SBT's experience with salmonid production monitoring and evaluation research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Salmon River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 214 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 128 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Salmon River populations as a result of SBT's research activities will result in substantial impacts on those populations.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	11,900	11,900
Capture, Tag/Mark, Release	5,000	5,000
Total Non-Lethal Take	**16,900**	**16,900**
Indirect Mortality	338	338
Total Lethal Take	**338**	**338**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with SBT's research activities occur throughout the Salmon River Basin in Idaho. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam (the first Snake River dam that the outmigrating juvenile steelhead would encounter) in 2001 will be 825,853. Based upon SBT's experience with steelhead production research, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 338 juvenile, threatened, SnR steelhead from the Salmon River populations as a result of SBT's research activities will result in substantial impacts on those populations.

SBT uses the following measures to minimize and mitigate take: Traps are checked twice daily. Personnel are thoroughly trained before handling ESA-listed fish. Fish that are PIT-tagged are allowed to fully recover before being released. Nets are checked frequently, fish are handled carefully, and care is taken to apply anesthetic properly. Electrofishing impacts are minimized by using proper equipment and settings for the water conditions, curtailing shocking immediately when ESA-listed species are encountered, and by handling all captured fish appropriately (proper water temperature, oxygen, allowance for full recovery). Impacts from seining are minimized by having snorkelers herd fish towards the seines, which reduces the duration of harassment, and by handling fish properly and carefully (SBT 1998). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1134

Permit 1134 authorizes CRITFC annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; adult and juvenile, threatened, SnR fall chinook salmon; and adult and juvenile, threatened, SnR steelhead associated with scientific research conducted throughout the Snake River Basin and at Bonneville Dam on the mainstem Columbia River. ESA-listed adult and juvenile salmon and steelhead are observed/harassed during snorkel surveys and spawning ground surveys. ESA-

listed juvenile salmon and steelhead are captured (using nets, traps, seines, electrofishing, or hook-and-line), sampled for biological information and/or sampled for tissues and scales and/or tagged/marked (with fin clips, PITs, or other identifiers), and released. Intentional mortalities of juvenile, threatened, SnR fall chinook salmon and juvenile, threatened, SnR steelhead are authorized. In addition, CRITFC is authorized to collect gametes from post-spawned, adult, threatened, SnR spring/summer chinook salmon males and post-spawned, adult, threatened, SnR steelhead males for cryopreservation purposes. Also, ESA-listed adult salmon and steelhead carcasses are authorized to be collected and sampled for tissues and scales. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon – Project 4

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Totals for Species
Capture, Tag/Mark, Release	251	251
Total Non-Lethal Take	**251**	**251**
Indirect Mortality	3	3
Total Lethal Take	**3**	**3**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with Project 4 occur at Bonneville Dam on the lower Columbia River. According to CRITFC (2001a), as many as 17,607 adult, threatened, SnR spring/summer chinook salmon escaped to Bonneville Dam during the upstream migration in 2000. These fish represented a combination of naturally-produced adults and adults that originated from the hatchery programs in the Snake River Basin. Based upon CRITFC's experience with this type of research, a maximum of 1 percent of the ESA-listed adult chinook salmon handled may be indirectly killed. If the adult escapement of ESA-listed adult chinook salmon to Bonneville Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 3 adult, threatened, SnR spring/summer chinook salmon as a result of CRITFC's research will result in a substantial impact to the SnR spring/summer chinook salmon ESU. However, the impact of the loss could be greater if any of the mortalities are naturally-produced fish. Percent mortality of adult, threatened, SnR spring/summer chinook salmon associated with CRITFC's scientific research that occurs at Bonneville Dam is **0.02 percent (3/17,607)**.

SnR Spring/Summer Chinook Salmon – Project 5

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Totals for Species
Capture, Handle, Release	1,700	1,700
Total Non-Lethal Take	**1,700**	**1,700**

Indirect Mortality	17	17
Total Lethal Take	**17**	**17**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with Project 5 occur throughout the Snake River Basin including tributaries of the Imnaha and Grande Ronde Rivers in Oregon, the Tucannon River in Washington, and the Salmon and Clearwater Rivers in Idaho. Permit 1134 requires that CRITFC biologists obtain gametes from post-spawned adult male chinook salmon only, although some adult females are expected to be harassed and/or handled incidentally. Many of the adult chinook salmon males handled by CRITFC are near death after having contributed their sperm to the spawning populations and therefore, have no further biological use other than to enrich the river systems with nutrients from the decay of their carcasses. According to the *U.S. v. Oregon* TAC, as many as 11,825 adult, threatened, SnR spring/summer chinook salmon escaped to Lower Granite Dam during the upstream salmon migration in 2000 (TAC 2000). Additionally, according to WDFW (2001a), approximately 339 adult, threatened, SnR spring/summer chinook salmon returned to the Tucannon River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from the hatchery supplementation programs in the Snake River Basin conducted by IDFG, WDFW, and ODFW. Based upon CRITFC's experience with this type of research, a maximum of 1 percent of the ESA-listed adult chinook salmon handled may be indirectly killed. If the adult escapement of ESA-listed SnR spring/summer chinook salmon to Lower Granite Dam and the Tucannon River in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 17 adult, threatened, SnR spring/summer chinook salmon from the Snake River populations as a result of CRITFC's research activities will result in substantial impacts on those populations. However, the impact of the loss could be greater if one or more adult chinook salmon females are killed, especially if they happen to be females involved with spawning or protecting redds. In addition, the impact of the loss could be greater if any of the mortalities are naturally-produced fish. To reduce the potential for mortalities associated with Project 5, a Special Condition that restricts CRITFC's sampling activities is included in Permit 1134 (see the *Description of the Proposed Actions* section).

SnR Spring/Summer Chinook Salmon – Projects 1, 2, 7

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	14	138,100	106,525	244,639
Capture, Tag/Mark, Release	0	12,000	41,500	53,500
Total Non-Lethal Take	**14**	**150,100**	**148,025**	**298,139**
Indirect Mortality	0	3,002	2,961	5,963

Total Lethal Take	**0**	**3,002**	**2,961**	**5,963**

The annual non-lethal take of adult, threatened, SnR spring/summer chinook salmon associated with Project 2 occurs throughout the Snake River Basin including tributaries of the Imnaha River in Oregon and the Salmon and Clearwater Rivers in Idaho. According to the *U.S. v. Oregon* TAC, as many as 11,825 adult, threatened, SnR spring/summer chinook salmon escaped to Lower Granite Dam during the upstream salmon migration in 2000 (TAC 2000). These fish included both naturally-produced adults and adults produced from the hatchery supplementation programs conducted by IDFG and ODFW. No mortalities of ESA-listed chinook salmon adults associated with Project 2 are expected by CRITFC. If the adult escapement of ESA-listed SnR spring/summer chinook salmon to the Snake River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 14 adult, threatened, SnR spring/summer chinook salmon from the Snake River populations as a result of CRITFC's research will result in substantial impacts on those populations.

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with Projects 1, 2, and 7 occur in the tributaries of the Snake River upstream of Lower Granite Dam including the Imnaha and Grande Ronde Rivers in Oregon and the Salmon and Clearwater Rivers in Idaho. A component of Project 7 also occurs at Lower Granite Dam. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 478,200; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 513,697. Based upon CRITFC's experience with salmonid research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2,961 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 3,002 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Snake River populations as a result of CRITFC's research activities will result in substantial impacts on those populations.

SnR Fall Chinook Salmon – Project 4

Type of Take	SnR Fall Chinook Salmon Adults	Totals for Species
Capture, Tag/Mark, Release	11	11
Total Non-Lethal Take	**11**	**11**
Indirect Mortality	0	0

Total Lethal Take	**0**	**0**

The annual non-lethal take of adult, threatened, SnR fall chinook salmon associated with Project 4 occurs at Bonneville Dam on the lower Columbia River. According to CRITFC (2001a), as many as 1,639 adult, threatened, SnR fall chinook salmon escaped to Bonneville Dam during the upstream salmonid migration in 2000. No mortalities of ESA-listed adult chinook salmon are expected by CRITFC. If the adult escapement of ESA-listed SnR fall chinook salmon to Bonneville Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 11 adult, threatened, SnR fall chinook salmon associated with CRITFC's research will result in a substantial impact to the SnR fall chinook salmon ESU. Percent mortality of adult, threatened, SnR fall chinook salmon associated with CRITFC's scientific research that occurs at Bonneville Dam is **0.0 percent (0/1,639)**.

SnR Fall Chinook Salmon – Project 7

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	4,000	4,000
Capture, Tag/Mark, Release	7,520	7,520
Total Non-Lethal Take	**11,520**	**11,520**
Direct Mortality	480	480
Indirect Mortality	230	230
Total Lethal Take	**710**	**710**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with Project 7 occur in the tributaries of the Snake River upstream of Lower Granite Dam including the Imnaha and Grande Ronde Rivers in Oregon and the Salmon and Clearwater Rivers in Idaho. A component of Project 7 also occurs at Lower Granite Dam. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 937,626. Based upon CRITFC's experience, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 710 juvenile, threatened, SnR fall chinook salmon (total of indirect mortalities plus intentional lethal takes) from the Snake River populations as a result of CRITFC's research activities will result in substantial impacts on those populations.

SnR Steelhead – Project 5

Type of Take	SnR Steelhead Adults	Totals for Species
Capture, Handle, Release	1,150	1,150
Total Non-Lethal Take	**1,150**	**1,150**
Indirect Mortality	12	12
Total Lethal Take	**12**	**12**

The annual non-lethal and lethal takes of adult, threatened, SnR steelhead associated with Project 5 occur throughout the Snake River Basin including tributaries of the Imnaha and Grande Ronde Rivers in Oregon, the Tucannon River in Washington, and the Salmon and Clearwater Rivers in Idaho. Permit 1134 requires that CRITFC biologists obtain gametes from adult steelhead males that have completed annual spawning only, although some adult steelhead females are expected to be harassed and/or handled incidentally. According to the *U.S. v. Oregon* TAC, as many as 18,869 adult, threatened, SnR steelhead (both A-run and B-run) escaped to Lower Granite Dam during the upstream steelhead migration in 2000 (unpublished data, TAC). Additionally, according to WDFW (2001c), approximately 198 adult, threatened, SnR steelhead returned to the Tucannon River Basin in 2000. Based upon CRITFC's experience with this type of research, a maximum of 1 percent of the ESA-listed steelhead adults handled may be indirectly killed. If the adult escapement of ESA-listed steelhead to Lower Granite Dam and the Tucannon River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 12 adult, threatened, SnR steelhead from the Snake River populations as a result of CRITFC's research activities will result in substantial impacts on those populations. However, the impact of the loss could be greater if one or more adult steelhead females are killed, especially if they happen to be females involved with spawning or protecting redds. To reduce the potential for mortalities associated with Project 5, a Special Condition that restricts CRITFC's sampling activities is included in Permit 1134 (see *Description of the Proposed Actions* section).

SnR Steelhead – Projects 1, 2, 7, 10

Type of Take	SnR Steelhead Adults	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	75	87,050	87,125
Capture, Tag/Mark, Release	0	18,000	18,000
Total Non-Lethal Take	**75**	**105,050**	**105,125**
Direct Mortality	0	270	270
Indirect Mortality	1	2,101	2,102
Total Lethal Take	**1**	**2,371**	**2,372**

The annual non-lethal and lethal takes of adult, threatened, SnR steelhead associated with Project 2 occur throughout the Snake River Basin including tributaries of the Imnaha River in Oregon

and the Salmon and Clearwater Rivers in Idaho. According to the *U.S. v. Oregon* TAC, as many as 18,869 adult, threatened, SnR steelhead (both A-run and B-run) escaped to Lower Granite Dam during the upstream steelhead migration in 2000 (unpublished data, TAC). Based upon CRITFC's experience with this type of research, a maximum of 1 percent of the ESA-listed steelhead adults handled may be indirectly killed. If the adult escapement of ESA-listed steelhead to Lower Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR steelhead from the SnR steelhead populations as a result of CRITFC's research activities will result in substantial impacts on those populations.

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with Projects 1, 2, 7, and 10 occur in the tributaries of the Snake River upstream of Lower Granite Dam including the Imnaha and Grande Ronde Rivers in Oregon and the Salmon and Clearwater Rivers in Idaho. A component of Project 7 also occurs at Lower Granite Dam. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853. Based upon CRITFC's experience with steelhead research, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2,371 juvenile, threatened, SnR steelhead (direct + indirect mortalities) from the SnR steelhead populations as a result of CRITFC's research activities will result in substantial impacts on those populations.

CRITFC uses the following measures to minimize and mitigate take: Electrofishing is used to capture fish only as a last resort. No electrofishing occurs when water temperatures exceed 19° Centigrade. Periodic checking of rotary screw trap cones is conducted to reduce the potential for fish impingement. Live boxes are checked regularly for overcrowding and predators and to keep the traps clean of debris. CRITFC field workers are thoroughly oriented and trained with standard trap operations, fish handling techniques, PIT-tagging procedures, and anesthetic protocols before beginning work. During spawning ground surveys, extreme care is taken to walk on the stream bank and to avoid adults that are actively spawning. Adult fish are closely monitored during the scale sampling efforts and Bonneville and Tumwater Dams. If the fish do not appear to be reacting well to the anesthetic, the number of fish allowed in the anesthetic tank is reduced and/or the water in the tank is changed (CRITFC 1998). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1140

Permit 1140 authorizes the NWFSC, NMFS annual takes of juvenile, endangered, SnR sockeye salmon; juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer

chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with scientific research conducted in the Columbia River estuary. ESA-listed salmon and steelhead juveniles are captured with seines and fyke nets, sampled for biological information, and released. Intentional mortalities of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon are authorized. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Sockeye Salmon

Type of Take	SnR Sockeye Salmon Juveniles	Totals for Species
Capture, Handle, Release	9	9
Total Non-Lethal Take	**9**	**9**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, endangered, SnR sockeye salmon associated with NWFSC's research occurs in the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, endangered, SnR sockeye salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 14,300. No mortalities of juvenile, endangered, SnR sockeye salmon are expected. If the estimated outmigration of juvenile, endangered, SnR sockeye salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 9 juvenile, endangered, SnR sockeye salmon as a result of NWFSC's research activities will result in a substantial impact on the Snake River sockeye salmon ESU.

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	4	6
Total Non-Lethal Take	**2**	**4**	**6**
Direct Mortality	2	2	4
Indirect Mortality	0	0	0
Total Lethal Take	**2**	**2**	**4**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with NWFSC's research occur in the Columbia River estuary. According to the juvenile salmon outmigration estimates

produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 479,609; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point in 2001 will be 571,653. A proportion of the juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon handled by NWFSC will be taken lethally. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 2 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon will result in a substantial impact to the SnR spring/summer chinook salmon ESU.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	0
Total Non-Lethal Take	**0**	**0**
Direct Mortality	2	2
Total Lethal Take	**2**	**2**

The annual lethal take of juvenile, threatened, SnR fall chinook salmon associated with NWFSC's research occurs in the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 774,879. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual lethal take of up to 2 juvenile, threatened, SnR fall chinook salmon as a result of NWFSC's research will result in a substantial impact to the SnR fall chinook salmon ESU.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	6	6
Total Non-Lethal Take	**0**	**0**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, threatened, SnR steelhead associated with NWFSC's research occurs in the Columbia River estuary. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 851,085. No mortalities of juvenile, threatened, SnR steelhead are expected. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 6 juvenile, threatened, SnR steelhead as a result of NWFSC's research activities will result in a substantial impact on the SnR steelhead ESU.

NWFSC biologists use the following measures to minimize and mitigate take: Every effort will be made for the humane treatment of the captured fish. For example, relatively small nets and short tows will be used to minimize the effects of stress on the fish. Those fish identified as ESA-listed species will be processed first. After being captured, targeted fish will be transferred immediately into live wells prior to being subjected to analysis (NWFSC 1998a). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1152

Permit 1152 authorizes ODFW annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with scientific research conducted throughout the Grande Ronde and Imnaha River Basins in Oregon. ESA-listed adult and juvenile salmon are observed/harassed during snorkel and spawning ground surveys. Juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon are captured (using nets, seines, traps, and electrofishing), sampled for biological information and/or tissues, and released. Juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon are captured (using nets, seines, traps, or electrofishing), tagged/marked (with PIT tags, paint marks, or other identifiers), and released. Also, ESA-listed adult and juvenile fish carcasses are authorized to be collected and sampled for tissues and scales. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	6,200	36,400	42,600
Capture, Tag/Mark, Release	0	17,800	17,800
Total Non-Lethal Take	**6,200**	**54,200**	**60,400**

Indirect Mortality	124	1,084	1,208
Total Lethal Take	**124**	**1,084**	**1,208**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with ODFW's scientific research occur in the tributaries of the Imnaha and Grande Ronde Rivers in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the estimated total emigration of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 175,520 (unpublished data, ODFW); the estimated total emigration of ESA-listed, artificially-propagated, SnR spring/ summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 399,500 (unpublished data, ODFW). Based upon ODFW's experience with salmon research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1,084 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 124 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Imnaha and Grande Ronde River populations as a result of ODFW's research will result in substantial impacts on those populations.

ODFW biologists use the following measures to minimize and mitigate take: When collecting parr, passive seining techniques (where the fish are herded into the seine by snorkelers) will be used to reduce scale loss caused by dragging fish in a seine. To minimize stress associated with handling and tagging, parr will be collected only at temperatures of 18° Centigrade or cooler and will be tagged only at temperatures of 15° Centigrade or cooler. During the operation of screw traps, trap checks will be increased (up to 24 hour continuous monitoring) as necessary to keep traps clean of debris and to avoid any trap malfunctions that can lead to mortality. In all projects, sanctuary nets will be used to transfer fish from the river to holding containers filled with water and mild anesthetic (ODFW 1998). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1156

Permit 1156 authorizes USEPA/Dynamac Corporation annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon associated with scientific research conducted in the Grande Ronde River Basin in Oregon. ESA-listed salmon juveniles are captured using electrofishing, sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	2	4
Total Non-Lethal Take	**2**	**2**	**4**
Indirect Mortality	0	0	0
Total Lethal Take	**0**	**0**	**0**

The annual non-lethal take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with USEPA/Dynamac's research occurs in the tributaries of the Grande Ronde River in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Grande Ronde River Basin in 2001 is 71,062 (unpublished data, ODFW); the total amount of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Grande Ronde River Basin in 2001 is 276,500 (unpublished data, ODFW). No mortalities of ESA-listed SnR spring/summer chinook salmon juveniles are expected. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Grande Ronde River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 2 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 2 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Grande Ronde River population as a result of USEPA/Dynamac's research will result in a substantial impact on that population.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	2
Total Non-Lethal Take	**2**	**2**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, threatened, SnR fall chinook salmon associated with USEPA/Dynamac's scientific research occurs in the tributaries of the Grande Ronde River in Oregon. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite

Dam in 2001 will be 937,626. No mortalities of ESA-listed SnR fall chinook salmon juveniles are expected. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 2 juvenile, threatened, SnR fall chinook salmon from the Grande Ronde River population as a result of USEPA/Dynamac's research activities will result in a substantial impact on that population.

USEPA/Dynamac biologists use the following measures to minimize and mitigate take: To minimize backpack electrofishing injury, the researchers will use a low pulse rate (30 pulses/s), a narrow pulse width (< 6msec), low peak voltage (500 V). For the raft-mounted gear, the researchers will employ large cathodes (20 droppers) and 6 anode droppers to reduce the field strength in the vicinity of the electrodes and to allow the use of lower voltages. Stunned fish are recovered using a soft mesh dipnet and placed in a holding tank. Following the collection of biological information, the fish are placed back in the holding tank to recover before being released alive. When juvenile salmonids are observed to be harmed, the researchers will increase the pulse rate (which decreases the potential damage to small fish but increases the potential threat to larger fish). If large and small salmonids are present and the small ones show evidence of harm, the researchers will shorten the holding time in the live well. All operators of electrofishing equipment will be fully trained (USEPA/Dynamac 1998 and 2000). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit Modifications/Amendments

Permit 1056, Modification 3

For Modification 3 to Permit 1056, NWFSC requests annual takes of juvenile, threatened, SnR steelhead associated with the research. ESA-listed juvenile steelhead are proposed to be captured, sampled for biological information, and released or captured, PIT-tagged, and released. A lethal take of juvenile, threatened, SnR steelhead is also requested. Also for Modification 3, NWFSC requests annual takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and juvenile, threatened, SnR steelhead associated with a new study (Study 3). ESA-listed chinook salmon and steelhead juveniles are proposed to be captured, sampled for biological information, and released or taken lethally. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Steelhead – Study 1

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	12,050	12,050
Capture, Tag/Mark, Release	7,500	7,500
Total Non-Lethal Take	**19,550**	**19,550**

Indirect Mortality	391	391
Total Lethal Take	**391**	**391**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with Study 1 would occur throughout the Salmon River Basin in Idaho. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853. Based upon NWFSC's experience with steelhead research, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 391 juvenile, threatened, SnR steelhead from the Salmon River populations as a result of NWFSC's research activities will result in substantial impacts on those populations.

SnR Steelhead – Study 2

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	500	500
Total Non-Lethal Take	**500**	**500**
Direct Mortality	800	800
Indirect Mortality	10	10
Total Lethal Take	**810**	**810**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with Study 2 would occur within the Salmon and Clearwater River Basins in Idaho, the Imnaha and Grande Ronde River Basins in Oregon, and the Tucannon River Basin in Washington. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853 and the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Tucannon River Basin in 2001 will be 25,000. Based upon NWFSC's experience with steelhead research, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake and Tucannon River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 810 juvenile, threatened, SnR steelhead (direct + indirect mortalities) from the Salmon, Clearwater, Imnaha, Grande Ronde, and Tucannon River populations will result in substantial impacts on those populations.

SnR Spring/Summer Chinook Salmon - Study 3

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	1,000	1,000
Total Non-Lethal Take	**0**	**1,000**	**1,000**
Direct Mortality	0	600	600
Indirect Mortality	0	20	20
Total Lethal Take	**0**	**620**	**620**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with Study 3 occur throughout the Salmon River Basin in Idaho, the Grande Ronde River Basin in Oregon, and the Imnaha River Basin in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed, naturally-produced, SnR spring/ summer chinook salmon juveniles estimated to emigrate from the Salmon, Grande Ronde, and Imnaha River Basins in 2001 is 441,342 (unpublished data, IDFG and ODFW). Based upon NWFSC's experience with juvenile salmon outmigration research, a maximum of 2 percent of the ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon, Grande Ronde, and Imnaha River Basins in 2001 is assumed to be typical in future years, NMFS does not believe that the annual loss of up to 620 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon (direct + indirect mortalities) from the Salmon, Grande Ronde, and Imnaha River populations as a result of NWFSC's research activities will result in substantial impacts on those populations.

SnR Steelhead – Study 3

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	500	500
Total Non-Lethal Take	**500**	**500**
Direct Mortality	300	300
Indirect Mortality	10	10
Total Lethal Take	**310**	**310**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with Study 3 would occur within the Salmon River Basin in Idaho, the Imnaha River Basin in Oregon, and the Grande Ronde River Basin in Oregon. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River

Basin and reach Lower Granite Dam in 2001 will be 825,853. Based upon NWFSC's experience with steelhead research, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 310 juvenile, threatened, SnR steelhead (direct + indirect mortalities) from the Salmon, Imnaha, and Grande Ronde River populations as a result of NWFSC's research activities will result in substantial impacts on those populations.

Permit 1124, Amendment

For the amendment of Permit 1124, IDFG will be provided annual takes of adult and juvenile, endangered, SnR sockeye salmon; adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; and adult and juvenile, threatened, SnR fall chinook salmon associated with potential salvage/rescue operations in the Salmon and Clearwater River Basins in Idaho. ESA-listed adult and juvenile salmon that are determined by IDFG and/or its designated agents to be in peril will be collected, transported, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Sockeye Salmon

Type of Take	SnR Sockeye Salmon Adults	SnR Sockeye Salmon Juveniles	Totals for Species
Collect for Transport	50	3,000	3,050
Total Non-Lethal Take	**50**	**3,000**	**3,050**
Indirect Mortality	1	60	61
Total Lethal Take	**1**	**60**	**61**

The annual non-lethal and lethal takes of adult, endangered, SnR sockeye salmon associated with IDFG's salvage/rescue operations could occur in the Sawtooth Basin lakes area or the mainstem Salmon River migration corridor in Idaho. According to IDFG (2001), 257 adult, endangered, SnR sockeye salmon returned to the Sawtooth Basin in 2000. These fish all originated from IDFG's SnR sockeye salmon captive broodstock program. Based upon IDFG's experience with adult sockeye salmon research and enhancement activities, a maximum of 1 percent of the ESA-listed SnR sockeye salmon adults handled may be indirectly killed. If the adult escapement of SnR sockeye salmon to the Sawtooth Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, endangered, SnR sockeye salmon as a result of IDFG's salvage/rescue operations will result in a substantial impact to the SnR sockeye salmon ESU. Without assistance, trapped sockeye salmon adults would not be able to return to the Stanley Basin Lakes and contribute to the perpetuation of the species. Percent

mortality of adult, endangered, SnR sockeye salmon associated with IDFG's salvage/rescue operations that would occur in the Sawtooth Basin lakes area or the mainstem Salmon River migration corridor is **0.39 percent (1/257)**.

The annual non-lethal and lethal takes of juvenile, endangered, SnR sockeye salmon associated with IDFG's salvage/rescue operations could occur in the Sawtooth Basin lakes area or the mainstem Salmon River migration corridor in Idaho. According to IDFG (2001), 7,798 juvenile, endangered, SnR sockeye salmon are estimated to have outmigrated from Redfish, Pettit, and Alturas Lakes in 2000. These fish represented a combination of naturally-produced juveniles and juveniles that originated from IDFG's SnR sockeye salmon captive broodstock program. Based upon IDFG's experience with juvenile sockeye salmon research and enhancement activities, a maximum of 2 percent of the ESA-listed sockeye salmon juveniles handled may be indirectly killed. If the juvenile sockeye salmon outmigration from the Sawtooth Basin lakes in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 60 juvenile, endangered, SnR sockeye salmon as a result of IDFG's salvage/rescue operations will result in a substantial impact to the SnR sockeye salmon ESU. Without assistance, trapped sockeye salmon juveniles would likely perish and would not be able to contribute to the perpetuation of the species.

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Collect for Transport	100	5,000	5,000	10,100
Total Non-Lethal Take	**100**	**5,000**	**5,000**	**10,100**
Indirect Mortality	1	100	100	201
Total Lethal Take	**1**	**100**	**100**	**201**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with IDFG's salvage/rescue operations could occur anywhere within the Salmon and Clearwater River Basins in Idaho. According to IDFG (2000), approximately 2,399 adult, threatened, SnR spring and summer chinook salmon returned to the Salmon and Clearwater River Basins in 2000. These fish represented a combination of naturally-produced adults and adults that originated from IDFG's hatchery supplementation programs. Based upon IDFG's experience with adult chinook salmon research, a maximum of 1 percent of the ESA-listed SnR spring/summer chinook salmon adults handled may be indirectly killed. If the adult escapement of SnR spring/summer chinook salmon to the Salmon and Clearwater River Basins in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR spring/summer chinook salmon from the Salmon and Clearwater River

populations as a result of IDFG's salvage/rescue operations will result in substantial impacts on those populations. However, the impact of the loss could be greater if the mortality is a naturally-produced fish. Without assistance, trapped chinook salmon adults would not be able to return to their respective stream of origin and contribute to the perpetuation of the species.

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with IDFG's salvage/rescue operations could occur anywhere within the Salmon and Clearwater River Basins in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon and Clearwater River Basins in 2001 is 277,702 (unpublished data, IDFG); the total amount of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon River Basin in 2001 is 484,770 (unpublished data, IDFG). Based upon IDFG's experience with salmon research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon from the Salmon and Clearwater River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 100 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 100 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Salmon and Clearwater River populations as a result of IDFG's salvage/rescue operations will result in substantial impacts on those populations. Without assistance, trapped chinook salmon juveniles would likely perish and would not be able to contribute to the perpetuation of the species.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Adults	SnR Fall Chinook Salmon Juveniles	Totals for Species
Collect for Transport	100	5,000	5,100
Total Non-Lethal Take	**100**	**5,000**	**5,100**
Indirect Mortality	1	100	101
Total Lethal Take	**1**	**100**	**101**

The annual non-lethal and lethal takes of adult, threatened, SnR fall chinook salmon associated with IDFG's salvage/rescue operations could occur anywhere on the mainstem reaches within the Salmon and Clearwater River Basins in Idaho. According to the *U.S. v. Oregon* TAC, as many as 857 adult, threatened, SnR fall chinook salmon escaped to Lower Granite Dam during the upstream salmon migration in 2000 (unpublished data, TAC). Based upon IDFG's experience with scientific research and enhancement activities involving chinook salmon, a maximum of 1 percent of the ESA-listed SnR fall chinook salmon adults handled may be indirectly killed. If the adult escapement of ESA-listed SnR fall chinook salmon to Lower

Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR fall chinook salmon from the Salmon or Clearwater River populations as a result of IDFG's salvage/rescue operations will result in substantial impacts on those populations. Without assistance, trapped chinook salmon adults would not be able to return to their respective stream of origin and contribute to the perpetuation of the species.

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with IDFG's salvage/rescue operations could occur anywhere on the mainstem reaches within the Salmon and Clearwater River Basins in Idaho. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 937,626. Based upon IDFG's experience, a maximum of 2 percent of the ESA-listed SnR fall chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 100 juvenile, threatened, SnR fall chinook salmon from the Salmon and Clearwater River populations as a result of IDFG's salvage/rescue operations will result in substantial impacts on those populations. Without assistance, trapped chinook salmon juveniles would likely perish.

Permit 1126, Amendment

For the amendment of Permit 1126, WDFW will be provided annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and adult and juvenile, threatened, SnR fall chinook salmon associated with potential salvage/rescue operations in the Snake and Tucannon River Basins in Washington. ESA-listed adult and juvenile salmon that are determined by WDFW and/or its designated agents to be in peril will be collected, transported, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Collect for Transport	100	5,000	5,000	10,100
Total Non-Lethal Take	**100**	**5,000**	**5,000**	**10,100**
Indirect Mortality	1	100	100	201
Total Lethal Take	**1**	**100**	**100**	**201**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with WDFW's salvage/rescue operations could occur anywhere within the tributaries of the Snake and Tucannon Rivers in Washington. According to WDFW (2001a), approximately 339 adult, threatened, SnR spring/summer chinook salmon returned to the Tucannon River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from WDFW's hatchery supplementation program. Based upon WDFW's experience with adult chinook salmon research, a maximum of 1 percent of the ESA-listed SnR spring/summer chinook salmon adults handled may be indirectly killed. If the adult escapement of SnR spring/summer chinook salmon to the Tucannon River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR spring/summer chinook salmon from the Snake or Tucannon River populations in Washington as a result of WDFW's salvage/rescue operations will result in a substantial impact on those populations. However, the impact of the loss could be greater if the mortality is a naturally-produced fish. Without assistance, trapped chinook salmon adults would not be able to return to their respective stream of origin and contribute to the perpetuation of the species.

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with WDFW's salvage/rescue operations could occur anywhere within the Snake River and its tributaries, including the Tucannon River, the Grande Ronde River, and Asotin Creek, in Washington. The majority of WDFW's salvage/rescue take is likely to occur in the Tucannon River where WDFW conducts smolt trapping operations. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Tucannon River in 2001 is 16,000 (unpublished data, WDFW); the total amount of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Tucannon River in 2001 is 100,000 (unpublished data, WDFW). Based upon WDFW's experience, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon from the Tucannon River in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 100 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 100 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Tucannon River population as a result of WDFW's salvage/rescue operations will result in a substantial impact on that population. Without assistance, trapped chinook salmon juveniles would likely perish and would not be able to contribute to the perpetuation of the species.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Adults	SnR Fall Chinook Salmon Juveniles	Totals for Species

Collect for Transport	100	5,000	5,100
Total Non-Lethal Take	**100**	**5,000**	**5,100**
Indirect Mortality	1	100	101
Total Lethal Take	**1**	**100**	**101**

The annual non-lethal and lethal takes of adult, threatened, SnR fall chinook salmon associated with WDFW's salvage/rescue operations could occur anywhere within the mainstem reaches of the Snake and Tucannon Rivers in Washington. According to the Fish Passage Center and the *U.S. v. Oregon* TAC, as many as 1,219 adult, threatened, SnR fall chinook salmon returned to Lower Monumental Dam and as many as 857 adult, threatened, SnR fall chinook salmon returned to Lower Granite Dam during the upstream salmon migration in 2000 (FPC 2001; unpublished data, TAC). The approximate total number of adult, threatened, SnR fall chinook salmon to return to the mainstem reaches of the Snake and Tucannon Rivers in Washington in 2000 can be calculated by subtracting the value for the total number of adult chinook salmon returns to Lower Granite Dam in 2000 from the value for the total number of adult chinook salmon returns to Lower Monumental Dam in 2000. The approximate total number of adult, threatened, SnR fall chinook salmon to return to the mainstem reaches of the Snake and Tucannon Rivers in Washington in 2000 is 362 (1,219 - 857). Based upon WDFW's experience with research and enhancement activities involving chinook salmon, a maximum of 1 percent of the adult, threatened, SnR fall chinook salmon handled may be indirectly killed. If the adult escapement of ESA-listed SnR fall chinook salmon to the Snake and Tucannon Rivers in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR fall chinook salmon from the Snake or Tucannon River populations as a result of WDFW's salvage/rescue operations will result in substantial impacts on those populations. Without assistance, trapped chinook salmon adults would not be able to return to their respective stream of origin and contribute to the perpetuation of the species.

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with WDFW's salvage/rescue operations could occur anywhere within the mainstem reaches of the Snake and Tucannon Rivers in Washington. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) in 2001 will be 102,935. Based upon WDFW's experience with salmonid production research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake and Tucannon Rivers in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 100 juvenile, threatened, SnR fall chinook salmon from the Snake and Tucannon River populations as a result of WDFW's salvage/rescue operations will result in substantial impacts on those populations. Without assistance, trapped chinook salmon juveniles would likely perish and would not be able to contribute to the perpetuation of the species.

Permit 1134, Amendment

For the amendment of Permit 1134, CRITFC biologists will be allowed to collect gametes from pre-spawned and partially-spawned adult, threatened, SnR spring/summer chinook salmon males and adult, threatened, SnR steelhead males throughout the Snake River Basin including the tributaries of the Grande Ronde and Imnaha Rivers in Oregon, the Tucannon River in Washington, and the Salmon and Clearwater Rivers in Idaho. Currently, the permit allows the collection of gametes from post-spawned adult salmon and steelhead males only. The amendment will not result in an increase in annual take levels. However, approval of the amendment has the potential to result in greater impacts to the species since takes could occur throughout each species' entire spawning period. Such impacts may include the disruption of natural spawning behavior by harassing or handling adult males, an increase in the potential for mortality, and/or incidental takes of salmon and steelhead females. According to CRITFC, only males disassociated with active spawning would be sampled. Initiation of sampling would occur at or just after peak spawning occurs in each spawning aggregate (CRITFC 2001b). In order to assure that the potential risks to reproductive success are minimized, abundance below a threshold of 10 redds in a stream or 20-30 individual chinook salmon or steelhead would raise a red flag and collection efforts would then be limited to the latter part of the spawning period as currently applied (CRITFC 2001b). NMFS considers CRITFC's proposed measures to minimize the impacts to the ESA-listed fish to be adequate. NMFS does not believe that the collection of gametes from pre-spawned and partially-spawned salmon and steelhead males from the Snake River populations will result in substantially greater impacts on those populations.

Permit 1152, Modification 1

For Modification 1 to Permit 1152, ODFW requests an increase in the annual takes of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon associated with the research. ESA-listed spring/summer chinook salmon juveniles are proposed to be captured, sampled for biological information, and released or captured, tagged/marked, and released. Also for Modification 1, ODFW requests annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with potential salvage/rescue operations. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Collect for Transport	100	5,000	5,000	10,100
Capture, Handle, Release	0	38,800	0	38,800

Capture, Tag/Mark, Release	0	5,500	0	5,500
Total Non-Lethal Take	**100**	**49,300**	**5,000**	**54,400**
Indirect Mortality	1	986	100	1,087
Total Lethal Take	**1**	**986**	**100**	**1,087**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with ODFW's salvage/rescue operations could occur anywhere within the Imnaha and Grande Ronde River Basins in Oregon. According to ODFW (2001a and 2001b), approximately 1,110 adult, threatened, SnR spring and summer chinook salmon returned to the Imnaha River Basin in 2000 and approximately 132 adult, threatened, SnR spring and summer chinook salmon returned to the Grande Ronde River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from ODFW's hatchery supplementation and captive broodstock programs. Based upon ODFW's experience with adult chinook salmon research, a maximum of 1 percent of the ESA-listed SnR spring/summer chinook salmon adults handled may be indirectly killed. If the adult escapement of SnR spring/summer chinook salmon to the Imnaha and Grande Ronde River Basins in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 adult, threatened, SnR spring/summer chinook salmon from the Imnaha and Grande Ronde River populations as a result of ODFW's salvage/rescue operations will result in substantial impacts on those populations. However, the impact of the loss could be greater if the mortality is a naturally-produced fish. Without assistance, trapped chinook salmon adults would not be able to return to their respective stream of origin and contribute to the perpetuation of the species.

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with ODFW's scientific research activities and salvage/rescue operations would occur in the tributaries of the Imnaha and Grande Ronde Rivers in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the estimated total emigration of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 175,520 (unpublished data, ODFW); the estimated total emigration of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 399,500 (unpublished data, ODFW). Based upon ODFW's experience with salmon production monitoring and evaluation research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon from the Imnaha and Grande Ronde River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 100 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 986 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Imnaha and Grande Ronde River populations as a result of ODFW's research and salvage/rescue operations will result in substantial impacts on those populations.

Permit 1156, Modification 1

For Modification 1 to Permit 1156, USEPA/Dynamac requests an increase in the annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon associated with the research. Also for Modification 1, USEPA/Dynamac requests annual takes of juvenile, threatened, SnR steelhead associated with the research. ESA-listed salmon and steelhead juveniles are proposed to be captured, sampled for biological information, and released. Also for Modification 1, USEPA/Dynamac requests annual takes of adult, threatened, SnR spring/summer chinook salmon; adult, threatened, SnR fall chinook salmon; and adult, threatened, SnR steelhead associated with the research. ESA-listed salmon and steelhead adults are proposed to be captured, sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	5	5	12
Total Non-Lethal Take	**2**	**5**	**5**	**12**
Indirect Mortality	0	0	0	0
Total Lethal Take	**0**	**0**	**0**	**0**

The annual non-lethal take of adult, threatened, SnR spring/summer chinook salmon associated with USEPA/Dynamac's research would occur in the Salmon River Basin in Idaho. According to IDFG (2000), approximately 2,399 adult, threatened, SnR spring and summer chinook salmon returned to the Salmon and Clearwater River Basins in 2000. These fish represented a combination of naturally-produced adults and adults that originated from IDFG's hatchery supplementation programs. No mortalities of adult, threatened, SnR spring/summer chinook salmon are expected by USEPA/Dynamac. If the adult escapement of SnR spring/summer chinook salmon to the Salmon and Clearwater River Basins in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 2 adult, threatened, SnR spring/summer chinook salmon from the Salmon River populations as a result of USEPA/Dynamac's research will result in substantial impacts on those populations.

The annual non-lethal take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with USEPA/Dynamac's research would occur in the Salmon River Basin in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of ESA-listed,

naturally-produced, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon and Clearwater River Basins in 2001 is 277,702 (unpublished data, IDFG); the total amount of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles estimated to emigrate from the Salmon River Basin in 2001 is 484,770 (unpublished data, IDFG). No mortalities of ESA-listed SnR spring/summer chinook salmon juveniles are expected. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Salmon and Clearwater River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 5 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 5 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Salmon River populations as a result of USEPA/Dynamac's research will result in substantial impacts on those populations.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Adults	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	5	7
Total Non-Lethal Take	**2**	**5**	**7**
Indirect Mortality	0	0	0
Total Lethal Take	**0**	**0**	**0**

The annual non-lethal take of adult, threatened, SnR fall chinook salmon associated with USEPA/Dynamac's scientific research would occur in the Salmon River Basin in Idaho. According to the *U.S. v. Oregon* TAC, as many as 857 adult, threatened, SnR fall chinook salmon escaped to Lower Granite Dam during the upstream salmonid migration in 2000 (unpublished data, TAC). No mortalities of adult, threatened, SnR fall chinook salmon are expected by USEPA/Dynamac. If the adult escapement of ESA-listed SnR fall chinook salmon to Lower Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 2 adult, threatened, SnR fall chinook salmon from the Salmon River population as a result of USEPA/Dynamac's research will result in a substantial impact on that population.

The annual non-lethal take of juvenile, threatened, SnR fall chinook salmon associated with USEPA/Dynamac's scientific research would occur in the Salmon River Basin in Idaho. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 937,626. No mortalities of ESA-listed SnR fall chinook salmon juveniles are expected. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 5 juvenile, threatened, SnR fall chinook salmon from the Salmon River population will result in a substantial impact on that population.

SnR Steelhead

Type of Take	SnR Steelhead Adults	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	6	15	21
Total Non-Lethal Take	**6**	**15**	**21**
Indirect Mortality	0	0	0
Total Lethal Take	**0**	**0**	**0**

The annual non-lethal take of adult, threatened, SnR steelhead associated with USEPA/Dynamac's scientific research would occur in the tributaries of the Salmon River in Idaho and Asotin Creek in Washington. According to the *U.S. v. Oregon* TAC, as many as 18,869 adult, threatened, SnR steelhead (both A-run and B-run) escaped to Lower Granite Dam during the upstream steelhead migration in 2000 (unpublished data, TAC). No mortalities of adult, threatened, SnR steelhead are expected by USEPA/Dynamac. If the adult escapement of ESA-listed steelhead to Lower Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 6 adult, threatened, SnR steelhead from the Salmon River and Asotin Creek populations as a result of USEPA/Dynamac's research activities will result in substantial impacts on those populations.

The annual non-lethal take of juvenile, threatened, SnR steelhead associated with USEPA/Dynamac's scientific research would occur in the tributaries of the Salmon River in Idaho and Asotin Creek in Washington. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853. No mortalities of ESA-listed SnR steelhead juveniles are expected. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 15 juvenile, threatened, SnR steelhead from the Salmon River and Asotin Creek populations as a result of USEPA/Dynamac's research activities will result in substantial impacts on those populations.

Permit 1205, Modification 1

For Modification 1 to Permit 1205, ODEQ requests annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with the research. ESA-listed salmon and steelhead juveniles are proposed to be captured, sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	126	126	252
Total Non-Lethal Take	**126**	**126**	**252**
Indirect Mortality	3	3	6
Total Lethal Take	**3**	**3**	**6**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with ODEQ's scientific research activities would occur in the tributaries of the Imnaha and Grande Ronde Rivers in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the estimated total emigration of ESA-listed, naturally-produced, SnR spring/ summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 175,520 (unpublished data, ODFW); the estimated total emigration of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 399,500 (unpublished data, ODFW). Based upon ODEQ's experience with salmon research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of ESA-listed SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 3 juvenile, threatened, naturally-produced, SnR spring/ summer chinook salmon and the annual loss of up to 3 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Imnaha and Grande Ronde River populations as a result of ODEQ's research will result in substantial impacts on those populations.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	126	126
Total Non-Lethal Take	**126**	**126**
Indirect Mortality	3	3
Total Lethal Take	**3**	**3**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with ODEQ's scientific research would occur on the mainstem reaches of the Imnaha and Grande Ronde Rivers in Oregon. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 937,626. Based upon ODEQ's

experience, a maximum of 2 percent of the ESA-listed SnR fall chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 3 juvenile, threatened, SnR fall chinook salmon from the Imnaha and Grande Ronde River populations as a result of ODEQ's research activities will result in substantial impacts on those populations.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	189	189
Total Non-Lethal Take	**189**	**189**
Indirect Mortality	4	4
Total Lethal Take	**4**	**4**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with ODEQ's research activities would occur in the tributaries of the Imnaha and Grande Ronde Rivers in Oregon. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853. Based upon ODEQ's experience, a maximum of 2 percent of the juvenile, threatened, SnR steelhead handled may be indirectly killed. If the estimated outmigration of ESA-listed SnR steelhead juveniles from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 4 juvenile, threatened, SnR steelhead from the Imnaha and Grande Ronde River populations as a result of ODEQ's research will result in substantial impacts on those populations.

ODEQ uses the following measures to minimize and mitigate take: ESA-listed fish will be handled with extreme care to minimize stress and mortality. Experienced crew leaders will be used. Fish will be continuously observed for signs of injury or stress and the electrofisher settings will be modified if necessary. Only pulse direct currents will be used. Pulse frequencies and pulse widths will be kept as low as effectively possible. Electrofishing will not be conducted in waters with ESA-listed fish if the water temperature exceeds 70° F. Fish will be held in a dark-colored bucket to recover and bucket water will be changed frequently. Electrofishing will be done as a moving, one-time pass through the survey reach. Relatively short reaches of stream will be electrofished, typically a few hundred meters (ODEQ 2001). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

New Permits

Permit 1229

Proposed Permit 1229 would authorize the Northern Wasco County PUD annual takes of juvenile, endangered, SnR sockeye salmon; juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with scientific research/monitoring conducted at The Dalles Dam on the lower Columbia River. ESA-listed salmon and steelhead juveniles are proposed to be captured in the screened turbine intake channel at the dam, examined and sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Sockeye Salmon

Type of Take	SnR Sockeye Salmon Juveniles	Totals for Species
Capture, Handle, Release	1	1
Total Non-Lethal Take	**1**	**1**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, endangered, SnR sockeye salmon associated with Northern Wasco County PUD's research would occur at The Dalles Dam on the lower Columbia River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, endangered, SnR sockeye salmon expected to emigrate from the Snake River Basin and reach The Dalles Dam in 2001 (under the full transportation/no spill scenario) will be 46. No mortalities of juvenile, endangered, SnR sockeye salmon are expected. If the estimated outmigration of juvenile, endangered, SnR sockeye salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 1 juvenile, endangered, SnR sockeye salmon as a result of Northern Wasco County PUD's research activities will result in a substantial impact on the Snake River sockeye salmon ESU.

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	6	8
Total Non-Lethal Take	**2**	**6**	**8**
Indirect Mortality	0	0	0

Total Lethal Take	**0**	**0**	**0**

The annual non-lethal take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with Northern Wasco County PUD's research would occur at The Dalles Dam on the lower Columbia River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach The Dalles Dam in 2001 (under the full transportation/no spill scenario) will be 4,188; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach The Dalles Dam in 2001 (under the full transportation/no spill scenario) will be 4,437. No mortalities of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon are expected. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 6 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual non-lethal take of up to 2 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon as a result of Northern Wasco County PUD's research will result in a substantial impact to the SnR spring/summer chinook salmon ESU.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	2	2
Total Non-Lethal Take	**2**	**2**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, threatened, SnR fall chinook salmon associated with Northern Wasco County PUD's research would occur at The Dalles Dam on the lower Columbia River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach The Dalles Dam in 2001 (under the full transportation/no spill scenario) will be 1,710. No mortalities of juvenile, threatened, SnR fall chinook salmon are expected. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 2 juvenile, threatened, SnR fall chinook salmon as a result of Northern Wasco County PUD's research will result in a substantial impact to the SnR fall chinook salmon ESU.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	3	3
Total Non-Lethal Take	**3**	**3**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, threatened, SnR steelhead associated with Northern Wasco County PUD's research would occur at The Dalles Dam on the lower Columbia River. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach The Dalles Dam in 2001 (under the full transportation/no spill scenario) will be 938. No mortalities of juvenile, threatened, SnR steelhead are expected. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 3 juvenile, threatened, SnR steelhead as a result of the research will result in a substantial impact on the SnR steelhead ESU.

Northern Wasco County PUD proposes to use the following measures to minimize and mitigate take: An initial verification of suitable passage conditions occurs in late March, before the sampling season begins. Fish interception is by diversion into an overflow tank with removal only for examination prior to return to an anesthetic recovery tank and inwater release for return to the river. No fish are detained after examination. The fish diversion and tank are carefully inspected before, during, and after each day's sampling for proper operation, debris removal, tank cover (to prevent bird predation), or other concerns. No sampling is scheduled when forebay levels are scheduled to be below the minimum operating level for fish sampling apparatus to avoid fish strandings in the diversion pipes (Northern Wasco County PUD 1999). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1290

Proposed Permit 1290 would authorize the NWFSC, NMFS annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with scientific research conducted in the Columbia River estuary. ESA-listed salmon and steelhead juveniles are proposed to be captured with seines, sampled for biological information, and released. Intentional mortalities of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon are requested. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	11	23	34
Total Non-Lethal Take	**11**	**23**	**34**
Direct Mortality	3	7	10
Indirect Mortality	0	0	0
Total Lethal Take	**3**	**7**	**10**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with NWFSC's research would occur in the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 479,609; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point in 2001 will be 571,653. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual lethal take of up to 7 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 3 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon as a result of NWFSC's research will result in a substantial impact to the SnR spring/summer chinook salmon ESU.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	13	13
Total Non-Lethal Take	**13**	**13**
Direct Mortality	2	2
Indirect Mortality	0	0
Total Lethal Take	**2**	**2**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon

associated with NWFSC's research would occur in the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 774,879. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual lethal take of up to 2 juvenile, threatened, SnR fall chinook salmon as a result of NWFSC's research will result in a substantial impact to the SnR fall chinook salmon ESU.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	34	34
Total Non-Lethal Take	**34**	**34**
Indirect Mortality	1	1
Total Lethal Take	**1**	**1**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with NWFSC's research would occur in the Columbia River estuary. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 851,085. Based upon NWFSC's experience with steelhead research, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 juvenile, threatened, SnR steelhead will result in a substantial impact on the SnR steelhead ESU.

NWFSC proposes to use the following measures to minimize and mitigate take: Using the small purse seine technique, juvenile salmonids are continuously kept in water and not exposed to undue stress. The cod end of the beach seine is never pulled completely out of the water to minimize stress to all captured fish. All possible steps will be taken to remove fish from the seines as quickly and gently as possible. Sanctuary dip nets are used to remove fish from the seines and thus, all fish are kept in estuarine water at all times. After capture, all salmonids will be held in buckets with running water until they fully recover from capture and measurement operations (unless chosen to be taken lethally). After recovery, the salmonids not chosen to be taken lethally will be carefully released back into the water (NWFSC 2000 and 2001a). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1291

Proposed Permit 1291 would authorize USGS annual takes of juvenile, endangered, SnR sockeye salmon; juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with scientific research conducted at John Day, The Dalles, and Bonneville Dams on the lower Columbia River. ESA-listed salmon and steelhead juveniles are proposed to be captured, sampled for biological information, and released. ESA-listed steelhead juveniles are also proposed to be captured, implanted with radio transmitters, transported, held for as long as 24 hours, released, and tracked electronically. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Sockeye Salmon

Type of Take	SnR Sockeye Salmon Juveniles	Totals for Species
Capture, Handle, Release	11	11
Total Non-Lethal Take	**11**	**11**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, endangered, SnR sockeye salmon associated with USGS's research would occur at John Day Dam or Bonneville Dam on the lower Columbia River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, endangered, SnR sockeye salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 76. No mortalities of juvenile, endangered, SnR sockeye salmon are expected. If the estimated outmigration of juvenile, endangered, SnR sockeye salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 11 juvenile, endangered, SnR sockeye salmon as a result of USGS's research activities will result in a substantial impact on the Snake River sockeye salmon ESU.

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	562	1,090	1,652
Total Non-Lethal Take	**562**	**1,090**	**1,652**
Indirect Mortality	11	22	33
Total Lethal Take	**11**	**22**	**33**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with USGS's research would occur at John Day Dam or Bonneville Dam on the lower Columbia River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 6,980; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 7,395. Based upon USGS's experience with salmonid migration and survival studies, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 22 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 11 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon as a result of USGS's research will result in a substantial impact to the SnR spring/summer chinook salmon ESU.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	129	129
Total Non-Lethal Take	**129**	**129**
Indirect Mortality	3	3
Total Lethal Take	**3**	**3**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with USGS's research would occur at John Day Dam or Bonneville Dam on the lower Columbia River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 3,192. Based upon USGS's experience with salmonid migration and survival studies, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 3 juvenile, threatened, SnR fall chinook salmon as a result of USGS's research will result in a substantial impact to the SnR fall chinook salmon ESU.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	946	946
Capture, Tag/Mark, Release	95	95
Total Non-Lethal Take	**1,041**	**1,041**
Indirect Mortality	21	21
Total Lethal Take	**21**	**21**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with USGS's research would occur at John Day Dam or Bonneville Dam on the lower Columbia River. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 1,458. Based upon USGS's experience with salmonid migration and survival studies, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 21 juvenile, threatened, SnR steelhead as a result of USGS's research will result in a substantial impact on the SnR steelhead ESU.

USGS proposes to use the following measures to minimize and mitigate take: Fish with PIT tags will not be tagged with radiotransmitters. As fish are moved through the tanks at the dams, thorough examinations will be made to ensure that fish will not be impinged by tank hardware. Fish will be anesthetized and sorted in small batches and with all possible speed to ensure that they are not unnecessarily exposed to anesthesia. Steps are taken throughout the implantation procedures to ensure the well-being of the fish. For example, USGS uses an artificial slime restorer and a buffer when fish are anesthetized. USGS also administers antibiotics intraperitoneally and disinfects all surgical instruments to protect the fish from infection. USGS will modify the implantation technique to the size and condition of the fish to minimize the stress associated with tagging. Fish are netted only when necessary and only with sanctuary nets. Oxygen and high-flow water are provided to aid the fish in recovering from the tagging procedures (USGS 2001). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1322

Proposed Permit 1322 would authorize the NWFSC, NMFS annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon; juvenile, threatened, SnR fall chinook salmon; and juvenile, threatened, SnR steelhead associated with scientific research conducted in the Columbia River estuary. ESA-listed salmon and steelhead

juveniles are proposed to be captured with seines and trapnets, sampled for biological information, and released. Intentional mortalities of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR fall chinook salmon are requested. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	0	0
Total Non-Lethal Take	**0**	**0**	**0**
Direct Mortality	8	6	14
Indirect Mortality	0	0	0
Total Lethal Take	**8**	**6**	**14**

The annual lethal take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with NWFSC's research would occur in the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 479,609; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point in 2001 will be 571,653. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual lethal take of up to 6 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 8 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon as a result of NWFSC's research will result in a substantial impact to the SnR spring/summer chinook salmon ESU.

SnR Fall Chinook Salmon

Type of Take	SnR Fall Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	67	67
Total Non-Lethal Take	**67**	**67**
Direct Mortality	14	14
Indirect Mortality	1	1

Total Lethal Take	**15**	**15**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with NWFSC's research would occur in the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 774,879. Based upon NWFSC's experience with salmon abundance research, a maximum of 2 percent of the juvenile, threatened, SnR fall chinook salmon handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 15 juvenile, threatened, SnR fall chinook salmon (total of indirect mortalities plus intentional lethal takes) as a result of NWFSC's research will result in a substantial impact to the SnR fall chinook salmon ESU.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	3	3
Total Non-Lethal Take	**3**	**3**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of juvenile, threatened, SnR steelhead associated with NWFSC's research would occur in the Columbia River estuary. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Tongue Point (in the Columbia River estuary) in 2001 will be 851,085. No mortalities of juvenile, threatened, SnR steelhead are expected. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 3 juvenile, threatened, SnR steelhead as a result of NWFSC's research activities will result in a substantial impact on the SnR steelhead ESU.

NWFSC proposes to use the following measures to minimize and mitigate take: All possible steps will be taken to remove fish from the seines and nets as quickly and gently as possible. Fish are immediately placed into estuarine water with aeration. To minimize the stress to all caught fish, the cod end of the beach seine and trapnet will never be completely out of the water. Dip nets with reservoir bags will be used to dip fish out of the seine to allow fish to remain in estuarine water when handled. If catches appear to be larger than anticipated, the duration and

size of the hauls can be controlled to reduce catch volume (NWFSC 2001b). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1339

Proposed Permit 1339 would authorize CRITFC annual takes of adult, threatened, SnR spring/summer chinook salmon and adult, threatened, SnR steelhead associated with scientific research conducted in the Imnaha River Basin in Oregon. ESA-listed salmon and steelhead adults are proposed to be captured with temporary/portable picket weirs, sampled for fin tissues and scales, marked with opercular punches, tagged with Tyvek disc tags, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Totals for Species
Capture, Tag/Mark, Release	25	25
Total Non-Lethal Take	**25**	**25**
Indirect Mortality	0	0
Total Lethal Take	**0**	**0**

The annual non-lethal take of adult, threatened, SnR spring/summer chinook salmon associated with CRITFC's research activities would occur within the Imnaha River Basin in Oregon. According to ODFW (2001a), approximately 1,110 adult, threatened, SnR spring/summer chinook salmon returned to the Imnaha River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from ODFW's hatchery supplementation program. No mortalities of adult, threatened, SnR spring/summer chinook salmon are expected by CRITFC. If the adult escapement of SnR spring/summer chinook salmon to the Imnaha River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 25 adult, threatened, SnR spring/summer chinook salmon from the Imnaha River populations as a result of CRITFC's research activities will result in substantial impacts on those populations.

SnR Steelhead

Type of Take	SnR Steelhead Adults	Totals for Species
Capture, Tag/Mark, Release	750	750
Total Non-Lethal Take	**750**	**750**
Indirect Mortality	8	8
Total Lethal Take	**8**	**8**

The annual non-lethal and lethal takes of adult, threatened, SnR steelhead associated with CRITFC's research activities would occur within the Imnaha River Basin in Oregon. Currently, there is a very limited amount of information on annual adult SnR steelhead escapement levels to the Imnaha River Basin. As such, this analysis is not sensitive enough to evaluate the effects of CRITFC's research activities on SnR steelhead at the population level because of insufficient information. This analysis assumes that the status of each affected population of SnR steelhead is the same as the ESU as a whole.

According to the *U.S. v. Oregon* TAC, as many as 18,869 adult, threatened, SnR steelhead (both A-run and B-run) escaped to Lower Granite Dam during the upstream steelhead migration in 2000 (unpublished data, TAC). Based upon CRITFC's experience with steelhead research, a maximum of 1 percent of the ESA-listed steelhead adults handled may be indirectly killed. If the adult escapement of ESA-listed steelhead to Lower Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 8 adult, threatened, SnR steelhead from the Imnaha River populations as a result of CRITFC's research activities will result in substantial impacts on those populations.

CRITFC proposes to use the following measures to minimize and mitigate take: A monitoring plan has been developed to provide safeguards against any potential migration impedance. The plan contains criteria for determining when facility impacts are significant and provides guidelines for corrective actions. Discrete bank observations will be used to determine if the fish counting station is impeding fish movement. Observations will be made daily after installation of the facility both in downstream and upstream locations. If any problems are identified, the pickets or the entire counting station will be removed (CRITFC 2000). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1340

Proposed Permit 1340 would authorize OSU annual takes of adult and juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and adult and juvenile, threatened, SnR steelhead associated with scientific research conducted in tributaries of the Imnaha River and the Grande Ronde River and in Joseph Creek (a tributary of the Snake River) in Oregon. ESA-listed adult and juvenile salmon and steelhead are proposed to be observed/harassed during snorkel surveys. In addition, ESA-listed salmon and steelhead juveniles are proposed to be captured with hook-and-line, sampled for biological information and stomach contents, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	60	60	120
Total Non-Lethal Take	**60**	**60**	**120**
Indirect Mortality	1	1	2
Total Lethal Take	**1**	**1**	**2**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with OSU's activities would occur in tributaries of the Imnaha and Grande Ronde Rivers and in Joseph Creek in Oregon. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the estimated total emigration of ESA-listed, naturally-produced, SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 175,520 (unpublished data, ODFW); the estimated total emigration of ESA-listed, artificially-propagated, SnR spring/summer chinook salmon juveniles from the Imnaha and Grande Ronde River Basins in 2001 is 399,500 (unpublished data, ODFW). Based upon OSU's experience with salmon research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Imnaha and Grande Ronde Rivers in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 1 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Imnaha River, the Grande Ronde River, and Joseph Creek populations will result in substantial impacts on the populations.

SnR Steelhead

Type of Take	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	260	260
Total Non-Lethal Take	**260**	**260**
Indirect Mortality	5	5
Total Lethal Take	**5**	**5**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with OSU's research activities would occur in tributaries of the Imnaha River, the Grande Ronde River, and Joseph Creek in Oregon. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853. Based upon OSU's experience, a

maximum of 2 percent of the juvenile, threatened, SnR steelhead handled may be indirectly killed. If the estimated outmigration of ESA-listed SnR steelhead juveniles from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 5 juvenile, threatened, SnR steelhead from the Imnaha River, the Grande Ronde River, and Joseph Creek populations as a result of OSU's research will result in substantial impacts on those populations.

OSU proposes to use the following measures to minimize and mitigate take: The least invasive techniques available have been chosen to conduct the research. The direct observation of fish behavior and sampling by barbless hook-and-line will be used in place of electroshocking. Injuries to salmonids will be minimized by restricting fishing to the cool hours of the day when air temperatures are no greater than 18° C. Each fish will be anesthetized and its stomach pumped immediately after being caught. Fish will be placed in a recovery bucket in the stream and released as soon as they are able to swim easily. At the sites that exceed 18° C throughout the day, the researchers will not collect fish for that sampling interval (OSU 2000). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1341

Proposed Permit 1341 would authorize SBT annual takes of juvenile, endangered, SnR sockeye salmon and juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with scientific research conducted in the vicinity of Pettit and Alturas lakes in Idaho. ESA-listed salmon juveniles are proposed to be captured with a rotary screw trap or weir, sampled for biological information and/or tagged/marked with PITs or other identifiers, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Sockeye Salmon

Type of Take	SnR Sockeye Salmon Juveniles	Totals for Species
Capture, Handle, Release	5,600	5,600
Capture, Tag/Mark, Release	1,400	1,400
Total Non-Lethal Take	**7,000**	**7,000**
Indirect Mortality	140	140
Total Lethal Take	**140**	**140**

According to IDFG (2001), 7,798 juvenile, endangered, SnR sockeye salmon are estimated to have outmigrated from Redfish, Pettit, and Alturas Lakes in 2000. This estimate represents a combination of naturally-produced smolts and smolts produced from IDFG's SnR sockeye salmon captive broodstock program. Based upon SBT's experience with sockeye salmon production monitoring and evaluation research, a maximum of 2 percent of the ESA-listed

sockeye salmon juveniles handled may be indirectly killed. If the juvenile sockeye salmon outmigration from the Sawtooth Basin lakes in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 140 juvenile, endangered, SnR sockeye salmon associated with SBT's research will result in a substantial impact to the SnR sockeye salmon ESU.

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	800	800
Total Non-Lethal Take	**0**	**800**	**800**
Indirect Mortality	0	16	16
Total Lethal Take	**0**	**16**	**16**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with SBT's research would occur in the vicinity of Pettit and Alturas Lakes in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon estimated to emigrate from the Salmon River Basin in 2001 is 265,822 (unpublished data, IDFG). Based upon SBT's experience with salmon research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 16 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon River populations as a result of SBT's research activities will result in substantial impacts on those populations.

SBT proposes to use the following measures to minimize and mitigate take: The trap and weir will be checked (cleaned and fish removed) immediately after sunrise and just before sunset during the majority of the trapping season. However, during initial and peak runoff, the trap and weir will be checked at a minimum of six hour intervals or more often depending on debris build up. Cinder blocks and large woody debris are placed in the live boxes for concealment cover for captured smolts. All ESA-listed fish handled out-of-water will be anesthetized. For the fish to be tagged, SBT researchers will follow the tagging guidelines set forth by the PIT tag Steering Committee (SBT 2001). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1342

Proposed Permit 1342 would authorize Dr. Gary Thorgaard of WSU to possess sperm collected

from threatened, SnR spring/summer chinook salmon and threatened SnR steelhead and to use that sperm to produce hybrid test fish in a laboratory setting. The ESA-listed fish sperm will be acquired from Nez Perce Tribe biologists who are authorized to collect male gametes from ESA-listed adult salmon and steelhead males for cryopreservation under a separate take authorization. The hybrid fish are proposed to be raised to the parr stage and sacrificed to analyze the behavioral, physiological, and genetic changes that occur during domestication (WSU 2001). Since the hybrid fish will be euthanized at the completion of the experiment, and not released into the wild, NMFS does not believe that the Dr. Gary Thorgaard's research activities will result in a substantial impact to the threatened SnR spring/summer chinook salmon or the threatened SnR steelhead ESUs.

Permit 1343

Proposed Permit 1343 would authorize TCM annual takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with scientific research/monitoring conducted in Thompson Creek and Squaw Creek in the vicinity of Thompson Creek Mine in Idaho. ESA-listed salmon juveniles are proposed to be observed/harassed during snorkel surveys. ESA-listed salmon juveniles are also proposed to be captured using electrofishing, sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	0	25	25
Total Non-Lethal Take	**0**	**25**	**25**
Indirect Mortality	0	1	1
Total Lethal Take	**0**	**1**	**1**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with TCM's research would occur in Thompson Creek and Squaw Creek drainages which are within the upper Salmon River subbasin in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon estimated to emigrate from the Salmon River Basin in 2001 is 265,822 (unpublished data, IDFG). Based upon TCM's experience with salmonid research, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the

estimated outmigration of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the Salmon River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 1 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon from the upper Salmon River metapopulation as a result of TCM's research activities will result in a substantial impact on that metapopulation.

TCM proposes to use the following measures to minimize and mitigate take: During the electrofishing surveys, direct current will be used to prevent mortality. The minimum settings for voltage, amperage, and frequency to effectively sample fish will be used. No drugs will be used to anesthetize the fish, thus preventing the chance of overdose. All fish collected during electrofishing surveys will be held in flow-through live cars set in the stream prior to gathering the biological information. ESA-listed species will be processed first, as soon as possible after collection, and gently released and observed to verify that they have recovered from the effects of electrofishing. The estimated maximum holding time is 15 minutes (TCM 2001). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1344

Proposed Permit 1344 would authorize HMC annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with scientific research/monitoring conducted in Jordan Creek and the Yankee Fork of the Salmon River in the vicinity of HMC's Grouse Creek Mine in Idaho. ESA-listed salmon juveniles are proposed to be observed/harassed during snorkel surveys. ESA-listed salmon juveniles are also proposed to be captured using electrofishing, sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species
Capture, Handle, Release	15	15	30
Total Non-Lethal Take	**15**	**15**	**30**
Indirect Mortality	0	0	0
Total Lethal Take	**0**	**0**	**0**

The annual non-lethal take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with HMC's research would occur in Jordan Creek and the Yankee Fork Salmon River drainages which are within the upper Salmon River subbasin in Idaho. Based on last year's research efforts (adult escapement, redd counts, fecundity, survival information), the total amount of juvenile, threatened, naturally-

produced, SnR spring/summer chinook salmon estimated to emigrate from the Salmon River Basin in 2001 is 265,822 (unpublished data, IDFG); the total amount of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon estimated to emigrate from the Salmon River Basin in 2001 is 484,770 (unpublished data, IDFG). No mortalities of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon are expected. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Salmon River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 15 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 15 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the upper Salmon River metapopulation as a result of HMC's research activities will result in a substantial impact on that metapopulation.

HMC proposes to use the following measures to minimize and mitigate take: During the electrofishing surveys, direct current will be used to prevent mortality. The minimum settings for voltage, amperage, and frequency to effectively sample fish will be used. No drugs will be used to anesthetize the fish, thus preventing the chance of overdose. All fish collected during electrofishing surveys will be held in flow-through live cars set in the stream prior to gathering the biological information. ESA-listed species will be processed first, as soon as possible after collection, and gently released and observed to verify that they have recovered from the effects of electrofishing. The estimated maximum holding time is 15 minutes (HMC 2001). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Permit 1345

Proposed Permit 1345 would authorize WDFW annual takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon and juvenile, threatened, SnR steelhead associated with scientific research/monitoring conducted in selected rivers and tributaries within the Snake River Basin in Washington. ESA-listed salmon and steelhead juveniles are proposed to be captured using boat electrofishing, sampled for biological information, and released. Proposed Permit 1345 would also authorize WDFW annual takes of adult, threatened, SnR spring/summer chinook salmon and adult, threatened, SnR steelhead associated with the research. ESA-listed salmon and steelhead adults are proposed to be captured using boat electrofishing, sampled for biological information, and released. The maximum annual takes with the potential to result in mortalities and estimated maximum lethal takes are enumerated below:

SnR Spring/Summer Chinook Salmon

Type of Take	SnR Spring/Summer Chinook Salmon Adults	Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Totals for Species

Capture, Handle, Release	1	2	2	5
Total Non-Lethal Take	**1**	**2**	**2**	**5**
Indirect Mortality	0	0	0	0
Total Lethal Take	**0**	**0**	**0**	**0**

The annual non-lethal take of adult, threatened, SnR spring/summer chinook salmon associated with WDFW's research activities would occur in selected mainstem rivers and tributaries in the Snake River Basin in Washington, including the Tucannon River. According to the *U.S. v. Oregon* TAC, as many as 11,825 adult, threatened, SnR spring/summer chinook salmon escaped to Lower Granite Dam on the Snake River during the upstream salmon migration in 2000 (TAC 2000). Additionally, according to WDFW (2001a), approximately 339 adult, threatened, SnR spring/summer chinook salmon returned to the Tucannon River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from the hatchery supplementation programs in the Snake River Basin conducted by IDFG, ODFW, and WDFW. No mortalities of adult, threatened, SnR spring/summer chinook salmon are expected by WDFW. If the adult escapement of SnR spring/summer chinook salmon to the Snake and Tucannon River Basins in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 1 adult, threatened, SnR spring/summer chinook salmon from the Snake or Tucannon River populations as a result of WDFW's research activities will result in a substantial impact on those populations.

The annual non-lethal take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with WDFW's research activities would occur in selected mainstem rivers and tributaries in the Snake River Basin in Washington, including the Tucannon River. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) under the full transportation/no spill scenario in 2001 will be 52,981; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam in 2001 will be 154,806. No mortalities of juvenile, threatened, SnR spring/summer chinook salmon are expected by WDFW. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake and Tucannon River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 2 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual non-lethal take of up to 2 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Snake and Tucannon River populations as a result of WDFW's research activities will result in substantial impacts on those populations.

SnR Steelhead

Type of Take	SnR Steelhead Adults	SnR Steelhead Juveniles	Totals for Species
Capture, Handle, Release	1	3	4
Total Non-Lethal Take	**1**	**3**	**4**
Indirect Mortality	0	0	0
Total Lethal Take	**0**	**0**	**0**

The annual non-lethal take of adult, threatened, SnR steelhead associated with WDFW's research would occur in selected mainstem rivers and tributaries in the Snake River Basin in Washington, including the Tucannon River. According to the *U.S. v. Oregon* TAC, as many as 18,869 adult, threatened, SnR steelhead escaped to Lower Granite Dam during the upstream steelhead migration in 2000 (unpublished data, TAC). Additionally, according to WDFW (2001c), approximately 198 adult, threatened, SnR steelhead returned to the Tucannon River Basin in 2000. No mortalities of adult, threatened, SnR steelhead are expected by WDFW. If the adult escapement of ESA-listed steelhead to Lower Granite Dam and the Tucannon River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 1 adult, threatened, SnR steelhead from the Snake and Tucannon River populations as a result of WDFW's research will result in substantial impacts on those populations.

The annual non-lethal take of juvenile, threatened, SnR steelhead associated with WDFW's research activities would occur in selected mainstem rivers and tributaries in the Snake River Basin in Washington, including the Tucannon River. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) under the full transportation/no spill scenario in 2001 will be 35,230. No mortalities of juvenile, threatened, SnR steelhead are expected by WDFW. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake and Tucannon River Basins in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 3 juvenile, threatened, SnR steelhead from the Snake and Tucannon River populations as a result of WDFW's research activities will result in substantial impacts on those populations.

WDFW proposes to use the following measures to minimize and mitigate take: Fish captured using boat electrofishing are not anesthetized and are quickly weighed and measured for length. The fish recover immediately and are returned alive to the area from which they were netted. The surveys are usually conducted in the backwater sloughs, oxbow lakes, and ponds rather than in the main channel of a river system. Survey timing, warmer water temperatures, and limiting the sampling to shallow shoreline sections greatly limits the number of resident and anadromous

salmonids taken with boat electrofishing gear (WDFW 2001b). NMFS considers these to be adequate measures to minimize the impacts to the ESA-listed fish.

Cumulative Take Analysis

The cumulative take analysis for the proposed actions that occur in tributary areas assumes that the effects to the ESA-listed fish are best represented by describing the effects to the specific populations present in the ESU. For the proposed actions that occur in the tributary areas, the relative risk to the species is determined by comparing the potential annual cumulative mortality level of each affected life stage (adults, migrating juveniles or smolts, and non-migrating juveniles) caused by the proposed actions to recent estimates of the total number of fish (for the life stage) present in each affected population, if that information is available.[6] The annual maximum mortality level of each affected life stage resulting from the proposed actions that are likely to cause mortalities (from the tables below) is then expressed as a percentage of the estimated total number of fish in each population affected by the proposed actions.

For the proposed actions that occur in the mainstem migration corridor, the relative risk to the ESA-listed species is determined by comparing the potential annual cumulative mortality level of each affected life stage (adults and migrating juveniles or smolts) caused by the proposed actions to recent estimates of the total number of fish (for that life stage) present for the ESU as a whole at a specific reference point in the river, usually at one of the hydropower dams in the vicinity of where the research activities would occur. When the juvenile fish migrate as smolts out of the tributary areas from which they originate and enter the mainstem migration corridor, they encounter a completely different set of hazards which affect their ability to survive. Also, the degree of risk to the fish changes when the fish begin to migrate out of the tributary areas which has a direct influence on the probability of mortality. For example, in the mainstem migration corridor, multiple takes of individual fish (fish that are handled more than once) start to add up. Also, in the mainstem migration corridor, migrating smolts encounter variable environmental conditions such as changing temperature and salinity regimes, risks associated with passing over concrete hydropower dams (such as gas bubble trauma) and through electricity-generating turbines, and an increased exposure to predators. The annual maximum mortality level of each affected life stage resulting from the proposed actions that are likely to cause mortalities (from the tables below) is then expressed as a percentage of the estimated total number of fish for each ESU present at the chosen reference point in the river.

<u>Snake River Sockeye Salmon Adults</u>
There is only one proposed permit action that involves an annual take of adult, endangered, SnR sockeye salmon. That permit action is the proposed amendment of IDFG's scientific research

[6] To the extent that production information at the population level is not available, the cumulative take analysis is conducted at the river system level. To the extent that production information by river system is not available, the cumulative take analysis is conducted for the ESU as a whole.

Permit 1124 to include takes of ESA-listed sockeye salmon associated with salvage/rescue operations. The annual non-lethal and lethal takes of adult, endangered, SnR sockeye salmon associated with IDFG's salvage/rescue operations would occur in the Sawtooth Basin lakes area or the mainstem Salmon River migration corridor in Idaho. Since there is only one permit action that involves a take of ESA-listed SnR sockeye salmon adults, and since the proposed take is exclusive to the species' designated spawning and rearing areas or the mainstem Salmon River migration corridor, the analysis of the effects of that take is sufficient at the population level (see the *Analysis of the Effects of the Proposed Actions* section above).

Snake River Sockeye Salmon Juveniles

Snake River Basin Tributary Areas

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) and the cumulative annual lethal take of juvenile, endangered, SnR sockeye salmon associated with the proposed actions that are proposed to occur in the tributary areas within the species' ESU. For this analysis, the table only includes takes of migrating juvenile, endangered, SnR sockeye salmon. Since there is only one permit action that involves a take of non-migrating SnR sockeye salmon juveniles,[7] and since the proposed take of non-migrating SnR sockeye salmon juveniles is exclusive to the species' designated spawning and rearing areas, the analysis of the effects of that take is sufficient at the population level. Since the observe/harass take category and the handling of ESA-listed juvenile fish carcasses, if applicable, will not be enumerated in the proposed permits, they are not included in the table. Lethal take in the table includes both proposed direct mortalities and proposed indirect mortalities where applicable.

SnR Sockeye Salmon Juveniles - Tributary

Proposed Permit Action	Non-lethal Take of SnR Sockeye Salmon Juveniles	Lethal Take of SnR Sockeye Salmon Juveniles
1124	50	1
1124, Amd	3,000	60
1341	7,000	140
Totals	**10,050**	**201**

The annual non-lethal and lethal takes of migrating juvenile, endangered, SnR sockeye salmon

[7] The one permit action that involves a take of non-migrating juvenile, endangered, SnR sockeye salmon is IDFG's current Permit 1124. IDFG's mid-water trawl surveys in Redfish, Alturas, and Pettit Lakes involve intentional lethal takes of non-migrating SnR sockeye salmon juveniles. See the *Analysis of the Effects of the Proposed Actions* section above.

associated with the proposed scientific research activities and salvage/rescue operations would occur in the Sawtooth Basin lakes area or the mainstem Salmon River migration corridor in Idaho. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, endangered, SnR sockeye salmon expected to emigrate from the Salmon River Basin and reach Lower Granite Dam in 2001 will be 15,309. Based upon the Permit Holder/Applicant's experience with juvenile sockeye salmon research and enhancement activities, a maximum of 2 percent of the ESA-listed sockeye salmon juveniles handled may be indirectly killed. If the ESA-listed SnR sockeye salmon juvenile outmigration from the Salmon River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 201 juvenile, endangered, SnR sockeye salmon as a result of the proposed scientific research activities and salvage/rescue operations will result in a substantial impact to the SnR sockeye salmon ESU.

Percent mortality of juvenile, endangered, SnR sockeye salmon associated with the actions proposed to occur in the Snake River Basin tributary areas is **1.3 percent (201/15,309)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 10,050 juvenile, endangered, SnR sockeye salmon that is proposed to occur in the tributary areas of the species' ESU, together with the annual lethal take of up to 201 juvenile, endangered, SnR sockeye salmon that is proposed to occur in the tributary areas of the species' ESU, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Mainstem Migration Corridor

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) of migrating juvenile, endangered, SnR sockeye salmon associated with the proposed actions that are proposed to occur in the mainstem Columbia River migration corridor.

SnR Sockeye Salmon Juveniles - Mainstem Migration Corridor

Proposed Permit Action	Non-lethal Take of SnR Sockeye Salmon Juveniles	Lethal Take of SnR Sockeye Salmon Juveniles
1140	9	0
1229	1	0
1291	11	0
Totals	**21**	**0**

The annual non-lethal takes of migrating juvenile, endangered, SnR sockeye salmon associated with the proposed scientific research activities would occur in the mainstem lower Columbia River or the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total

number of juvenile, endangered, SnR sockeye salmon expected to emigrate from the Snake River Basin and reach John Day Dam (located on the lower Columbia River) in 2001 (under the full transportation/no spill scenario) will be 76. John Day Dam is chosen as the point of reference for this analysis because all of the proposed actions involving takes of juvenile, endangered, SnR sockeye salmon on the mainstem Columbia River migration corridor would occur either at or downstream from John Day Dam. No mortalities of migrating juvenile, endangered, SnR sockeye salmon are expected by the researchers. If the ESA-listed SnR sockeye salmon juvenile outmigration from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 21 juvenile, endangered, SnR sockeye salmon as a result of the proposed scientific research activities will result in a substantial impact to the SnR sockeye salmon ESU.

Percent mortality of juvenile, endangered, SnR sockeye salmon associated with the actions proposed to occur in the mainstem Columbia River migration corridor is **0.0 percent (0/76)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 21 juvenile, endangered, SnR sockeye salmon that is proposed to occur in the mainstem Columbia River migration corridor will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the take.

Snake River Spring/Summer Chinook Salmon Adults

All of the proposed actions involving takes of adult, threatened, SnR spring/summer chinook salmon would occur in the tributary areas within the species ESU (Salmon and Clearwater Rivers in Idaho, Imnaha and Grande Ronde Rivers in Oregon, and the Tucannon River and Asotin Creek in Washington) with one exception.[8] Since there is only one permit action that involves a take of adult, threatened, SnR spring/summer chinook salmon on the mainstem Columbia River migration corridor, the individual analysis for that permit action is deemed to be sufficient and is excluded from this cumulative take analysis. The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) and the cumulative annual lethal take of adult, threatened, SnR spring/summer chinook salmon associated with the actions proposed to occur in the tributary areas of the species' ESU. Since the observe/harass take category and the handling of ESA-listed adult fish carcasses, if applicable, will not be enumerated in the proposed permits, they are not included in the table (these activities are not likely to result in any mortalities).

SnR Spring/Summer Chinook Salmon Adults

[8] CRITFC's current Permit 1134 involves a take of adult, threatened, SnR spring/summer chinook salmon on the mainstem migration corridor. CRITFC's chinook salmon stock identification study (Project 4) takes place at Bonneville Dam on the lower Columbia River. See the *Analysis of the Effects of the Proposed Actions* section above.

Proposed Permit Action	Non-lethal Take of SnR Spring/Summer Chinook Salmon Adults	Lethal Take of SnR Spring/Summer Chinook Salmon Adults
1124	820	8
1126	50	1
1134	1,714	17
1124, Amd	100	1
1126, Amd	100	1
1152, Mod 1	100	1
1156, Mod 1	2	0
1339	25	0
1345	1	0
Totals	**2,912**	**29**

The annual non-lethal and lethal takes of adult, threatened, SnR spring/summer chinook salmon associated with the proposed scientific research activities and salvage/rescue operations would occur in the streams and tributaries of the Snake River including the Salmon and Clearwater Rivers in Idaho, the Imnaha and Grande Ronde Rivers in Oregon, and the Tucannon River and Asotin Creek in Washington. WDFW's proposed takes of adult, threatened, SnR spring/summer chinook salmon under scientific research Permit 1126 and proposed scientific research Permit 1345 would occur in the streams and tributaries of the Snake River between Lower Granite Dam and Lower Monumental Dam, including the upstream areas of the Tucannon River which merges with the Snake River between Little Goose and Lower Monumental Dams. Therefore, WDFW's cumulative take of adult, threatened, SnR spring/summer chinook salmon is discussed in the context of the Tucannon River populations of the species and is addressed separately from all of the other Permit Holder/Applicant's takes (which are proposed to occur almost entirely upstream of Lower Granite Dam). According to the *U.S. v. Oregon* TAC, as many as 11,825 adult, threatened, SnR spring/summer chinook salmon escaped to Lower Granite Dam during the upstream salmonid migration in 2000 (TAC 2000). Additionally, according to WDFW (2001a), approximately 339 adult, threatened, SnR spring/summer chinook salmon returned to the Tucannon River Basin in 2000. These fish represented a combination of naturally-produced adults and adults that originated from the hatchery supplementation programs in the Snake River Basin conducted by IDFG, WDFW, and ODFW. Based upon the Permit Holder/Applicant's experience with adult chinook salmon research and enhancement activities, a maximum of 1 percent of the ESA-listed adult chinook salmon handled may be indirectly killed. If the adult escapement of ESA-listed SnR spring/summer chinook salmon to Lower Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 27 adult, threatened, SnR spring/summer chinook salmon from the Snake River populations upstream of Lower Granite Dam as a result of the proposed activities will result in substantial

impacts on those populations. Additionally, if the adult escapement of ESA-listed SnR spring/summer chinook salmon to the Tucannon River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2 adult, threatened, SnR spring/summer chinook salmon from the Tucannon River population as a result of WDFW's proposed activities will result in substantial impacts on that population.

Percent mortality of adult, threatened, SnR spring/summer chinook salmon associated with the actions proposed to occur in the Snake River Basin tributary areas upstream of Lower Granite Dam is **0.23 percent (27/11,825)**. Percent mortality of adult, threatened, SnR spring/summer chinook salmon associated with the actions proposed to occur by WDFW in the Tucannon River Basin is **0.59 percent (2/339)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 2,912 adult, threatened, SnR spring/summer chinook salmon, together with the annual lethal take of up to 29 adult, threatened, SnR spring/summer chinook salmon that is proposed to occur in the tributary areas of the species' ESU, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Snake River Spring/Summer Chinook Salmon Juveniles

Snake River Basin Tributary Areas

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take and the cumulative annual lethal take (direct + indirect mortalities) of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with the actions that are proposed to occur in the ESU's tributary areas.

SnR Spring/Summer Chinook Salmon Juveniles - Tributary

Proposed Permit Action	Non-lethal Take of Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Lethal Take of Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Non-lethal Take of Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Lethal Take of Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Total Lethal Take
1056	0	0	29,000	1,380	1,380
1124	30,700	614	85,200	2,454	3,068
1126	35,100	902	12,200	369	1,271
1127	6,400	128	10,700	214	342
1134	150,100	3,002	148,025	2,961	5,963
1152	6,200	124	54,200	1,084	1,208
1156	2	0	2	0	0
1056, Mod 3	0	0	1,000	620	620
1124, Amd	5,000	100	5,000	100	200
1126, Amd	5,000	100	5,000	100	200
1152, Mod 1	49,300	986	5,000	100	1,086
1156, Mod 1	5	0	5	0	0
1205, Mod 1	126	3	126	3	6
1340	60	1	60	1	2
1341	0	0	800	16	16
1343	0	0	25	1	1
1344	15	0	15	0	0
1345	2	0	2	0	0
Totals	**288,010**	**5,960**	**356,360**	**9,403**	**15,363**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with the proposed scientific research activities and salvage/rescue operations would occur in the streams and tributaries of the Snake River including the Salmon and Clearwater Rivers in Idaho, the Imnaha and Grande Ronde Rivers in Oregon, and the Tucannon River and Asotin Creek in Washington. The majority of WDFW's proposed takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon under scientific research Permit 1126 and proposed scientific research Permit 1345 would occur in the streams and tributaries of the Snake River between Lower Granite Dam and Lower Monumental Dam, including the Tucannon River which merges with the Snake River between Little Goose and Lower Monumental Dams. Because of the Corps' Juvenile Fish Transportation Program at the

hydropower dams on the Snake River, there is a considerable disparity between the number of juvenile fish that reach Lower Granite Dam versus the number of juvenile fish that continue to migrate downstream inriver (Schiewe 2001). Therefore, WDFW's cumulative take of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon is addressed separately from the other Permit Holder/Applicant's takes (which, for the most part, are proposed to occur upstream of Lower Granite Dam). According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 478,200; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 513,697. In addition, according to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) under the full transportation/no spill scenario in 2001 will be 52,981; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam in 2001 will be 154,806. Based upon the Permit Holder/Applicant's experience with juvenile chinook salmon research and enhancement activities, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin to Lower Granite Dam in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 8,634 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 5,258 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Snake River populations upstream of Lower Granite Dam as a result of the proposed scientific research activities and salvage/rescue operations will result in substantial impacts on those populations. Additionally, if the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake and Tucannon River Basins to Lower Monumental Dam in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 469 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 1,002 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon from the Snake and Tucannon River populations as a result of WDFW's proposed scientific research activities and salvage/rescue operations will result in substantial impacts on those populations.

Percent mortality of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with the actions proposed to occur in the Snake River Basin tributary areas upstream of Lower Granite Dam is **1.9 percent (8,934/478,200)**; percent mortality of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon associated with the actions proposed to occur in the Snake River Basin tributary areas upstream of Lower Granite

Dam is **1.0 percent (4,958/513,697)**. Percent mortality of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with the actions proposed to occur by WDFW in the Snake and Tucannon River Basins between Lower Granite Dam and Lower Monumental Dam is **0.9 percent (469/52,981)**; percent mortality of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon associated with the actions proposed to occur by WDFW in the Snake and Tucannon River Basins between Lower Granite Dam and Lower Monumental Dam is **0.6 percent (1,002/154,806)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 356,360 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 288,010 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon that is proposed to occur in the tributary areas of the species' ESU, together with the annual lethal take of up to 9,403 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 5,960 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon that is proposed to occur in the tributary areas of the ESU's range, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Mainstem Migration Corridor

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) and the cumulative annual lethal take of migrating juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with the proposed actions that are proposed to occur in the mainstem Columbia River migration corridor. Lethal take in the table includes both proposed direct mortalities and proposed indirect mortalities where applicable.

SnR Spring/Summer Chinook Salmon Juveniles - Mainstem Migration Corridor

Proposed Permit Action	Non-lethal Take of Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Lethal Take of Artificially-Propagated SnR Spring/Summer Chinook Salmon Juveniles	Non-lethal Take of Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Lethal Take of Naturally-Produced SnR Spring/Summer Chinook Salmon Juveniles	Total Lethal Take
1140	2	2	4	2	4
1229	2	0	6	0	0
1290	11	3	23	7	10
1291	562	11	1,090	22	33
1322	0	8	0	6	14
Totals	**577**	**24**	**1,123**	**37**	**61**

The annual non-lethal and lethal takes of juvenile, threatened, naturally-produced and artificially-propagated, SnR spring/summer chinook salmon associated with the proposed scientific research activities would occur in the mainstem lower Columbia River or the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 6,980; the total number of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 7,395. John Day Dam is chosen as the point of reference for this analysis because all of the proposed actions involving takes of juvenile, threatened, SnR spring/summer chinook salmon on the mainstem Columbia River migration corridor would occur either at or downstream from John Day Dam. Based upon the Permit Holder/Applicant's experience with salmonid migration and survival studies, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR spring/summer chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 37 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and the annual loss of up to 24 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon as a result of the proposed scientific research activities will result in a substantial impact to the SnR spring/summer chinook salmon ESU.

Percent mortality of juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon associated with the actions proposed to occur in the mainstem Columbia River migration corridor is **0.5 percent (37/6,980)**; percent mortality of juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon associated with the actions proposed to occur in the mainstem Columbia River migration corridor is **0.3 percent (24/7,395)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 1,123 juvenile,

threatened, naturally-produced, SnR spring/summer chinook salmon and up to 577 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon that is proposed to occur in the mainstem Columbia River migration corridor, together with the annual lethal take of up to 37 juvenile, threatened, naturally-produced, SnR spring/summer chinook salmon and up to 24 juvenile, threatened, artificially-propagated, SnR spring/summer chinook salmon that is proposed to occur in the mainstem Columbia River migration corridor, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Snake River Fall Chinook Salmon Adults

There is one permit action that involves takes of adult, threatened, SnR fall chinook salmon on the mainstem Columbia River migration corridor.[9] Since there is only one permit action that involves takes of adult, threatened, SnR fall chinook salmon on the mainstem Columbia River migration corridor, the individual analysis for that permit action is deemed to be sufficient and is excluded from this cumulative take analysis. The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) and the cumulative annual lethal take of adult, threatened, SnR fall chinook salmon associated with the actions proposed to occur in the tributary areas within the species' ESU. Since the observe/harass take category and the handling of ESA-listed adult fish carcasses, if applicable, will not be enumerated in the proposed permits, they are not included in the table (these activities are not likely to result in any mortalities).

SnR Fall Chinook Salmon Adults

Proposed Permit Action	Non-lethal Take of SnR Fall Chinook Salmon Adults	Lethal Take of SnR Fall Chinook Salmon Adults
1124, Amd	100	1
1126, Amd	100	1
1156, Mod 1	2	0
Totals	**202**	**2**

According to the Fish Passage Center, as many as 1,219 adult, threatened, SnR fall chinook salmon returned to Lower Monumental Dam on the Snake River during the upstream salmonid migration in 2000 (FPC 2001). Based upon the Permit Holder/Applicant's experience with scientific research and enhancement activities involving chinook salmon, a maximum of 1 percent of the adult, threatened, SnR fall chinook salmon handled may be indirectly killed. If the

[9] CRITFC's current Permit 1134 involves a take of adult, threatened, SnR fall chinook salmon on the mainstem migration corridor. CRITFC's chinook salmon stock identification study (Project 4) takes place at Bonneville Dam on the lower Columbia River. See the *Analysis of the Effects of the Proposed Actions* section above.

adult escapement of ESA-listed SnR fall chinook salmon to the Snake River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 2 adult, threatened, SnR fall chinook salmon from the Snake River populations as a result of salvage/rescue operations will result in substantial impacts on those populations.

Percent mortality of adult, threatened, SnR fall chinook salmon associated with the actions proposed to occur in the tributary areas of the Snake River Basin is **0.16 percent (2/1,219)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 202 adult, threatened, SnR fall chinook salmon that is proposed to occur in the tributary areas of the species' ESU, together with the annual lethal take of up to 2 adult, threatened, SnR fall chinook salmon that is proposed to occur in the tributary areas of the species' ESU, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Snake River Fall Chinook Salmon Juveniles

Snake River Basin Tributary Areas

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take and the cumulative annual lethal take (direct + indirect mortalities) of juvenile, threatened, SnR fall chinook salmon associated with the actions that are proposed to occur in the tributary areas within the species' ESU.

SnR Fall Chinook Salmon Juveniles - Tributary

Proposed Permit Action	Non-lethal Take of SnR Fall Chinook Salmon Juveniles	Lethal Take of SnR Fall Chinook Salmon Juveniles
1124	100	2
1126	9,300	286
1134	11,520	710
1156	2	0
1124, Amd	5,000	100
1126, Amd	5,000	100
1156, Mod 1	5	0
1205, Mod 1	126	3
Totals	**31,053**	**1,201**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with the proposed scientific research activities and salvage/rescue operations would occur in the mainstem reaches of the Salmon and Clearwater Rivers in Idaho, the Imnaha and Grande Ronde Rivers in Oregon, and the Tucannon River and Asotin Creek in Washington. The

majority of WDFW's proposed takes of juvenile, threatened, SnR fall chinook salmon under scientific research Permit 1126 would occur in the mainstem tributaries of the Snake River between Lower Granite Dam and Lower Monumental Dam, including the Tucannon River which merges with the Snake River between Little Goose and Lower Monumental Dams. Because of the Corps' Juvenile Fish Transportation Program at the hydropower dams on the Snake River, there is a considerable disparity between the number of juvenile fish that reach Lower Granite Dam versus the number of juvenile fish that continue to migrate downstream inriver (Schiewe 2001). Therefore, WDFW's cumulative take of juvenile, threatened, SnR fall chinook salmon is addressed separately from the other Permit Holder/Applicant's takes (which, for the most part, are proposed to occur upstream of Lower Granite Dam). According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 937,626. In addition, according to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) under the full transportation/no spill scenario in 2001 will be 102,935. Based upon the Permit Holder/Applicant's experience with juvenile chinook salmon research and enhancement activities, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin to Lower Granite Dam in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 815 juvenile, threatened, SnR fall chinook salmon from the Snake River populations upstream of Lower Granite Dam as a result of the proposed scientific research activities and salvage/rescue operations will result in substantial impacts on those populations. Additionally, if the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake and Tucannon River Basins to Lower Monumental Dam in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 386 juvenile, threatened, SnR fall chinook salmon from the Snake and Tucannon River populations as a result of WDFW's proposed scientific research activities and salvage/rescue operations will result in substantial impacts on those populations.

Percent mortality of juvenile, threatened, SnR fall chinook salmon associated with the actions proposed to occur in the Snake River Basin tributary areas upstream of Lower Granite Dam is **0.09 percent (815/937,626)**. Percent mortality of juvenile, threatened, SnR fall chinook salmon associated with the actions proposed to occur by WDFW in the Snake and Tucannon River Basins between Lower Granite Dam and Lower Monumental Dam is **0.37 percent (386/102,935)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 31,053 juvenile, threatened, SnR fall chinook salmon that is proposed to occur in the tributary areas of the species' ESU, together with the annual lethal take of up to 1,201 juvenile, threatened, SnR fall chinook salmon that is proposed to occur in the tributary areas of

the species' ESU, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Mainstem Migration Corridor

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) and the cumulative annual lethal take of migrating juvenile, threatened, SnR fall chinook salmon associated with the proposed actions that are proposed to occur in the mainstem Columbia River migration corridor. Lethal take in the table includes both proposed direct mortalities and proposed indirect mortalities where applicable.

SnR Fall Chinook Salmon Juveniles - Mainstem Migration Corridor

Proposed Permit Action	Non-lethal Take of SnR Fall Chinook Salmon Juveniles	Lethal Take of SnR Fall Chinook Salmon Juveniles
1140	0	2
1229	2	0
1290	13	2
1291	129	3
1322	67	15
Totals	**211**	**22**

The annual non-lethal and lethal takes of juvenile, threatened, SnR fall chinook salmon associated with the proposed scientific research activities would occur in the mainstem lower Columbia River or the Columbia River estuary. According to the juvenile salmon outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR fall chinook salmon expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 3,192. John Day Dam is chosen as the point of reference for this analysis because all of the proposed actions involving takes of juvenile, threatened, SnR fall chinook salmon on the mainstem Columbia River migration corridor would occur either at or downstream from John Day Dam. Based upon the Permit Holder/Applicant's experience with salmonid migration and survival studies, a maximum of 2 percent of the ESA-listed chinook salmon juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR fall chinook salmon from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 22 juvenile, threatened, SnR fall chinook salmon as a result of the proposed scientific research activities will result in a substantial impact to the SnR fall chinook salmon ESU.

Percent mortality of juvenile, threatened, SnR fall chinook salmon associated with the actions proposed to occur in the mainstem Columbia River migration corridor is **0.69 percent (22/3,192)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 211 juvenile, threatened, SnR fall chinook salmon that is proposed to occur in the mainstem Columbia River migration corridor, together with the annual lethal take of up to 22 juvenile, threatened, SnR fall chinook salmon that is proposed to occur in the mainstem Columbia River migration corridor, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Snake River Steelhead Adults

There is one permit action that involves takes of adult, threatened, SnR steelhead on the mainstem Columbia River migration corridor.[10] Since there is only one permit action that involves takes of adult, threatened, SnR steelhead on the mainstem Columbia River migration corridor, the individual analysis for that permit action is deemed to be sufficient and is excluded from this cumulative take analysis. The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take and the cumulative annual lethal take of adult, threatened, SnR steelhead associated with the actions proposed to occur in the tributary areas within the species' ESU.

SnR Steelhead Adults

Proposed Permit Action	Non-lethal Take of SnR Steelhead Adults	Lethal Take of SnR Steelhead Adults
1134	1,225	13
1156, Mod 1	6	0
1339	750	8
1345	1	0
Totals	**1,982**	**21**

The annual non-lethal and lethal takes of adult, threatened, SnR steelhead associated with the proposed scientific research would occur throughout the Snake River Basin including tributaries of the Imnaha and Grande Ronde Rivers in Oregon, the Tucannon River in Washington, and the Salmon and Clearwater Rivers in Idaho. WDFW's take of adult, threatened, SnR steelhead under proposed scientific research Permit 1345 would occur in the streams and tributaries of the Snake River between Lower Granite Dam and Lower Monumental Dam, including the Tucannon River which merges with the Snake River between Little Goose and Lower Monumental Dams.

[10] WDFW's current Permit 1102 involves a take of adult, threatened, SnR steelhead on the mainstem migration corridor. WDFW's steelhead stock assessment research (Study 1) takes place at Bonneville Dam on the lower Columbia River. See the *Analysis of the Effects of the Proposed Actions* section above.

Therefore, WDFW's cumulative take of adult, threatened, SnR steelhead is discussed in the context of the Tucannon River populations of the species and is addressed separately from all of the other Permit Holder/Applicant's takes (which are proposed to occur almost entirely upstream of Lower Granite Dam). According to the *U.S. v. Oregon* TAC, as many as 18,869 adult, threatened, SnR steelhead (both A-run and B-run) escaped to Lower Granite Dam during the upstream steelhead migration in 2000 (unpublished data, TAC). Additionally, according to WDFW (2001c), approximately 198 adult, threatened, SnR steelhead returned to the Tucannon River Basin in 2000. Based upon the Permit Holder/Applicant's experience with adult steelhead research, a maximum of 1 percent of the ESA-listed steelhead adults handled may be indirectly killed. If the adult escapement of ESA-listed steelhead to Lower Granite Dam in 2000 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 21 adult, threatened, SnR steelhead from the Snake River populations upstream of Lower Granite Dam as a result of the proposed research activities will result in substantial impacts on those populations. No mortalities of adult, threatened, SnR steelhead are expected by WDFW under proposed Permit 1345. If the adult escapement of ESA-listed steelhead to the Tucannon River Basin in 2000 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 1 adult, threatened, SnR steelhead from the Tucannon River populations as a result of WDFW's proposed scientific research activities will result in substantial impacts on those populations.

Percent mortality of adult, threatened, SnR steelhead associated with the actions proposed to occur in the tributary areas of the Snake River Basin upstream of Lower Granite Dam is **0.11 percent (21/18,869)**. Percent mortality of adult, threatened, SnR steelhead associated with the actions proposed to occur by WDFW in the Tucannon River Basin is **0.0 percent (0/198)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 1,982 adult, threatened, SnR steelhead that is proposed to occur in the tributary areas of the species' ESU, together with the annual lethal take of up to 21 adult, threatened, SnR steelhead that is proposed to occur in the tributary areas of the species' ESU, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Snake River Steelhead Juveniles

Snake River Basin Tributary Areas

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take (collect for transport; capture, handle, release; capture, tag/mark, release) and the cumulative annual lethal take of juvenile, threatened, SnR steelhead associated with the actions that are proposed to occur in the tributary areas within the species' ESU. Since the observe/harass take category and the handling of ESA-listed juvenile steelhead carcasses, if applicable, will not be enumerated in the proposed permits, they are not included in the table (these activities are not likely to result in any mortalities of ESA-listed steelhead). Lethal take in

the table includes both proposed direct mortalities and proposed indirect mortalities where applicable.

SnR Steelhead Juveniles - Tributary

Proposed Permit Action	Non-lethal Take of SnR Steelhead Juveniles	Lethal Take of SnR Steelhead Juveniles
1127	16,900	338
1134	105,050	2,371
1056, Mod 3	20,550	1,511
1156, Mod 1	15	0
1205, Mod 1	189	4
1340	260	5
1345	3	0
Totals	**142,967**	**4,229**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with the proposed scientific research activities would occur in the streams and tributaries of the Snake River including the Salmon and Clearwater Rivers in Idaho, the Imnaha and Grande Ronde Rivers in Oregon, and the Tucannon River in Washington. The majority of WDFW's proposed takes of juvenile, threatened, SnR steelhead under proposed scientific research Permit 1345 would occur in the tributaries of the Snake River between Lower Granite Dam and Lower Monumental Dam, including the Tucannon River which merges with the Snake River between Little Goose and Lower Monumental Dams. Because of the Corps' Juvenile Fish Transportation Program at the hydropower dams on the Snake River, there is a considerable disparity between the number of juvenile fish that reach Lower Granite Dam versus the number of juvenile fish that continue to migrate downstream inriver (Schiewe 2001). Therefore, WDFW's cumulative take of juvenile, threatened, SnR steelhead is addressed separately from the other Permit Holder/Applicant's takes (which, for the most part, are proposed to occur upstream of Lower Granite Dam). According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach Lower Granite Dam in 2001 will be 825,853. In addition, according to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake and Tucannon River Basins and reach Lower Monumental Dam (the first Snake River dam downstream from the confluence of the Snake and Tucannon Rivers) under the full transportation/no spill scenario in 2001 will be 35,230 (this number is considerably less than the number of juvenile steelhead that are expected to reach Lower Granite Dam because the majority of the SnR steelhead juveniles that reach Lower Granite Dam under the full transportation/no

spill scenario will be removed from the river at the dam and transported downriver in barges). Based upon the Permit Holder/Applicant's experience with juvenile steelhead research activities, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin to Lower Granite Dam in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 4,229 juvenile, threatened, SnR steelhead from the Snake River populations upstream of Lower Granite Dam as a result of the proposed scientific research activities will result in substantial impacts on those populations. No mortalities of juvenile, threatened, SnR steelhead are expected by WDFW under proposed Permit 1345. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake and Tucannon River Basins to Lower Monumental Dam in 2001 is assumed to be typical for future years, NMFS does not believe that the annual non-lethal take of up to 3 juvenile, threatened, SnR steelhead from the Snake and Tucannon River populations as a result of WDFW's proposed scientific research activities will result in substantial impacts on those populations.

Percent mortality of juvenile, threatened, SnR steelhead associated with the actions proposed to occur in the Snake River Basin tributary areas upstream of Lower Granite Dam is **0.51 percent (4,229/825,853)**. Percent mortality of juvenile, threatened, SnR steelhead associated with the actions proposed to occur by WDFW in the Snake and Tucannon River Basins between Lower Granite Dam and Lower Monumental Dam is **0.0 percent (0/35,230)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 142,967 juvenile, threatened, SnR steelhead that is proposed to occur in the tributary areas of the species' ESU, together with the annual lethal take of up to 4,229 juvenile, threatened, SnR steelhead that is proposed to occur in the tributary areas of the species' ESU, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

Mainstem Migration Corridor

The following table summarizes the cumulative annual non-lethal take that has the potential to result in lethal take and the cumulative annual lethal take (direct + indirect mortalities) of migrating juvenile, threatened, SnR steelhead associated with the actions that are proposed to occur in the mainstem Columbia River migration corridor.

SnR Steelhead Juveniles - Mainstem Migration Corridor

Proposed Permit Action	Non-lethal Take of SnR Steelhead Juveniles	Lethal Take of SnR Steelhead Juveniles
1140	6	0
1229	3	0
1290	34	1
1291	1,041	21
1322	3	0
Totals	**1,087**	**22**

The annual non-lethal and lethal takes of juvenile, threatened, SnR steelhead associated with the proposed scientific research activities would occur in the mainstem lower Columbia River or the Columbia River estuary. According to the juvenile steelhead outmigration estimates produced by NMFS' NWFSC for the 2001 outmigration season (Schiewe 2001), the total number of juvenile, threatened, SnR steelhead expected to emigrate from the Snake River Basin and reach John Day Dam in 2001 (under the full transportation/no spill scenario) will be 1,458 (this number is low compared to the number of juvenile steelhead that are expected to reach McNary Dam because the majority of the SnR steelhead juveniles that reach McNary Dam under the full transportation/no spill scenario will be removed from the river at the dam and transported downriver in barges). John Day Dam is chosen as the point of reference for this analysis because all of the proposed actions involving takes of juvenile, threatened, SnR steelhead on the mainstem Columbia River migration corridor would occur either at or downstream from John Day Dam. Based upon the Permit Holder/Applicant's experience with steelhead migration and survival studies, a maximum of 2 percent of the ESA-listed steelhead juveniles handled may be indirectly killed. If the estimated outmigration of juvenile, threatened, SnR steelhead from the Snake River Basin in 2001 is assumed to be typical for future years, NMFS does not believe that the annual loss of up to 22 juvenile, threatened, SnR steelhead as a result of the proposed scientific research activities will result in a substantial impact to the SnR steelhead ESU.

Percent mortality of juvenile, threatened, SnR steelhead associated with the actions proposed to occur in the mainstem Columbia River migration corridor is **1.51 percent (22/1,458)**. Based on the foregoing analysis, NMFS concludes that the annual non-lethal take of up to 1,087 juvenile, threatened, SnR steelhead that is proposed to occur in the mainstem Columbia River migration corridor, together with the annual lethal take of up to 22 juvenile, threatened, SnR steelhead that is proposed to occur in the mainstem Columbia River migration corridor, will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Adequate measures are in place to minimize the effects of the non-lethal take.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future Tribal, state, local or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. For the purpose of this analysis, the action area is that part of the Snake River Basin described in the *Description of the Proposed Actions* section above. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities will be reviewed through separate section 7 consultation processes. Non-Federal actions that require authorization under section 10 of the ESA, and that are not included within the scope of this consultation, will be evaluated in separate section 7 consultations.

Future Tribal, state, and local government actions will likely to be in the form of legislation, administrative rules, or policy initiatives. Government and private actions may include changes in land and water uses, including ownership and intensity, any of which could impact ESA-listed species or their habitat. Government actions are subject to political, legislative, and fiscal uncertainties. These realities, added to the geographic scope of the action area which encompasses numerous government entities exercising various authorities and the many private landholdings, make any analysis of cumulative effects difficult and frankly speculative. This section identifies representative actions that, based on currently available information, are reasonably certain to occur. It also identifies some goals, objectives and proposed plans by government entities, however, NMFS is unable to determine at this point in time whether any proposals will in fact result in specific actions.

State Actions

Each state in the Snake and Columbia River Basins administers the allocation of water resources within its borders. Most streams in the basin are overappropriated even though water resource development has slowed in recent years. Washington closed the mainstem Columbia River to new water withdrawals, and is funding a program to lease or buy water rights. If carried out over the long term this might improve water quantity. The state governments are cooperating with each other and other governments to increase environmental protections, including better habitat restoration, hatchery, and harvest reforms. NMFS also cooperates with the state water resource management agencies in assessing water resource needs in the Snake River Basin, and in developing flow requirements that will benefit ESA-listed fish. During years of low water, however, there could be insufficient flow to meet the needs of the fish. These government efforts could be discontinued or even reduced, so their cumulative effects on ESA-listed fish is unpredictable.

The state of Washington has various strategies and programs designed to improve the habitat of ESA-listed species and assist in recovery planning, including the Salmon Recovery Planning Act, a framework for developing watershed restoration projects. The state is developing a water quality improvement scheme through the development of Total Maximum Daily Loads. As with the Oregon initiatives, these programs could benefit the ESA-listed species if implemented and sustained. The state of Idaho is involved with numerous efforts to enhance the survival and

recovery of ESA-listed SnR salmon and steelhead including an aggressive irrigation diversion screening program, conservation hatchery programs, habitat enhancement activities, and watershed planning efforts.

In the past, each state's economy was heavily dependent on natural resources, with intense resource extraction activity. Changes in the states' economies have occurred in the last decade and are likely to continue with less large scale resource extraction, more targeted extraction methods, and significant growth in other economic sectors. Growth in new businesses is creating urbanization pressures with increased demands for buildable land, electricity, water supplies, waste disposal sites, and other infrastructure. Economic diversification has contributed to population growth and movement in the states, a trend likely to continue for the next few decades. Such population trends will place greater demands in the action area for electricity, water, and buildable land; will affect water quality directly and indirectly; and will increase the need for transportation, communication, and other infrastructure development. The impacts associated with economic and population demands will affect habitat features, such as water quality and quantity, which are important to the survival and recovery of the ESA-listed species. The overall effect is likely to be negative, unless carefully planned for and mitigated.

Some of the state programs described above are designed to address these impacts. Also, Washington enacted a Growth Management Act to help communities plan for growth and address growth impacts on the natural environment. If the programs continue they may help lessen some of the potential adverse effects identified above.

Local Actions

Local governments will be faced with similar but more direct pressures from population growth and movement. There will be demands for intensified development in rural areas as well as increased demands for water, municipal infrastructure, and other resources. The reaction of local governments to such pressures is difficult to assess at this time without certainty in policy and funding. In the past, local governments in the action area generally accommodated additional growth in ways that adversely affected ESA-listed fish habitat. Also, there is little consistency among local governments in dealing with land use and environmental issues so that any positive effects from local government actions on ESA-listed species and their habitat are likely to be scattered throughout the action area.

In Washington, local governments are considering ordinances to address aquatic and fish habitat health impacts from different land uses. These programs are part of state planning structures. Some local government programs, if submitted, may qualify for a limit under the NMFS' ESA section 4(d) rules which are designed to conserve ESA-listed species. Local governments also may participate in regional watershed health programs, although political will and funding will determine participation and therefore, the effect of such actions on ESA-listed species. Overall, without comprehensive and cohesive beneficial programs and the sustained application of such programs, it is likely that local actions will not have measurable positive effects on ESA-listed

species and their habitat, but may even contribute to further degradation.

Tribal Actions

Tribal governments will continue to participate in cooperative efforts involving watershed and basin planning designed to improve fish habitat. The results from changes in Tribal forest and agriculture practices, in water resource allocations, and in changes to land uses are difficult to assess for the same reasons discussed under State and Local Actions. The earlier discussions related to growth impacts apply also to Tribal government actions. Tribal governments will need to apply comprehensive and beneficial natural resource programs to areas under their jurisdiction to produce measurable positive effects for ESA-listed species and their habitat.

Private Actions

The effects of private actions are the most uncertain. Private landowners may convert current use of their lands, or they may intensify or diminish current uses. Individual landowners may voluntarily initiate actions to improve environmental conditions, or they may abandon or resist any improvement efforts. Their actions may be compelled by new laws, or may result from growth and economic pressures. Changes in ownership patterns will have unknown impacts. Whether any of these private actions will occur is highly unpredictable, and the effects even more so.

Summary

Non-federal actions are likely to continue affecting the ESA-listed species. The cumulative effects in the action area are difficult to analyze considering the geographic landscape of this consultation, the political variation in the action area, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, based on the trends identified in this section, the adverse cumulative effects are likely to increase. Although state, Tribal, and local governments have developed plans and initiatives to benefit ESA-listed fish, they must be applied and sustained in a comprehensive way before NMFS can consider them "reasonably certain to occur" in its analysis of cumulative effects.

CONCLUSIONS

After reviewing the current status of the endangered and threatened species that are the subject of this consultation, the environmental baseline for the action area, the effects of the proposed section 10(a)(1)(A) permit actions, and cumulative effects, it is NMFS' biological opinion that issuance of the permit actions, as proposed, and the funding of the proposed activities by Federal agencies, if applicable, are not likely to jeopardize the continued existence of endangered SnR sockeye salmon, threatened SnR spring/summer chinook salmon, threatened SnR fall chinook salmon, or threatened SnR steelhead or result in the destruction or adverse modification of the species' respective designated critical habitats.

INCIDENTAL TAKE STATEMENT

Section 9 and the regulations implementing section 4 of the ESA prohibit any take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of ESA-listed species without a specific permit or exemption. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

However, as discussed in the accompanying biological opinion, the proposed takes of ESA-listed species is part of the intended purpose of the proposed actions and is, therefore, not incidental take. Therefore, NMFS does not expect that implementation of the proposed actions will incidentally take threatened or endangered species.

CONSERVATION RECOMMENDATIONS

Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to develop additional information, or to assist Federal agencies in complying with their obligations under section 7(a)(1) of the ESA. NMFS believes the following conservation recommendation is consistent with these obligations, and therefore should be implemented:

> NMFS shall monitor actual annual takes of ESA-listed fish species associated with scientific research and enhancement activities, as provided to NMFS in annual reports or by other means, and shall adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels are determined to operate to the disadvantage of the ESA-listed species.

REINITIATION OF CONSULTATION

Consultation must be reinitiated if: The amount or extent of cumulative annual takes specified in the permits and/or the Incidental Take Statement of this consultation is exceeded or is expected to be exceeded; new information reveals effects of the actions that may affect the ESA-listed species in a way not previously considered; a specific action is modified in a way that causes an effect on the ESA-listed species that was not previously considered; or a new species is listed or

critical habitat is designated that may be affected by the action (50 CFR 402.16).

MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

"Essential fish habitat" (EFH) is defined in section 3 of the Magnuson-Stevens Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interprets EFH to include aquatic areas and their associated physical, chemical, and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem.

The MSA and its implementing regulations at 50 CFR 600.920 require a Federal agency to consult with NMFS before it authorizes, funds, or carries out any action that may adversely effect EFH. The purpose of consultation is to develop a conservation recommendation(s) that addresses all reasonably foreseeable adverse effects to EFH. Further, the action agency must provide a detailed, written response to NMFS within 30 days after receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with NMFS' conservation recommendation, the agency must explain its reasons for not following the recommendations.

Thus, one of the objectives of this consultation is to determine whether the proposed actions—the issuance of scientific research and/or enhancement permits under section 10(a)(1)(A) of the ESA—are likely to adversely affect EFH. If the proposed actions are likely to adversely affect EFH, conservation recommendations will be provided.

Identification of Essential Fish Habitat

The Pacific Fishery Management Council (PFMC) is one of eight Regional Fishery Management Councils established under the Magnuson-Stevens Act. The PFMC develops and carries out fisheries management plans for Pacific coast groundfish, coastal pelagic species, and salmon off the coasts of Washington, Oregon, and California. Pursuant to the MSA, the PFMC has designated freshwater and marine EFH for several species of Pacific salmon (PFMC 1999). For purposes of this consultation, freshwater EFH for salmon includes all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to Pacific salmon, except those upstream of the impassable dams. In the future, should subsequent analyses determine the habitat above any impassable dam is necessary for salmon conservation, the PFMC will modify the identification of Pacific salmon EFH (PFMC 1999). Marine EFH for Pacific salmon in Oregon and Washington includes all estuarine, nearshore, and marine waters within the western boundary of the U.S. Exclusive Economic Zone (EEZ) 200 miles offshore.

Proposed Action and Action Area

For this EFH consultation, the proposed actions and action area are as described in detail above. The actions are the issuance of a number of scientific research and/or enhancement permits pursuant to section 10(a)(1)(A) of the ESA. The proposed action area is the Snake River Basin, including all river reaches accessible to salmon in the Snake River tributaries upstream to Hells Canyon Dam in Idaho. A more detailed description and identification of EFH for salmon is found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts on these species' EFH from the above proposed action is based on this information.

Effects of the Proposed Action

Based on information submitted by the action agencies and permit applicants, as well as NMFS' analysis in the ESA consultation above, NMFS believes that the effects of the actions on EFH are likely to be within the range of effects considered in the ESA portion of this consultation.

Conclusion

Using the best scientific information available and based on its ESA consultation above, as well as the foregoing EFH sections, NMFS has determined that the proposed actions are not likely to adversely affect EFH designated for Pacific salmon

EFH Conservation Recommendation

The Reasonable and Prudent Measures and the Terms and Conditions outlined above are applicable to designated salmon EFH. Therefore, NMFS recommends that those same Reasonable and Prudent Measures and Terms and Conditions be adopted as the EFH Conservation Recommendation for this consultation.

Statutory Response Requirement

Section 305(b)(4)(B) of the MSA and implementing regulations at 50 CFR section 600.920 require a Federal action agency to provide a detailed, written response to NMFS within 30 days after receiving an EFH conservation recommendation. The response must include a description of measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with a conservation recommendation from NMFS, the agency must explain its reasons for not following the recommendation.

Consultation Renewal

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

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