National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Consultation Biological Opinion and Magnuson–Stevens Act Essential Fish Habitat Consultation

Action Agencies: The National Marine Fisheries Service (NMFS)
The Environmental Protection Agency (EPA)
The (NMFS) Northwest Fisheries Science Center (NWFSC)
The United States Geological Survey (USGS)
The United States Fish and Wildlife Service (USFWS)
The United States Forest Service (USFS)
The Bonneville Power Administration (BPA)

Species/ESUs Affected: Threatened Middle Columbia River (MCR) steelhead (*Oncorhynchus mykiss*)

Essential Fish Habitat (EFH) Affected: Pacific salmon, groundfish, and coastal pelagic species

Activities Considered:

1. Issuance of Permit No. 1156 to the EPA.
2. Issuance of Permit No. 1291 to the USGS.
3. Issuance of Permit No. 1335 to the USFS.
4. Issuance of permit No. 1382 to the USGS.
5. Issuance of Permit No. 1403 to the NWFSC.
6. Issuance of Permit No. 1410 to the NWFSC.
7. Issuance of Permit No. 1421 to the USFWS.
8. Issuance of Permit No. 1422 to the USFS.
9. Issuance of Permit No. 1426 to the BPA.

Consultation Conducted by: The Protected Resources Division (PRD), Northwest Region, NMFS Consultation Number 2002/01950.

This Biological Opinion (Opinion) constitutes NMFS' review of nine ESA section 10(a)(1)(A) permit actions that could affect MCR steelhead. 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is based on information provided in the applications for the proposed permits and permit modifications, published and unpublished scientific information on the biology and ecology of threatened steelhead in the action area, and other sources of information. A complete administrative record of this consultation is on file with the PRD in Portland, Oregon.

NMFS concludes that issuing the permits for the proposed research activities discussed in this biological opinion is not likely to jeopardize the continued existence of threatened MCR steelhead. Further, the activities would not adversely affect any designated EFH.

Approved by: for D. Robert Lohn, Regional Administrator
Date: 6/24/2003 (**Expires on:** 12/31/2007)

CONSULTATION HISTORY

NMFS proposes to issue nine permits and permit modifications and thereby authorize the permit holders to conduct scientific research on listed MCR steelhead. The Northwest Region's PRD decided to group these actions into a single consultation pursuant to 50 CFR 402.14(c) because they are similar in nature and duration and will affect the same threatened species. Though some of the proposed permit actions may affect other species as well, this Opinion constitutes formal consultation and an analysis of effects solely for MCR steelhead.

The first of the permit requests was received in December of 2002. It, and several others (though not all) were deemed incomplete to varying degrees when they arrived at the PRD. After numerous phone calls and e-mails, each of the applications was determined to be complete and was then published in a *Federal Register* notice asking for public comment. The public was given 30 days to comment on each application and, once that period closed, the consultation proper was begun. The full consultation histories for all nine actions are lengthy and are not directly relevant to the analysis for the proposed actions so they will not be detailed here. Nonetheless, the PRD in Portland, Oregon maintains the complete histories for each proposed action in the administrative record for this consultation.

DESCRIPTION OF THE PROPOSED ACTIONS

NMFS proposes to issue nine permits and permit modifications and thereby authorize the permit holders to conduct scientific research involving threatened MCR steelhead. Though some of these actions may affect other listed species as well as MCR steelhead, this Opinion constitutes formal consultation and an analysis of effects solely for MCR steelhead. It should be noted that some of the activities identified in the proposed permit actions would be funded by NMFS, the EPA, the BPA, the USGS, the USFS, and the USFWS. Although these agencies are responsible for complying with section 7 of the ESA because they are funding activities that may affect listed species, this consultation examines the actual actions they propose to fund and thus fulfills their section 7 consultation obligations.

NMFS proposes that all of the permit actions considered in this Opinion should expire on or before December 31, 2007. Also, in all instances where a permit holder does not expect to indirectly kill any juvenile MCR steelhead during the course of his or her work, the indirect lethal take figure has been set at one. The reason for this is that unforseen circumstances can arise on occasion, and NMFS has determined it is best in these instances to include modest overestimates of expected take. By doing this, NMFS gives researchers enough flexibility to make in-season research protocol adjustments in response to annual fluctuations in

environmental conditions—such as water flows, larger than expected run sizes, etc.—without having to shut down the research because the expected take was exceeded. Also, high take estimates are useful for conservatively analyzing the effects of the actions because it allows accidents that could cause higher-than-expected take levels to be taken into account during the analysis.

Research permits lay out the terms and conditions to be followed before, during, and after the research activities are conducted. These conditions are intended to (a) manage the interaction between scientists and listed salmonids by requiring that research activities be coordinated among permit holders and between permit holders and NMFS, (b) minimize impacts on listed species, and (c) ensure that NMFS receives information about the effects the permitted activities have on the species concerned. The following conditions are common to all of the permits consulted upon in this Opinion.

In all cases, the permit holder must:

1. The permit holder must ensure that listed species are taken only at the levels, by the means, in the areas and for the purposes stated in the permit application, and according to the terms and conditions in this permit.

2. The permit holder must not intentionally kill or cause to be killed any listed species unless the permit specifically allows intentional lethal take.

3. The permit holder must handle listed fish with extreme care and keep them in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; e.g., the holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, the permit holder must process listed fish first to minimize handling stress.

4. The permit holder must stop handling listed juvenile fish if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, listed fish may only be visually identified and counted.

5. If the permit holder anesthetizes listed fish to avoid injuring or killing them during handling, the fish must be allowed to recover before being released. Fish that are only counted must remain in water and not be anesthetized.

6. The permit holder must use a sterilized needle for each individual injection when passive integrated transponder tags (PIT-tags) are inserted into listed fish.

7. If the permit holder incidentally captures any listed adult fish while sampling for juveniles, the adult fish must be released without further handling and such take must be reported.

8. The permit holder must exercise care during spawning ground surveys to avoid disturbing listed adult salmonids when they are spawning. Researchers must avoid walking in salmon streams whenever possible, especially where listed salmonids are likely to spawn. Visual observation must be used instead of intrusive sampling methods, especially when just determining presence of anadromous fish.

9. The permit holder using backpack electrofishing equipment must comply with NMFS' Backpack Electrofishing Guidelines (June 2000) available at http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/final4d/electro2000.pdf

10. The permit holder must obtain approval from NMFS before changing sampling locations or research protocols.

11. The permit holder must notify NMFS as soon as possible but no later than two days after any authorized level of take is exceeded or if such an event is likely. The permit holder must submit a written report detailing why the authorized take level was exceeded or is likely to be exceeded.

12. The permit holder is responsible for any biological samples collected from listed species as long as they are used for research purposes. The permit holder may not transfer biological samples to anyone not listed in the application without prior written approval from NMFS.

13. The person(s) actually doing the research must have a copy of this permit while conducting the authorized activities.

14. The permit holder must allow any NMFS employee or representative to accompany field personnel while they conduct the research activities.

15. The permit holder must allow any NMFS employee or representative to inspect any records or facilities related to the permit activities.

16. The permit holder may not transfer or assign this permit to any other person as defined in Section 3(12) of the ESA. This permit ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

17. NMFS may amend the provisions of this permit after giving the permit holder reasonable notice of the amendment.

18. The permit holder must obtain all other Federal, state, and local permits/authorizations needed for the research activities.

19. On or before January 31st of every year, the permit holder must submit to NMFS a post-season report in the prescribed form describing the research activities, the number of listed fish taken and the location, the type of take, the number of fish intentionally killed and unintentionally killed, the take dates, and a brief summary of the research results. Falsifying annual reports or permit records is a violation of this permit.

20. If the permit holder violates any permit term or condition they will be subject to any and all penalties provided by the ESA. NMFS may revoke this permit if the authorized activities are not conducted in compliance with the permit and the requirements of the ESA or if NMFS determines that its ESA section 10(d) findings are no longer valid.

It should be noted that in this instance "permit holder" means the permit holder or any employee, contractor, or agent of the permit holder.

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.

Finally, NMFS will use the annual reports to monitor the actual number of listed fish taken annually in the scientific research activities and shall adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels rise to the point where they are detrimental to the listed species.

The Individual Permits

Permit 1156

The EPA in Corvallis, Oregon is requesting a 5-year permit to annually take a number of species but the only ones of concern to this Opinion are adult and juvenile threatened MCR steelhead. The research is designed to assess species status and trends in randomly-selected river systems in Washington. The EPA intends to conduct annual surveys for fish, macroinvertebrate, algae, and microbial assemblages as well as physical and chemical habitat conditions. Listed fish will be captured by electrofishing (using backpack or raft-mounted gear), sampled for biological information, and released.

The research will benefit the listed species by providing baseline information about water quality in the study areas and will also support enforcement of the Clean Water Act in those river systems where listed fish are present. Dynamac Corporation, the U.S. Geological Survey Biological Resources Division, the Idaho Department of Environmental Quality, and the Washington Department of Ecology will be cooperators in the proposed EPA research. The EPA requests the cooperators' biologists be authorized as agents of the EPA in conducting the research.

Permit 1291—Modification 2

The USGS is requesting a modification to Permit 1291 that would allow them to use McNary Dam on the Columbia River as a possible alternate collection point for some of the fish used in their research. Under the modification, the USGS would annually take juvenile threatened MCR steelhead as well as other species. Under the modification, the listed juvenile fish would be either (1) captured by Smolt Monitoring Program (SMP) personnel at John Day Dam (and, if necessary at Bonneville and McNary Dams) handled, and released or (2) captured by SMP personnel and given to USGS personnel and implanted with radio transmitters, transported, held for as long as 24 hours, released, and tracked electronically. The USGS requests that SMP personnel be allowed to act as agents of the USGS under the proposed permit. The USGS does not intend to kill any of the fish being captured, but a small percentage may die as a result of the research activities.

The purpose of the research is to monitor (using radio telemetry) juvenile fish movement, distribution, behavior, and survival in the Columbia River. The research would benefit listed salmonids by providing information on spill effectiveness, forebay residence times, and guidance efficiency under various flow regimes that would allow Federal resource managers to adjust bypass/collection structures and thereby optimize downriver migrant survival at the hydropower projects.

Permit 1335-Modification 2

The USFS in Corvallis, Oregon is requesting that Permit 1335 be modified to allow them to annually take juvenile threatened MCR steelhead (among other species) in randomly chosen sites in watersheds of the middle Columbia River drainage. The USFS proposes to capture (using backpack electrofishing), anesthetize, measure, and release listed salmonids.

The purposes of the study are to assess watershed conditions and factors limiting salmonid health and production, and evaluate watershed health under the Northwest Forest Plan. The activities will benefit listed fish by generating information to improve forest management. The USFS does

not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1382—Modification 1

The USGS is seeking a two-year permit to take juvenile threatened MCR steelhead during the course of research designed to assess bull trout populations and life history and habitat characteristics in the Umatilla River, Oregon. The researchers intend to use a variety of techniques to capture, mark, and monitor bull trout in the Umatilla River. The techniques that will affect MCR steelhead are snorkel surveys, backpack electrofishing, seining, trap netting, minnow trapping, and screw trapping. During the snorkeling exercise, the fish will simply be observed. Any MCR steelhead captured during the other operations will be counted and immediately released downstream from their capture sites.

The purpose of the research is to tie fish and population health (for bull trout) to habitat quality and land use in the Umatilla subbasin and thus assist in the process of recovery planning. MCR steelhead will benefit from this research because many of the habitat features bull trout require are also important to steelhead and therefore any improvement in those features for the purposes of recovering bull trout will be of help to the local depressed steelhead populations as well. The researchers do not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1403

The NWFSC is requesting a five-year permit to annually take juvenile threatened MCR steelhead (among other species) in the John Day River subbasin in Oregon. The research encompasses two studies: Assessment of Three Alternative Methods of Nutrient Enhancement (Salmon Carcasses, Carcass Analogues, and Nutrient Pellets) on Biological Communities in Columbia River Tributaries, and Utilization of Nutrients from Spawning Salmon by Juvenile Chinook Salmon and Steelhead in the Columbia and Snake River Basins. Under these studies, the fish would variously be (a) captured (using seines, nets, traps and, possibly, electrofishing equipment) and anesthetized; (b) measured and weighed; (c) held for a time in enclosures in the stream from which they are captured; and (d) released. Both projects call for some juvenile listed fish to be intentionally killed as part of the research. It is also likely that a small percentage of the fish being captured would unintentionally be killed during the process. In addition, tissue samples would be taken from adult carcasses found on streambanks.

The research has many purposes and would benefit listed salmon and steelhead in different ways. In general, the purpose of the research is to (a) learn how salmonids acquire nutrients from the

bodies of dead spawners and test three methods of using those nutrients to increase growth and survival among naturally produced salmonids and (b) determine the extent to which juvenile steelhead and chinook use marine-derived nutrients and learn more about the relationships between juvenile salmonid body size, population density, and nutrient uptake. The research will benefit the fish by helping managers use nutrient enhancement techniques to help recover listed salmonid populations. Moreover, managers will be able to gain a broader understanding of the role marine-derived nutrients play in ecosystem health as a whole. This, in turn, will help inform management decisions and actions intended to help salmon recovery in the future.

Permit 1410

The NWFSC requests a 5-year permit for annual take of adult and juvenile MCR steelhead (among other species). The NWFSC proposes to investigate the distribution, abundance, condition and health of juvenile salmon in relation to physical and biological oceanographic conditions in the Columbia River plume and surrounding ocean environment to better understand factors controlling estuarine and marine survival. The study will provide information to help predict and forecast survival potential as a function of easily measured indices of plume and ocean conditions. Further, the information will help hydropower operators develop a set of hydropower management scenarios that could benefit survival, growth, and health of juvenile salmon by changing the dynamics of the Columbia River plume. Listed fish will be collected with purse seines and trawl nets, sampled for biological data, and released. The NWFSC also requests authorization to lethally take salmon for endocrine assessments, genetic stock identification, pathogen prevalence and intensity, otolith and stomach content analysis, and histopathological attributes.

Permit 1421

The USFWS in Vancouver, Washington, is requesting a three-year permit to annually take adult and juvenile endangered adult and juvenile threatened MCR steelhead (among other species) during the course of a study in the Franz Lake National Wildlife Refuge on the Lower Columbia River. The USFWS proposes to capture (using boat and backpack electrofishing, fyke nets, and minnow traps), anesthetize, measure, check for tags, mark, sample for stomach content, and release listed salmonids.

The objectives of the study are to (1) document fish species in the refuge, (2) evaluate fish distribution relative to habitat features, and (3) describe fish diets in the refuge. The study will be coordinated with a mosquito control study conducted by the Oregon Cooperative Fish and Wildlife Research Unit. The study will benefit listed fish by generating information on the effects of mosquito control on salmonids and salmonid prey species, and the spacial and

temporal relations among fish distribution, fish diets, and areas typically treated to control mosquitos. The USFWS does not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1422

The USFS is requesting a five-year permit to annually take juvenile threatened MCR steelhead (among other species) during research activities taking place at various points in the Yakima River drainage in Washington State. The fish would be captured (using minnow traps, hook-and-line angling, and electrofishing equipment), identified, and immediately released. The purpose of the research is to determine fish distribution in the subbasins listed above. The research will benefit the fish by giving land managers information they need in order to design forest management activities (e.g., timber sales, grazing plans, road building) in such a way as to conserve listed species. The USFS does not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1426

The Bonneville Power Administration (BPA) is requesting a five-year permit to annually take adult threatened MCR steelhead at Roza Dam on the Yakima River, Washington. Under this study, the adult MCR steelhead would be captured at the adult monitoring and broodstock collection facility on the adult ladder at Roza Dam, anesthetized, radio-tagged, allowed to recover, and released.

The purpose of the research is to determine the movements (migration timing, holding area locations, migration routes, etc.) of the steelhead in the upper Yakima watershed. The information would benefit the fish because it would be used to help develop supplementation plans and passage improvements as well as protecting and enhancing mainstem and tributary habitats the MCR steelhead use. The BPA does not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

The Action Area

The action area for the proposed research projects comprises a large number of streams and rivers in the MCR subbasin. The actions have the potential to affect the water, substrate, and adjacent riparian zones of estuarine and accessible riverine reaches in several hydrologic units and counties. Accessible reaches are those within the historical range of the MCR ESU that can

still be occupied by any steelhead life stage. These include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive). Major river subbasins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles in Oregon and Washington. The following counties lie partially or wholly within these subbasins (or contain migration habitat for the species): Oregon—Clatsop, Columbia, Crook, Gilliam, Grant, Harney, Hood River, Jefferson, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler; Washington—Benton, Clark, Columbia, Cowlitz, Franklin, Kittitas, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima. More detailed habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for MCR steelhead can be found in the February 16, 2000, *Federal Register* notice designating critical habitat (65 FR 7764). It should be noted, however, that the critical habitat designation for MCR steelhead was vacated and remanded to NMFS for new rulemaking pursuant to a court order in May of 2002. In the absence of a new rule designating critical habitat for MCR steelhead, this consultation will evaluate the effects of the proposed actions on the species' habitat to determine whether those actions are likely to jeopardize the species' continued existence.

STATUS OF THE SPECIES UNDER THE ENVIRONMENTAL BASELINE

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire taxonomic species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered. MCR steelhead are just such a DPS and, as such, are for all intents and purposes considered a "species" under the ESA.

NMFS developed the approach for defining salmonid DPSs in 1991 (Waples 1991). It states that a population or group of populations is considered distinct if they are "substantially reproductively isolated from conspecific populations," and if they are considered "an important component of the evolutionary legacy of the species." A distinct population or group populations is referred to as an evolutionarily significant unit (ESU) of the species. Hence, MCR steelhead constitute an ESU of the species *O. mykiss*.

The MCR steelhead ESU was listed as threatened on March 25, 1999 (64 FR 14517). It includes all natural-origin populations in the Columbia River basin above the Wind River, Washington, and the Hood River, Oregon, up to and including the Yakima River, Washington. This ESU includes the only populations of inland winter steelhead in the United States (in the Klickitat River, Washington, and Fifteenmile Creek, Oregon). Both the Deschutes River and Umatilla River hatchery stocks are included in the ESU but are not listed.

The MCR steelhead were listed because NMFS determined that a number of factors—both environmental and demographic—had caused them to decline to the point where they were likely to be in danger of going extinct within the foreseeable future. These factors for decline affect MCR steelhead biological requirements at every life stage and they arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they take place.

Species/ESU Life History

Steelhead

Steelhead can be divided into two basic run types based on their level of sexual maturity at the time they enter fresh water 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 relatively

shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, others only have one run type.

For more information on steelhead biology please see NMFS (2002a), NMFS (2000a), and Busby et al. (1996).

MCR Steelhead

Fish in this ESU are predominantly summer steelhead, but winter-run fish are found in the Klickitat River and Fifteenmile Creek. Most fish in this ESU smolt at two years and spend one to two years in salt water before re-entering fresh water, where they may remain up to a year before spawning. Age-2-ocean steelhead dominate the summer steelhead run in the Klickitat River, whereas most other rivers with summer steelhead produce about equal numbers of both age-1- and age-2-ocean fish. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the ESU. Parr usually undergo a smolt transformation as 2-year-olds, at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean before returning to spawn in their natal streams. A nonanadromous form of *O. mykiss* (redband trout) co-occurs with the anadromous form in this ESU, and juvenile life stages of the two forms can be very difficult to differentiate. In addition, hatchery steelhead are also distributed throughout the range of this ESU. For more information on MCR steelhead life history, please see NMFS (2000a) and Busby et al. (1996).

Overview—Status of the MCR Steelhead in the Action Area

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at that time and in that action area. For the purposes of this consultation, MCR steelhead biological requirements are expressed in two ways: Population parameters such as fish numbers, distribution, and trends throughout the action area; and the condition of various essential habitat features such as water quality, stream substrates, and food availability. Clearly, these two types of information are interrelated. That is, the condition of a given habitat has a large impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so provides a more complete picture of all the factors affecting MCR steelhead survival. Therefore, the discussion to follow will be divided into two parts: Species Distribution and Trends; and Factors Affecting the Environmental Baseline.

Species Distribution and Trends

Distribution

Recent adult data for this ESU are summarized in NMFS' biological opinion on the operation of the Federal Columbia River Power System (NMFS 2000a). Though it is difficult to determine how many MCR steelhead there were historically, estimates for the Yakima River show returns in excess of 100,000 adults in the years before (WDF et al. 1993). If the return numbers were even close to comparable in the other major drainage areas in this ESU, the total historical run size was almost certainly well in excess of 300,000 fish.

In 1997, NMFS assessed the status of this ESU (NMFS 1997). Updated dam counts from the Deschutes River showed a 5-year geometric mean of approximately 9,700 summer steelhead in recent runs, corresponding to an escapement of 1,400 natural fish. For 1997, steelhead escapement above Sherars Falls included 17,566 stray hatchery steelhead and 1,729 naturally-produced Deschutes River steelhead. Run reconstructions for the Yakima, John Day, and Umatilla Rivers estimate that recent natural escapements are 4,000, 10,000, and 3,500 steelhead, respectively.

There is very little data on the historical numbers of juvenile outmigrants for the MCR steelhead ESU. In recent years however, the juvenile out migration has been estimated at more than 379,000 fish (Ferguson 2003). And more than one-quarter of the MCR steelhead outmigrants (a recent five-year average of 99,235) were produced in the Yakima River system (NMFS 2002b).

Escapements to the Yakima, Umatilla, and Deschutes River subbasins have shown overall upward trends, although all tributary counts in the Deschutes River are downward, and the Yakima River is recovering from extremely low abundance in the early 1980s. The John Day River probably represents the largest native, naturally-spawning stock in the ESU, and the combined spawner surveys for the John Day River has showed spawner declines of about 15% per year 1985 and 2000, but trends have been up in the last two years (NMFS 2003). NMFS, in proposing this ESU for listing as threatened under the ESA, cited low returns to the Yakima River, poor abundance estimates for Klickitat River and Fifteenmile Creek winter steelhead, and an overall decline for naturally producing stocks within the ESU. However, estimates based on dam counts show an overall increase in steelhead abundance, with a relatively stable naturally-produced component.

Hatchery fish are widespread and stray to spawn naturally throughout the region. Recent estimates of the proportion of natural spawners of hatchery origin range from low (Yakima, Walla Walla, and John Day Rivers) to moderate (Umatilla and Deschutes Rivers). Most hatchery production in this ESU is derived primarily from within-basin stocks. One recent area of concern is the increase in the number of Snake River hatchery (and possibly wild) steelhead

that stray and spawn naturally within the Deschutes River subbasin. In addition, one of the main threats cited in NMFS' listing decision for this species was the fact that hatchery fish constituted a steadily increasing proportion of the natural escapement in the MCR steelhead ESU (62 FR 43937, August 18, 1997).

Summary

Thus, the degree to which MCR steelhead biological requirements are being met in the action area with respect to population numbers and distribution is something of a mixed bag. While some improvement can be seen throughout the ESU as a whole, populations in critical subbasins exhibit continuing declining trends. Therefore, while there is some cause for optimism, there has been no genuine change in the species' status since it was listed, and the most likely scenario is that its biological requirements are not being met with respect to abundance, distribution, and overall trend.

Factors Affecting the Environmental Baseline in the Action Area

Environmental baselines for biological opinions are defined by regulation at 50 CFR 402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for *this* biological opinion is therefore the result of the impacts a great many activities (summarized below) have had on MCR steelhead survival and recovery. Put another way (and as touched upon previously), the baseline is the culmination of the effects that multiple activities have had on the species' *biological requirements* and, by examining those individual effects, it is possible to derive the species' status in the action area.

Many of the biological requirements for MCR steelhead in the action area can best be expressed in terms of essential habitat features. That is, the steelhead require 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 (February 16, 2000, 65 FR 7764). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. These factors are well known and documented in dozens—if not hundreds—of scientific papers, policy documents, news articles, books, and other media. It is therefore unnecessary to illustrate in this opinion the many ways in which human activities and natural factors have affected the MCR steelhead's habitat-related biological requirements; thus the following paragraphs constitute a brief summary

of what the most recent accepted science has to say about how human action and natural processes have degraded essential steelhead habitat features in the MCR subbasin.

Some factors in the action area (e.g., hydropower and agricultural development) have had adverse effects on every single one of the habitat-related biological requirements listed above, while other factors have only affected some of those essential habitat features. For example, road building in the MCR subbasin has had a sizeable effect on stream substrates and water quality (through siltation), and road culverts have blocked fish passage, but such activities have not had much of an effect on water velocity. In another instance, timber harvest and grazing activities have affected—to greater or lesser degrees—all the factors except space. Further, mining has affected most of the factors—but primarily water quality. And urban development has affected them all, but generally to a small degree in the largely rural MCR subbasin. In short, nearly every widespread human activity in the basin has adversely affected some or all of habitat features listed above. And by disrupting those habitat features, these activities—coupled with fish harvest and hatchery operations and occasional natural disturbances such as drought and fire—have had detrimental impacts on MCR steelhead health, physiology, numbers, and distribution in every subpopulation and at every life stage. (The impacts generated by hatchery operations and fish harvest have decreased greatly in recent years—particularly hatchery impacts as hatcheries are now being re-designed to supplement natural populations rather than replaces them.) For detailed information on how various factors have degraded essential habitat features in the MCR subbasin, please see any of the following: NMFS (1991), NMFS (1997), NMFS (1998), NMFS (2000a), NMFS (2002a) and, in particular, NMFS (2000d).

Summary

In conclusion, the picture of whether MCR steelhead biological requirements are being met is more clear-cut for habitat-related parameters than it is for population factors: given all the factors for decline, it is clear that the MCR steelhead's biological requirements are currently not being met under the environmental baseline. Thus their status is such that there must be a significant improvement in the environmental conditions of their habitat (over those currently available under the environmental baseline). Any further degradation of the environmental conditions could have a large impact because the species is already at risk. In addition, there must be efforts to minimize impacts caused by dams, harvest, hatchery operations, habitat degradation, and unfavorable natural conditions.

EFFECTS OF THE ACTION

The purpose of this section is to identify what effects NMFS' issuance of scientific research permits will have on threatened MCR steelhead. To the extent possible, this will include analyzing effects at the population level. Where information on MCR steelhead is lacking at the population level, this analysis assumes that the status of each affected population is the same as the ESU as a whole. The method NMFS uses for evaluating effects is discussed first, followed by discussions of the general effects scientific research activities are known to have and permit-specific effects.

Evaluating the Effects of the Action

Over the course of the last decade and hundreds of ESA section 7 consultations, NMFS developed the following four-step approach for applying the ESA Section 7(a)(2) standards when determining what effect a proposed action is likely to have on a given listed species. What follows here is a summary of that approach.

1. Define the biological requirements and current status of each listed species.

2. Evaluate the relevance of the environmental baseline to the species' current status.

3. Determine the effects of the proposed or continuing action on listed species and their habitat.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under (a) the effects of the proposed (or continuing) action, (b) the effects of the environmental baseline, and (c) any cumulative effects—including all measures being taken to improve salmonid survival and recovery.

The fourth step above requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (i.e., impacts on essential habitat features). The second part focuses on the species itself. It describes the action's impact on individual fish—or populations, or both—and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to answer the questions of whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its critical habitat (if any exists).

Effects on Habitat

Previous sections have detailed the scope of the MCR steelhead habitat in the action area, described the essential features of that habitat, and depicted its present condition. The discussion here focuses on how those features are likely to be affected by the proposed actions.

Full descriptions of the proposed activities are found in the next section. In general, the activities will be (a) electrofishing—using both backpack- and boat-based equipment, (b) snorkel surveys in spawning and rearing habitat, (c) capturing fish with angling equipment, traps, and nets of various types, and (d) marking the captured fish with various types of tags. All of these techniques are minimally intrusive in terms of their effect on habitat. None of them will measurably affect any of the 10 essential fish habitat features listed earlier (i.e., stream substrates, water quality, water quantity, food, streamside vegetation, etc.). Moreover, the proposed activities are all of short duration. Therefore, NMFS concludes that the proposed activities are unlikely to have an adverse impact on MCR steelhead habitat, and thus will not jeopardize the fish by reducing the ability of that habitat to contribute to their survival and recovery.

Effects on MCR Steelhead

The primary effects the proposed activities will have on MCR steelhead will occur in the form of direct "take" (the ESA take definition is given in the section introducing the individual permits), a major portion of which takes the form of harassment. Harassment generally leads to stress and other sub-lethal effects and is caused by observing, capturing, and handling fish. The ESA does not define harassment nor has NMFS defined this term through regulation. However, the 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 17.3]. For the purposes of this analysis, NMFS adopts this definition of harassment.

As the proposed permit actions show, 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 listed species. They may be expressed in *terms* of the take categories (e.g., how many MCR steelhead 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—regardless of where they occur or what species are involved.

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. 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 on page 5 of this Opinion. They are incorporated (where relevant) into every permit as part of the terms and conditions to which a researcher must adhere.

Observation

For some studies, Listed fish will be observed in-water (i.e., snorkel surveys). Direct observation is the least disruptive method for determining presence/absence of the species and estimating their relative abundance. Its effects are also generally the shortest-lived among any of the research activities discussed in this section. Typically, a cautious observer can effectively obtain data without disrupting the normal behavior of a fish. Fry and juveniles frightened by the turbulence and sound created by observers are likely to seek temporary refuge in deeper water or behind or under rocks or vegetation. In extreme cases, some individuals may temporarily leave a particular pool or habitat type when observers are in their area. Researchers minimize the amount of disturbance by moving through streams slowly—thus allowing ample time for fish to reach escape cover; though it should be noted that the research may at times involve observing adult fish—which are more sensitive to disturbance. During some of the research activities discussed below, 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—particularly in cases where the observation is to be conducted solely by researchers on the stream banks rather than in the water. There is little a researcher can do to mitigate the effects associated with observation activities because those effects are so minimal. In general, all they can do is move with care and attempt to avoid disturbing sediments, gravels, and, to the extent possible, the fish themselves.

Capture/handling

Capturing and handling fish causes them stress—though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience

trauma if care is not taken in the transfer process, and 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 kill or injure fish if the traps are not monitored and cleared on a regular basis.

Based on prior experience with the research techniques and protocols that would be used to conduct the proposed scientific research, no more than five percent of the juvenile salmonids encountered are likely to be killed as an indirect result of being captured and handled and, in most cases, that figure will not exceed three percent. In addition, it is not expected that more than one percent of the adults being handled will die. In any case, all researchers will employ the mitigation measures described earlier (page 4) and thereby keep adverse effects to a minimum. Finally, any fish indirectly killed by the research activities in the proposed permits may be retained as reference specimens or used for analytical purposes.

Electrofishing

Electrofishing is a process by which an electrical current is passed through water containing fish in order to stun them—thus making them easier to capture. It can cause a suite of effects ranging from simple harassment to actually killing the fish (adults and juveniles) in an area where it is occurring. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. Electrofishing can have severe effects on adult salmonids. Spinal injuries in adult salmonids from forced muscle contraction have been documented. Sharber and Carothers (1988) reported that electrofishing killed 50 percent of the adult rainbow trout in their study. The long-term effects electrofishing has on both juvenile and adult salmonids are not well understood, but long experience with electrofishing indicates that most impacts occur at the time of sampling and are of relatively short duration.

The effects electrofishing may have on MCR steelhead 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 (see the next subsection for more detail on capturing and handling effects). 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 rates are substantially lower than they are for 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). McMichael et al. (1998) found a 5.1% injury rate for juvenile MCR steelhead captured by electrofishing in the Yakima River subbasin. 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, Dalbey et al. 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg 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 salmonid survival and growth (Ainslie et al. 1998, Dalbey et al. 1996). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes they show no growth at all (Dalbey et al. 1996).

NMFS' electrofishing guidelines (NMFS 2000c) will be followed in all surveys employing electrofishing equipment. The guidelines require that field crews be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that 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 before electrofishing may begin. Electrofishing is not done in the vicinity of redds or spawning adults. All electrofishing equipment operators are trained by qualified personnel to be familiar with equipment handling, settings, maintenance, and safety. Operators work in pairs to increase both the number of fish that may be seen and the ability to identify individual fish without having to net them. Working in pairs also allows the researcher to net fish before they are subjected to 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 and water conductivity will be tested at the start of every electrofishing session so those minimal levels can be determined. When such low settings are used, shocked fish normally revive instantaneously. Fish requiring revivification 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 or rafts. 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 researchers' ability to minimize impacts on fish. That is, in areas of lower visibility it can be 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. And in any case, all researchers intending to use boat electrofishing will use all 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).

Tagging/marking

Techniques such as PIT-tagging (passive integrated transponder tagging), coded wire tagging, fin-clipping, and the use of radio transmitters are common to many scientific research efforts using listed species. All sampling, handling, and tagging procedures have an inherent potential to stress, injure, or even kill the marked fish. This section discusses each of the marking processes and its associated risks.

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 engaged in such activities will follow the conditions listed in the Description of the Proposed Actions section (as well as any permit-specific terms and conditions) to ensure that the operations take place in the safest possible manner. In general, the tagging operations will take place where there is cold water of high quality, a carefully controlled environment for administering anesthesia, sanitary conditions, quality control checking, and a carefully regulated holding environment where the fish can be allowed to recover from the operation.

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 juvenile fall chinook salmon 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.

Another 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 (Nielsen, 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.

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 conditions given on page 6 of this Opinion, 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% recovery rate (Stolte 1973). Recovery rates for steelhead were 60% when the adipose fin was clipped and 52% 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.

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, determining effect is a very straightforward process: 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 their 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

Permit 1156

Permit 1156 would allow the Dynamac Corporation (acting as an agent of the EPA) to annually capture, handle, and release juvenile and adult MCR steelhead during the course of research designed to gather water quality information and help enforce Clean Water Act standards. The research would take place primarily in various parts of the Little Klickitat and Yakima Rivers in Washington and the John Day and Deschutes Rivers in Oregon. The fish would be captured using backpack-and raft mount electrofishing equipment. The juveniles would be measured and examined, allowed to recover, and returned immediately to the river. If any adult fish are shocked, the electrofishing equipment would be turned off, and the would be allowed to swim away. It should be noted that for the purposes of delineating take, electrofishing is considered "handling" because it has a larger effect than simply observing/harassing the fish. Nonetheless, in this instance, none of the adult fish would actually be handled by humans. It is important to

note that in this and all other instances where unintentional mortalities are displayed, the number of dead fish is a part of the overall take request. Thus, for example, in the first line of the table below, the EPA is asking to take 35 juvenile MCR steelhead; the one fish that may die as a result of that action comes *out of* that total. It is not added to it.

The researchers are requesting the following levels of take:

Table 1. Requested MCR Steelhead Take by Life Stage and Activity for Permit 1156.

ESU/Species	Life Stage	Take Activity	Requested Take	Unintentional Mortality
MCR Steelhead	Juvenile	C/H/R	35	1
MCR Steelhead	Adult	C/H/R	12	0

(C=Capture, H=Handle, R=Release.).

The effect of the loss of on juvenile MCR steelhead is as close to zero as it is possible to get. There is simply no way to discern what negative effect the handling or the death of that one juvenile would have on a local population level, let alone on the ESU level.

Though the negative effects of the research are almost zero, the researchers will take the following steps to reduce them even further: (1) consulting with local district biologists to minimize the possibility of even encountering listed fish, (2) training the electrofishing crews for two weeks, (3), using a very low pulse rate on the equipment to minimize harm to adult fish, (4) keeping holding and handling time to a minimum, and (5) not using chemicals to sedate fish. Given these measures, the already stated Permit Conditions (page 4), and the need for Clean Water Act enforcement and baseline water quality information this study fulfills, the small loss of fish to be incurred is discountable.

Permit 1291—Modification 2

Permit 1291 would allow the USGS to increase the number of juvenile MCR steelhead they annually capture, handle, and tag. The fish would be collected out of the juvenile bypass systems at the John Day Dam and diverted into a monitoring facility. Smolt Monitoring Program (SMP) personnel will anesthetize them and transfer them to a sorting trough. At the trough, SMP and USGS personnel will identify fish by species and rearing type (clipped or unclipped), enumerate them, and move them to a holding tank for recovery. Some fish will be set aside as research fish to be radio-tagged. All remaining fish will be held in a recovery tank following standard SMP procedures. Once recovered, all fish will be released back into the river through the juvenile bypass system. As stated above, the preferred site for collection of all target species

is John Day Dam. However, as in years past, it may be difficult to obtain all the needed fish from the daily SMP sample, therefore additional fish may need to be collected at McNary and/or Bonneville dams.

The fish to be tagged would be anesthetized in a 20 L bucket using a buffered solution of 70 mg/L MS-222 with an artificial slime restorer solution. In general, the daily SMP sample is sorted and fish are set aside for the pre-tag holding period of 12-48 hours before the transmitters are implanted. This holding period allows time for gut evacuation, which allows the fish to better tolerate the implantation procedures. The radio tags would be surgically or gastrically implanted—depending on conditions. The determination of which implantation procedure will be used is based on a variety of factors. If study fish are to be evaluated for a short period and the numbers of fish to be tagged are high, gastric implantation would be used. If the fish will be monitored for longer periods and/or the number of fish to be released is smaller, the transmitters may be implanted surgically. Fish condition and water temperature would also play a role in the decision.

In either case, the fish would be treated with great care under sterile conditions. After implantation the fish would be placed into a 20 L bucket containing oxygenated water for recovery. When fish recover equilibrium (<5 min) they are transferred via the 20 L bucket to a 125 L holding container. These containers are perforated to allow for water circulation and are held within a large metal tank along with other containers of fish. Approximately 24 hours after tagging is complete, each perforated container would be moved to a release site downstream from the dam. Fish condition would be monitored continuously during transport.

In all, the USGS is asking to increase their allotted take by 627 juvenile MCR steelhead—18 of these fish would may be killed as an unintended result of the research. This means that they would take (but not permanently harm) an additional 0.17% of the expected outmigration and kill an additional 0.005%.

Again, the context for effect here is the number of fish expected to die. This is because the fish that are merely captured are unlikely to suffer any lasting ill-effects. Moreover, most of those fish are being captured under another research program covering the activities of the SMP; thus, many of the mortalities ascribed here to Permit 1291 are actually analyzed under another consultation. Nonetheless, they are grouped together here with the fish expected to die as a result of the tagging operation. In that way, it is certain that the mortality numbers are an overestimate (probably more than double) of what effect this permit will add to an already established program. But even given that overestimate, the numbers are so small that it cannot be determined what overall negative effect the mortalities would have on the MCR steelhead ESU.

Though the negative effects are negligible, the USGS will work to reduce them even further. Much of what they intend by way of mitigation is described above. Nonetheless, it is worth noting that the USGS personnel will handle the fish only when necessary; complete the anesthetization and implantation as quickly and safely as possible (with fish condition as the highest priority); use an artificial slime restorer and a buffer when during the anesthetization process; administer antibiotics intra-peritoneally; and disinfect all surgical instruments; modify the implantation technique to the size and condition of the fish to minimize the stress associated with tagging; net fish only when necessary and only with sanctuary nets; and provide oxygen and high-flow water in to help the fish recover from the tagging procedures. Given these measures, the permit conditions listed on page 4, and the critical nature of the information being gathered with respect to fish behavior and survival, the negative effects of the research can be discounted.

Permit 1335 - modification 2

Modification 2 to Permit 1335 would authorize the USFS to increase the number of MCR steelhead captured, handled, and released by up to 500 juveniles, 15 of which may be killed as an unintended result of the research. The sampling activities will take place in randomly-selected stream systems throughout the range of the ESU in Oregon. Therefore, the context for determining effect is the ESUs expected outmigration (approximately 370,000) minus those fish that enter the Columbia River Above McNary Dam (69,433)(Ferguson 2003). This is only an approximation, but it means that, at most, the research would kill an additional 0.005% of the (mostly) Oregon-origin outmigrating smolts and 0.004% of the ESU as a whole. This small amount of loss is entirely negligible in terms of its impact on either the local juvenile populations or the ESU's status. Even so, the researchers will try to reduce that impact even further. They will not do any electrofishing in areas with salmonid eggs or alevin, they will avoid all adult salmonids, and they will coordinate with state fish and game agencies whenever possible to avoid duplicate sampling. Given these measures, the small numbers of take, the already stated Permit Conditions, and the need to monitor Federal land use actions and their effects on aquatic habitats, the negative effects of the research may be entirely discounted.

Permit 1382—Modification 1

Under this modification, the USGS would expand their research program by capturing, handling, and releasing 150 MCR steelhead Juveniles in the Umatilla River, Oregon. As many as six of these fish may be killed during the course of this research. The researchers would use canoe-mounted electrofishing equipment to capture the fish. Because the research does not target MCR steelhead, the captured fish would simply be identified, counted, allowed to recover for a brief period, and then released back into the River.

It is not known how many young MCR steelhead the Umatilla River subbasin produces every year. But the context for determining the effect is the 300,000+ juvenile MCR steelhead expected to reach the Columbia River above below McNary Dam (Ferguson 2003). If the Umatilla River produces even one-quarter of those fish, the loss of six juveniles from the system would thus represent, at most, 0.01% of that portion of the outmigration. Thus the negative effect of losing seven juvenile MCR steelhead is negligible at the subbasin scale and it is even less discernible at the ESU scale.

Though the negative effect that would be generated by the research is essentially negligible, the USGS researchers will work to reduce it even further. The electrofishing units will be kept at the lowest possible setting, the fish will be handled as little as possible, fish densities will be kept low in the work troughs and handling tanks, and anesthetic levels will be carefully monitored.

Permit 1403

Permit 1403 would allow the NWFSC to annually capture, anesthetize, measure, release, and lethally take MCR steelhead during the course of research designed to evaluate the effects of marine-derived nutrients on salmonid populations in several locations throughout Oregon and Idaho. In this instance, the research will be conducted in the John Day River subbasin in Oregon. Most of the fish will be captured using seines, baited minnow traps, and dipnets, though electrofishing may be used in some instances. The sacrificed fish will be sampled for a dorsal muscle plug that will be used in determining (by stable isotope analysis) the degree to which the fish are affected by the various nutrient enrichment methods being tried. That is, the researchers will use the tissue samples to determine the most effective way of getting the fish the nutrients they need to survive their early life stages. (The samples will also be examined for the presence of whirling disease.)

The amounts of take being requested are displayed in the following table:

Table 2. Requested Take by Life Stage and Activity for Permit 1403.

ESU/Species	Life Stage	Take Activity	Requested Take	Unintentional Mortality
MCR Steelhead	Juvenile	C/H/R	350	10
MCR Steelhead	Juvenile	LT	200	N/A

(C=Capture, H=Handle, T=Tag, R=Release, LT=Lethal Take)

It is not known how many juvenile fish the John Day River produces, but the context for determining effect here is the 228,000+ fish expected to enter the Columbia River between

McNary and John Day Dams (Ferguson 2003). If the John Day River produces even half that number (and it is certainly a great deal more than half), then the loss of 210 juvenile MCR steelhead would represent 0.18% of the population. This is barely discernable at the population level and entirely negligible at the ESU level (0.06%). Moreover, in actuality take numbers are not likely to remain even that high. If the researchers are able to gather the information they need by simply taking fin clips from the captured fish (which they determine in the first season), the mortality numbers will drop markedly. In addition, the research is designed to evaluate the importance of marine-derived nutrients in upriver areas. That information will eventually be used to help rebuild local stocks by adding nutrients where they are needed. Such fertilization has the potential to substantially increase salmonid survival during the early life stages. At this (beginning) point it is necessary to sacrifice the fish to determine the relationship between the marine-derived nutrients and fish size and population dynamics. Considering the great potential for stream fertilization to help recover listed salmonid species, the small initial losses generated by this research are discountable.

Permit 1410

Permit 1410 would allow the NWFSC to annually lethally take one juvenile MCR steelhead during a series of trawls in the nearshore environment off the mouth of the Columbia River. No adults would be captured. Because the research will take place in the Columbia River plume, it is impossible to state from which part of the ESU that one juvenile will originate. Therefore, the context for effect is the entire 370,000+ juveniles expected to outmigrate (Ferguson 2003) and that means that the research would kill, at most, 0.0003% of the outmigration. This is as close to zero effect as it is possible to get and the loss is therefore negligible. This is especially true when one considers the fact that a great deal of information will be taken gathered during the research and used (eventually) to develop a set of hydropower management scenarios to benefit juvenile salmonid survival, growth, and health.

Permit 1421

Permit 1421 would allow the USFWS to annually capture, handle, and release 15 juvenile and six adult MCR steelhead during research conducted at Franz Lake, Washington. The researchers would use boat-and backpack electrofishing gear, some fyke nets and some baited minnow traps to capture the fish. The adult fish would not actually be physically handled. If they are encountered during the electrofishing operations, the equipment would immediately be shut off and the adults allowed to escape. The juveniles would be anesthetized, marked with a florescent dye, sampled for stomach contents by gastric lavage, allowed to recover, and released. None of the captured adults fish are expected to die as a result of the research; one of the juveniles may be killed as an unintended result of the research.

Because none of the adult fish would be killed (and it is entirely possible that not even those numbers will be taken), it is not expected that the research will have anything more than a very temporary negative effect on the adult fish. On the ESU scale, the capture of these fish cannot be differentiated from no effect at all. The same is nearly true of the juvenile fish. At most, the research would kill 0.0003% of the outmigration—and it is more likely that none at all would be killed. It is therefore impossible to determine what negative effect this will have on the ESU. Given this, and the fact that the research would generate important information about the use of certain pesticides in areas where anadromous fish are present, the possible negative effect of the research is negligible.

Permit 1422

Permit 1422 would allow the USFS to annually capture, handle, and release juvenile MCR steelhead in the Yakima River subbasin. The researchers would use hook-and-line angling, minnow traps, and some backpack electrofishing where the other methods would not work. The researchers will operate in different areas for year to year—based on the needs of differing forest management activities. The researchers are asking to take capture, handle, and release up to 320 juvenile MCR steelhead per year. As many as four of those fish may die as an unintended result of the research. The context for determining effect in this case is the 69,433 juvenile MCR steelhead expected to enter the Columbia River above McNary dam (Ferguson 2003). If the Yakima River produces two-thirds of those fish (and it is almost certainly more than that because the Walla Walla system produces far fewer fish than the Yakima), then the four dead juveniles would represent a loss of 0.009% of that population. This effect is therefore negligible at the population level and is certainly even more so at the ESU level.

But whatever that (minimal) effect is, the USFS will work to reduce it even further. They will use barbless, baitless hooks in the hook-and-line sampling, will check the minnow traps daily, and will only use electroshocking as a last resort and only on the lowest possible settings. The fish will handled as little as possible and released as soon as possible. Given these efforts, the small number of fish likely to be killed, and the fact that forest managers need the information the research will generate, the negative effects of the surveys are discountable.

Permit 1426

Permit 1426 would allow the BPA (and their agents, the Yakama Nation) to annually capture, measure, and radio-tag adult MCR steelhead at a facility at Roza Dam on the Yakima River. They will only tag fish judged to be in good condition. The fish would be captured at the facility, anesthetized, measured, tagged, observed for a period of a few hours—during which

they would be allowed to recover from the procedure—and released back into the river. Their movements in the upper Yakima River would then be tracked with fixed-position and mobile telemetry equipment. The researchers would capture and tag as many as 100 adult MCR steelhead each year; five of those fish may die as an unintended result of the research.

The context for determining effect in this instance is the number of adult MCR steelhead returning to the Yakima River. The 5-year geometric mean for those returns (1997-2001) is 901. But recent returns have exceeded 4,000 (NMFS 2003) This means that the research would kill between 0.5% and 0.1% of that population, though the number is probably even less than the lower of those figures for two reasons: First, the research may well not continue for the full five years, so the effect would quickly be attenuated if the take is halted. Second, the return numbers have steadily been increasing for the last four years (NMFS 2003), and while there are no current return numbers for the 2002 returns, that number is likely higher than the 4,000 figure for 2001. But even if the research were to kill a full 0.5% of the return, it is difficult to see what long-term negative effect that would have on the population—let alone ESU as a whole (which has produced—in only four of the ESU's possible production areas—a 5-year geometric mean (1997-2001) a minimum of over 10,000 fish, and recent averages are more than double that figure (NMFS 2003). Therefore, on the ESU scale, the loss of these fish would represent something certainly less than 0.05% of the total returns. Given the magnitude of this loss and the fact that the data gathered during the research will be used to develop plans for hatchery supplementation and passage improvements and protect and enhance mainstem and tributary habitat, the loss is entirely discountable.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions not involving Federal activities that are reasonably certain to occur within the action area subject to this consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act.

State, tribal and local government actions will likely be in the form of legislation, administrative rules or policy initiatives. Government and private actions may encompass changes in land and water uses—including ownership and intensity—any of which could impact 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 speculative. For more information on the various efforts being made at the local, tribal, state, and national levels to conserve MCR steelhead and other listed species, please see NMFS (2002a).

Non-Federal actions are likely to continue affecting listed species. The cumulative effects in the action area are difficult to analyze because of the Opinion's large geographic scope, the different resource authorities 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 the baseline, the adverse cumulative effects are likely to increase. Although state, tribal and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive way before NMFS can consider them "reasonably foreseeable" in its analysis of cumulative effects.

Integration and Synthesis of Effect

The vast majority (approximately 97%) of the MCR fish that will be captured, handled, observed, etc., during the course of the proposed research (out of a total of 1997 juvenile fish and 107 adults) are expected to survive with no long-term effects. (Though 200 juveniles will be sacrificed under Permit 1403.) Moreover, most capture, handling, and holding methods will be minimally intrusive and of short duration. Because so many of the captured fish are expected to survive the research actions and so few (a maximum of 0.6%) of the total MCR steelhead outmigration will be affected in even the slightest way, it is likely that long term no adverse effects will result from these actions at either the population or the ESU level. Therefore, adverse effect must be expressed in terms of the individual fish that may be killed during the various permitted activities. The following table summarizes these effects for each permit.

Table 3. Requested Take of Threatened MCR Steelhead

	Adult				Juvenile			
Permit	HANDLE		MORTALITY		HANDLE		MORTALITY	
Action	C,H,R	C, T/M, S, CT, R	INTENTIONAL	UNINTENTIONAL*	C,H,R	C, T/M, S, CT, R	INTENTIONAL	UNINTENTIONAL*
1156	12	0	0	0	35	0	0	1
1291	0	0	0	0	0	627	0	18
1335	0	0	0	0	500	0	0	15
1382	0	0	0	0	150	0	0	6
1403	0	0	0	0	350	0	200	10
1410	0	0	0	0	0	0	1	0
1421	6	0	0	0	15	0	0	1
1422	0	0	0	0	320	0	0	4
1426	0	100	0	5	0	0	0	0
TOTALS	18	100	0	5	1,370	627	201	55

Key: C,H,R = Capture, Handle, Release; C, T/M, CT,S, R = Capture, Tag/mark, Capture for Transport, Sample, Release.
*Remember, the unintentional mortalities come *out of* the total requested for the C, H, T/M, S, CT, and R activities.

Adults

The argument stated above for Permit 1426 holds true here as well. The total loss of five adult MCR steelhead represents some fraction far below five fish out of 10,000+—the total figure for the recent 5-year geometric means for adult returns in four of the ESU's biggest producing river systems (i.e., it is far less than 0.05%). There are two reasons for this. The first is, of course, that the 10,000 number doesn't take into account the rest of the steelhead-producing rivers in the ESU, and therefore the number is certainly a good deal larger than 10,000. Second, the recent 5-year geometric means for returns do not take into account the returns for the year 2002 and, as stated previously, recent returns in the four systems accounted for here are more than double the figures for the geometric means. Therefore, even though 0.05% mortality would have a negligible effect on the ESU, the probability is that that percentage is in fact a good deal smaller. In any case, the loss of five fish out of well more than 10,000 is discountable in terms of its adverse effect on the ESU as a whole.

Juveniles

If the total amount of estimated lethal take (juveniles) for all research activities—256 juvenile MCR steelhead—is expressed as a fraction of the 370,000+ fish expected to reach The Dalles Dam, it represents a loss of 0.07% of the run. However, and for a number of reasons, that percentage is in actuality probably much smaller. First, as stated earlier in the Opinion, there are no reliable estimates for the number of MCR steelhead produced in the tributaries between The Dalles and Bonneville Dams. Therefore, the anticipated outmigration of MCR steelhead is some number larger than the 370,000 fish expected to arrive at The Dalles Dam. It is impossible to say how much bigger that number would be if we had reliable figures for the Klickitat and Little White Salmon Rivers and Fifteenmile and Mosier Creeks and other, smaller tributaries between The Dalles and Bonneville Dams, but it is certain that using the 370,000 figure to represent the entire MCR steelhead outmigration is a very conservative estimate (see individual permits for rough estimates of outmigrations from these lower tributaries). Second, that outmigration figure is based on three-year old return numbers and, as stated earlier, returns have been steadily on the rise over the last few years and it is therefore entirely probably that the outmigration will in fact be much larger than the estimate used here. Third, it is important to remember that almost every estimate of lethal take for the proposed studies has purposefully been inflated to account for potential accidental deaths and it is therefore very likely that fewer than 256 juveniles will be killed by the research. Fourth, some of the studies will specifically affect steelhead in the smolt stage, but others will not. These latter studies are described as affecting "juveniles," which means they may affect steelhead yearlings, parr, or even fry: life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more. Therefore the 0.05% figure was derived by (a) underestimating the actual number of outmigrating MCR steelhead smolts, (b) overestimating the number of fish likely to be killed, and (c) treating each dead MCR steelhead as a smolt when some of them clearly won't be. Thus the actual number of juvenile MCR steelhead the research is likely to kill is undoubtedly smaller than 0.05% of the outmigration—perhaps as little as half (or less) of that figure.

But even if the entire 0.05% of the juvenile MCR steelhead population were killed, and they were *all* treated as smolts, it would be very difficult to translate that number into an actual effect on the species. Even if the subject were one adult killed out of a population of two thousand (0.05% is another way of expressing the fraction "one two-thousandth"), it would be hard to resolve an adverse effect. And in this instance, that effect is even smaller because the loss of a smolt is not equivalent to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults. In the case of Deschutes River summer steelhead (part of the MCR steelhead ESU), only 1-12% of the outmigrating smolts survived to return as adults between 1976 and 1994 (and in most years, the number was near the lower end of that range) (ODFW and WDFW 1998). This indicates that (conservatively) something near 90% of the smolts leaving the Deschutes River do not survive to return as adults. If this number holds even approximately true for the ESU as a whole, it means that some 90% of the 0.05% figure would likely be killed during the natural course of events.

Therefore the research, even in the worst possible scenario, would kill likely the (maximum) equivalent of one adult out of twenty thousand—a negligible adverse effect on the ESU.

Nonetheless, regardless of its magnitude, the negative effect associated with the proposed permits (in terms of both juvenile and adult losses) must be juxtaposed with the benefits to be derived from the research (see descriptions of the individual permits). Those benefits range from helping determine better ways to manage the Columbia River for the benefit of the migrating fish (Permit 1410) to helping modify dam operations to improve passage survival (Permit 1291). In all, the fish will derive some benefit from every permit considered in this Opinion. The amount of benefit will vary, but in some cases it may be significant. Therefore, in deciding whether to issue the permits considered here, NMFS must compare the tangible benefits they will produce (some of which are potentially significant) with the negligible adverse effects they will cause. However, for the purposes of ESA section 7(a)(2), NMFS must consider the proposed actions' adverse effects when deciding whether the contemplated actions will appreciably reduce the likelihood of the MCR steelhead's survival and recovery—the critical determination in issuing any biological opinion.

Conclusions

After reviewing the current status of the threatened MCR steelhead, 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 issuing the proposed permits is not likely to jeopardize the continued existence of threatened MCR steelhead.

Coordination with the National Ocean Service

None of the activities contemplated in this Biological Opinion will be conducted in or near a National Marine Sanctuary. Therefore, these activities will not have an adverse effect on any National Marine Sanctuary.

Conservation Recommendations

Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on 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 listed fish species—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 Listed species.

Reinitiation of Consultation

Consultation must be reinitiated if: The amount or extent of the specified annual take is exceeded or is expected to be exceeded; new information reveals effects of the actions that may affect the listed species in a way not previously considered; a specific action is modified in a way that causes an effect on the 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. EFH has been designated for Pacific salmon, groundfish, and coastal pelagic species. For information on EFH for these species, please see this website: http://www.nwr.noaa.gov/1habcon/habweb/msa.htm.

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 affect EFH—in this case, EFH for Pacific salmon, groundfish, and coastal pelagic species. 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 of 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 recommendation.

However, in this instance, no conservation recommendations are necessary. As the Biological Opinion above describes, the proposed research actions are not likely, singly or in combination, to adversely affect the habitat upon which Pacific salmon, groundfish, and coastal pelagic species, depend. All the actions are of limited duration, minimally intrusive, and are entirely discountable in terms of their effects, short-or long-term, on any habitat parameter important to the fish.

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