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

March 1, 1995

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324 25th Street
Ogden, Utah 84401-2301

Mr. John Lowe, Regional Forester
U.S. Forest Service, Region 6
P.O. Box 3623
Portland, Oregon 97208

Mr. David Jolly, Regional Forester
U. S. Forest Service, Region 1
P.O. Box 7669
Missoula, Montana 59807

Re: Endangered Species Act Section 7 Biological Opinion on the Land and Resource Management Plans for the Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests

Dear Messrs. Bosworth, Lowe, and Jolly:

Enclosed is the biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) on eight existing "Land and Resource Management Plans" (LRMPs). NMFS finds that forest activities consistent with the LRMPs may result in both immediate, localized project effects and longer-term, broader effects to the listed salmon. NMFS concludes in this Opinion that the importance of an LRMP to listed Snake River salmon depend on the degree to which its development potential is realized through site-specific activities. If National Forest managers maximize site-specific development of forest

resources permissible under existing LRMPs, NMFS would conclude that the actions realized under an LRMP are likely to jeopardize the listed species and adversely modify their critical habitat.

NMFS is concerned that in many respects the existing LRMPs currently do not forbid site-specific activities likely to adversely affect the listed species. For this reason, NMFS believes that the U.S. Forest Service (USFS) would be better able to ensure that the standards of ESA section 7(a)(2) are satisfied at the project level by making sure that the anticipated LRMP amendments reflect the biological requirements of listed salmon. This Opinion includes suggestions for addressing the long-term needs of Snake River salmon in the geographically-specific environmental impact statements the USFS is already preparing for the Snake River Basin.

NMFS has identified a set of goals, objectives and guidelines that it will apply to watershed and site-specific consultations until the LRMPs are amended. Conformance with the provisions of this Opinion, in combination with implementation of PACFISH, should provide reasonable certainty that site-specific actions will not result in jeopardy to listed salmon or adverse modification of critical habitat.

In order to efficiently complete consultations on the actions contained in the 47 watershed biological assessments previously submitted, it is crucial that NMFS and the USFS work closely together. We are committed to doing so, both in the PACFISH ongoing action screening process and in the process to modify proposed new actions as necessary to comport with this Opinion.

Sincerely,

for

Rolland A. Schmitten
Assistant Administrator
For Fisheries

Enclosure

cc: USFWS, Portland - Michael Spear, Director
BLM, Portland - Elaine Zielinski, State Director
BLM, Boise - Martha G. Hahn, State Director
USFS, Portland - Gordon Haugen, CBFW Director, Portland

Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

Land and Resource Management Plans for the: Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests

Agency: U.S. Department of Agriculture, Forest Service

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: March 1, 1995

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EXECUTIVE SUMMARY

The National Marine Fisheries Service (NMFS) prepared this biological opinion (Opinion) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) as interpreted by the Ninth Circuit Court of Appeals in Pacific River Council v. Thomas, 30 F.3d 1050 (7/7/94). NMFS is considering the U.S. Forest Service's (USFS) eight existing Land and Resource Management Plans (LRMPs) as amended by PACFISH. PACFISH is the USFS and Bureau of Land Management's interim strategy for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California. PACFISH will be in effect until significant amendments to the LRMPs are proposed through geographically specific environmental impact statements (EISs) for ecosystem management. The eight LRMPs encompass all of the designated critical habitat for endangered Snake River sockeye salmon, Snake River spring/summer chinook salmon and Snake River fall chinook salmon that occurs on National Forest system lands.

The LRMPs set forth broad management frameworks for goals, objectives, standards and guidelines, and desired future conditions. LRMPs also establish goals and objectives regarding how many, when, and where goods and services may be produced. PACFISH updated the LRMPs' standards and guidelines for riparian areas.

Federal lands management has allowed activities to occur which have degraded habitat in the National Forests, thereby contributing to the decline of Snake River salmon species. The effects of forest activities conducted within the framework of these LRMPs include effects on listed salmon and designated critical habitat from timber harvest, road construction, grazing, mining, outdoor recreation, small hydropower development, and water conveyance permitting. These actions have reduced physical, biological and chemical connectivity between streams and riparian areas, floodplains, and uplands; increased sediment yields (leading to pool filling and elimination of spawning and rearing habitat); reduced or eliminated large woody debris; reduced or eliminated the vegetative canopy (leading to increased temperature fluctuations); altered peak flow timing; caused

streams to become straighter, wider, and shallower; and have degraded water quality by adding toxic chemicals through mining and pest control. These effects, combined with cumulative effects from activities on nonfederal lands, have contributed to the decline of these salmon species.

Forest managers have broad discretion within the framework of the LRMPs to propose activities with effects ranging from beneficial to adverse. NMFS determined that forest activities consistent with the LRMPs may result in both immediate, localized project effects and longer-term, broader effects (from the aggregation of individual actions) to the listed salmon and critical habitat.

NMFS concludes in this Opinion that the significance to the listed salmon of an LRMP would depend upon the extent to which its development potential is realized through site-specific actions. If the extent to which an LRMP is realized exceeds a threshold of adverse effects, NMFS would conclude that the actions realized under an LRMP are likely to jeopardize the listed species and adversely modify their critical habitat.

NMFS recognizes that the site-specific forest activities will also be subject to subsequent ESA consultation, as the USFS has done since these salmon species were listed. Each site-specific action that the USFS determines "may affect" listed salmon has been, or will be submitted to NMFS for ESA section 7(a)(2) consultation. However, NMFS believes that the USFS would be better able to ensure the standards of ESA section 7(a)(2) are satisfied by amending its LRMPs to reflect the biological requirements of these listed salmon for survival and recovery than to rely exclusively upon site-specific consultations. The USFS is already preparing environmental impact statements to evaluate alternatives for LRMP amendments.

In this Opinion, NMFS has identified a set of objectives and guidelines (see Table 1) that NMFS will apply in consultations on watershed and site-specific actions and which the USFS should consider in developing their EISs that will amend the LRMPs. Adherence to these provisions would give reasonable certainty that ongoing and proposed watershed and site-specific actions would not cause broad-scale or localized effects that would result in jeopardy to listed salmon or adverse modification to their critical habitat.

The NMFS project-specific guidelines build on these components of PACFISH. PACFISH has the following components: riparian goals, riparian management objectives, riparian habitat conservation areas, standards and guidelines, key watersheds, watershed analysis, and watershed restoration.

The NMFS guidelines build on these components by setting the following goals: (1) no degradation of salmon habitats on Federal lands; (2) added protection for watersheds containing the best remaining habitat and the most readily restorable habitats; and (3) reevaluation of land allocations, long-term production of goods and services and similar decisions in the EISs already in preparation by the USFS.

In order to meet these goals, the USFS should ensure that the direct and indirect aggregated effects of activities in watersheds containing the best/restorable habitats have a high probability of avoiding degradation and of restoring these areas. Progress toward achieving this objective would be measured by progress toward maintaining and restoring habitat conditions to meet the objectives and standards described by NMFS and PACFISH.

NMFS' strategy includes the following components, which supplement components of PACFISH:

- ecological goals for Snake River watersheds;
- riparian habitat conservation areas;
- guidelines for identifying Priority Watersheds;
- guidelines for management of Priority Watersheds including changes to the PACFISH riparian management objectives, and guidelines for mining, timber, roads, roadless areas, and restoration;
- Forest-wide guidelines for access to spawning habitats, transport of toxic chemicals, water conveyance management, mining, and fire suppression;
- procedural guidelines for existing watershed biological assessments;
- monitoring and reporting guidelines;
- watershed analysis guidelines;
- supplemental guidelines for Snake River fall chinook salmon;
- supplemental guidelines for Snake River sockeye salmon; and
- long-term considerations for ecosystem management at the landscape and watershed scales.

If the USFS implements the above strategy, then their actions should contribute to achieving the overall goal of assuring that ecological processes that create and sustain designated critical habitat for Snake River salmon are protected and restored to avoid jeopardy to listed species and adverse modification of designated critical habitat.

Table E-1. Guidelines for site-specific actions.

Category	HIGH PRIORITY WATERSHEDS	FOREST-WIDE
RMOs/ RHCAs	1) Additions/revisions to PACFISH RMOs: a) < 20% surface fine sediment (spawning habitat) or < 30% cobble embeddedness (rearing habitat) b) width/depth ratio stratified by channel type c) $ 90% streambank stability. 2) Watershed analysis prior to revising RMOs. 3) Watershed analysis prior to reducing RHCA widths.	(PACFISH standards apply)
Mining	1) Locate new mines outside RHCAs. (Exceptions: *de minimis* risk activities) 2) Watershed analysis prior to approving plans of operation for "likely to adversely affect" actions. (Exceptions: *de minimis* risk activities)	With EPA and States, ensure draft plans of operation for new mines are conditioned so mines will not adversely affect groundwater or surface water quality in a manner that retards RMO attainment or adversely affects salmon.
Timber	1) Watershed analysis prior to harvest, salvage, or thinning in RHCAs; demonstrate action will not retard/prevent attainment of RMOs or adversely affect salmon. (Exceptions: *de minimis* risk activities) 2) (new/proposed sales) If ECA > 15%, watershed analysis prior to actions which would increase ECA. 3) (sold/awarded sales) For "likely to adversely affect" actions, aggregated effects analysis should show action(s) do not retard RMO attainment/do not adversely affect salmon.	(PACFISH standards apply)
Roads	1) (new/proposed roads) If road density > 2 miles/ square mile, reduce road mileage and emphasize road closure, obliteration, and revegetation. 2) (ongoing actions) New roads offset with concomitant road restoration/reductions in mileage. 3) Complete and implement as soon as feasible Road and Transportation Plans required by PACFISH.	(PACFISH standards apply)
Access	(Forest-wide standards apply)	Eliminate or adequately restrict access (including livestock, off-road vehicles, anglers, etc.) to spawning salmon and redds during spawning and incubation periods.
Toxic Chemical Transport	(Forest-wide standards apply)	Minimize risk of toxic fuel spills during transport through RHCAs by using alternative routes and all other possible precautions.
Roadless Areas	1) Ensure actions have # *de minimis* risk of degrading the functions and values of these areas. 2) Provide NMFS for roadless areas: a) maps; (b) pertinent description; c) any road construction plans; and (d) analysis of impacts of the proposed road system on designated critical habitat.	(PACFISH standards apply)
Fire Suppression/ Rehabilitation	(Forest-wide standards apply)	1) Annual briefing for Fire Overhead Teams on ESA requirements for habitat protection. 2) After a fire affecting RHCAs, evaluate implementation of measures in the Fire Situation Analyses, and evaluate effectiveness of rehabilitation efforts. Report to NMFS 15 months after containment.
Restoration	Priority Watershed focus. Short term: 1) develop restoration plans in context of broader-scale plans; 2) implement multi-agency restoration plans; 3) conduct direct restoration of RHCAs/stream channels only if corresponding change made to management actions causing the degradation; and 4) priority to restoration of degraded stream reaches connected to reaches of high quality habitat.	(PACFISH standards apply)

Category	HIGH PRIORITY WATERSHEDS	FOREST-WIDE
Monitoring	(Forest-wide standards apply)	1) With PACFISH monitoring committee conduct and report annually: a) implementation monitoring; b) effectiveness monitoring (focus on Priority Watersheds); c) photo-monitoring; d) begin validation monitoring. 2) Annual report to NMFS on implementation of requirements in this Opinion. 3) Quality control team random spot checks of the implementation of PACFISH and LRMP.

I. BACKGROUND

On July 7, 1994, the U.S. Court of Appeals for the Ninth Circuit determined in Pacific Rivers Council v. Thomas, 30 F.3d 1050 (9th Cir. 1994) that Land and Resource Management Plans (LRMPs), adopted by the U.S. Forest Service (USFS) before a species is listed for Endangered Species Act (ESA) purposes, hereafter "existing LRMPs", represent continuing agency "actions" within the meaning of ESA section 7(a)(2). Furthermore, the court determined that existing Land and Resource Management Plans (LRMPs) "may affect" listed species and therefore the USFS must consult with the National Marine Fisheries Service (NMFS) on LRMPs themselves pursuant to section 7 of the ESA in addition to any consultations the USFS may request concerning site-specific, ground disturbing forest activities.

Also, in February, 1995, the United States petitioned the U.S. Supreme Court to grant certiorari and review the Ninth Circuit's decision in Pacific Rivers Council v. Thomas, supra.

On August 3, 1994, in response to the decision by the Court of Appeals, the USFS sent to NMFS two biological assessments (Bas) with cover letters requesting formal consultation on LRMPs for the Umatilla and Wallowa-Whitman NFs. Both BAs concluded that the LRMPs "may affect" ESA listed salmon and their designated critical habitat.
Also in response to the decision by the Court of Appeals, on September 12, 1994, the USFS sent to NMFS BAs and accompanying cover letters requesting formal consultation on the LRMPs for the Boise, Challis, Nez Perce, Payette, Salmon, and Sawtooth NFs. The Boise, Nez Perce, Payette, and Sawtooth NFs concluded that implementation of their LRMPs "may affect" Snake River spring/summer chinook salmon, Snake River fall chinook salmon, and Snake River sockeye salmon.

Prior to these consultation requests and the Court of Appeals decision, on March 6, 1992, the USFS Northern, Intermountain, and Pacific Northwest Regions signed an Interagency Agreement with the NMFS. The goals of this agreement were to (1) further the purposes of the ESA by managing habitat for the conservation of endangered and threatened anadromous fish species listed pursuant to section 4 of the ESA; (2) contribute to the conservation of wild and naturally reproducing stocks of endemic salmonid fishes in the Snake

River Basin by removing threats of further habitat degradation and by providing habitat suitable for perpetuation of these species on National Forest lands); (3) promote recognition of the significance of these salmon stocks; (4) effectively implement LRMPs in a manner consistent with the ESA and the USFS Columbia River Basin Anadromous Fish Habitat Management Policy and Implementation Guidelines; and (5) facilitate implementation of conservation strategies that would reduce the time needed to coordinate and implement steps necessary for conserving these listed fish and their critical habitats.

In a September 28, 1992, letter (from John Lowe, USFS, to Rolland Schmitten, NMFS) the USFS asked whether NMFS wished to enter into informal consultation on the existing LRMPs and accompanying Final Environmental Impact Statements (EISs) for the Umatilla and Wallowa-Whitman Nfs. Responding on December 8, 1992 (Rolland Schmitten to John Lowe), NMFS advised the USFS that: (1) "the action agency normally has the knowledge and responsibility to determine whether a proposed action may affect a listed species or critical habitat"; and (2) "informal consultation on these LRMPs would not be constructive or necessary under the ESA at this time." The NMFS' letter continues: "The appropriate time for us to consult on LRMPs may be during the development of conservation strategies" (pursuant to the March 6, 1992, Interagency Agreement) "and on their consequential amendments to the LRMPs." Based on the terms of the Interagency Agreement, the "... development of conservation strategies should be well under way by mid-1993." Until the conservation strategies were developed, NMFS and the USFS agreed to embark on site-specific and watershed-scale consultations.

Also prior to these consultation requests, the USFS and the United States Department of Interior, Bureau of Land Management (BLM) had initiated both long-term and interim processes to update existing USFS LRMPs and BLM Land Use Plans (LUPs) to better address anadromous fish habitat requirements. On April 1, 1994, the USFS and BLM jointly requested formal consultation on the Draft Environmental Assessment (EA) for "Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California" (PACFISH) (USDA and USDI 1994). PACFISH amends riparian components of USFS LRMPs for the eight National Forests on an interim basis until long-term management approaches are established in the Records of

Decision for two geographically-specific EISs. The USFS and BLM expect that both EISs will have Records of Decision within 18 months of PACFISH implementation. PACFISH will apply for 18 months or until the two EISs are completed. NMFS completed a biological opinion (Opinion) concerning the PACFISH LRMP amendments on January 23, 1995.

The EISs are expected to include coordinated ecosystem management strategies for National Forest System and BLM public lands. The Eastside Ecosystem Management Project in Walla Walla, Washington, will guide the completion of an EIS that encompasses eastern Oregon and Washington. The second EIS, being developed in Boise, Idaho, will address the Upper Columbia River Basin, an area that includes most of Idaho and small portions of Montana, Nevada, Utah, and Wyoming. These combined efforts are referred to as the Interior Columbia Basin Ecosystem Management Project.

The USFS and BLM Notices of Intent (NOIs) to prepare EISs were released on February 1, 1994, and revised on May 23, 1994, for the Oregon/Washington EIS (February 1, 1994, 59 FR 4680 and May 23, 1994, 59 FR 26624) and on December 7, 1994, for the Upper Columbia River Basin EIS (December 7, 1994, 59 FR 63071). The NOIs indicate that, at a minimum, the EISs will: (1) include "direction which will protect and enhance aquatic ecosystems within the range of threatened and endangered anadromous fish through amendments to Forest Plans;" (2) provide guidance to address "forest ecosystem health, rangeland ecosystem health, riparian and aquatic ecosystem health, integration of economic and social considerations, population viability, and the long-term sustainability of threatened, endangered, and sensitive species;" and may (3) "identify changes to the ways current plans are implemented or budgets developed, that can improve capability to achieve ecosystem management objectives." The EISs will amend the current LRMPs but are not planned to replace them.

II. THE CONTINUING ACTION: LAND AND RESOURCE MANAGEMENT DIRECTION

The purpose of this section is to describe the particular action or actions that the action agency proposes to under take in the future. This is NMFS' biological opinion concerning the likely effect of the proposed action (which in this case are new and continuing activities within the

parameters of the existing LRMPs) on the listed species. Through its biological opinion, NMFS advises the action agency as to whether and how it may conform its actions, if necessary, to meet the substantive obligations of ESA section 7(a)(2).

Typically the agencies have conducted consultations concerning LRMPs at the time of LRMP adoption or amendment. In this case, however, consistent with the Court of Appeals opinion, NMFS is considering the existing LRMPs themselves. The Court held:

> The LRMPs are comprehensive management plans governing a multitude of individual projects. Indeed, every individual project planned in both national forests involved in this case is implemented according to the LRMPs. Thus, because the LRMPs have an ongoing and long-lasting effect even after adoption, NMFS hold that the LRMPs represent ongoing agency action.

PRC v. Thomas, 30 F.3d 1050 at 1053. Therefore, this Opinion's objective is to determine whether the continuing application of the management direction provided by these existing LRMPs, as amended by PACFISH, to watershed-level and site-specific project design and implementation, is likely to jeopardize the continued existence of Snake River sockeye salmon (*Oncorhynchus nerka*), Snake River spring/summer chinook salmon (*O. tshawytscha*), or Snake River fall chinook salmon (*O. tshawytscha*), or result in destruction or adverse modification of their designated critical habitat. NMFS approaches this objective with the recognition that the site-specific forest activities will also be subject to subsequent ESA consultation. Each site-specific action that the USFS determines "may affect" listed salmon has been, or will be submitted to NMFS for ESA section 7(a)(2) consultation. A full discussion of NMFS approach to this consultation appears in Section III, below.

As was stated in the United State's Petition for Certiorari, there is a two level system of management for the National Forest System:

> "The first level involves decisions about plan documents. Under the Forest and Rangeland Renewable Resources

Planning Act of 1974, as amended by the National Forest Management Act of 1976, 16 USC 1600 *et seq.*, the Forest Service is required to prepare an LRMP (forest plan) for each unit of the National Forest System. "The forest plan consists of both forest-wide and area specific standards and guidelines that provide for land uses with anticipated resource outputs." 53 Fed.Reg. 26,809(1988). With rare exceptions, the plans do not specify ground-disturbing activities (such as timber-cutting or road-building) that are permitted or required to go forward without further scrutiny. "The emphasis of the plan is not on site-specific decisions or specific resource outputs. Rather, the emphasis is on applying general management practices * * * to achieve multiple-use goals and objectives in the most cost efficient manner." *Id.* at 26,832. The plan establishes proposals (*ibid.*) that can be accomplished from a physical, biological, economic, and legal perspective. [But] [i]t is not certain that these proposals will be accomplished. First, the outputs proposed by the plan are projections or targets. For example, the number of acre-feet of water meeting water quality goals is a target number the forest will strive to attain. Another example is allowable sale quantity of timber. That is the maximum regulated volume of timber that can be sold over the planning period, not necessarily the volume that will be sold.

"Forest plans serve as guides for the forests for ten to fifteen years. 16 USC 1604(f)(5). After plans are adopted, they may be changed by amendment (16 USC 1604(f)(4)) or by revision (16 USC 1604(f)(5)).

"The second level of planning comes when site-specific activities are proposed. This phase requires an "analysis and evaluation of proposed actions" (53 Fed. Reg. 26,834 (1988)) based on "site-specific data" (*id.* at 26,836), not only to determine whether the proposed action is consistent with the forest plan, but also "to ensure compliance with [the National Environmental Policy Act of 1969], and to meet other appropriate laws and regulations" (*ibid.*), including the ESA. Significantly, such evaluations may result "in a decision not to proceed with a proposed project even though the project may be

> permissible under the Forest Plan." Clerk's Record (CR) 37(A)(Wallowa-Whitman Record of Decision) at 28."

Petition for a Writ of Certiorari, p. 3 and 4.

Unless otherwise stated, the information sources in this Opinion are the BAs on the eight LRMPs; Records of Decision (RODs) on the Federal EISs for the eight LRMPs; the Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman NFs LRMPs; the Draft PACFISH EA, Final PACFISH EA/FONSI and references included therein, and the NMFS January 23, 1995, PACFISH Opinion. RODs for each National Forest LRMP were signed on the following dates: (1) Boise NF, April 1990; (2) Challis NF, June 1987; (3) Nez Perce NF, October 1987; (4) Payette NF, May 1988; (5) Salmon NF, January 1988; (6) Sawtooth NF, September 1987; (7) Umatilla NF, June 1990; and (8) the Wallowa-Whitman NF, April 1990. All proposed land and resource management direction addressed in this consultation is contained in these eight LRMPs.

The USFS has expressed that the LRMPs' duration is to be for 10 to 15 years from the dates the RODs were signed, suggesting that new plans will be developed between 1997 and 2005. However, the plans are adjustable through monitoring, amendment, and revision. NMFS is also taking into consideration that the USFS has initiated a process for significant amendment to these eight LRMPs based upon information and analysis prepared for the Eastside Ecosystem Management Project and its associated EIS and for Upper Columbia River Basin EIS.

Based upon NMFS' review of the existing LRMPs and their role in forest management, it is NMFS' opinion that the LRMPs establish broad management direction in two areas: First, as stated above, LRMP management direction is established through desired future conditions, goals, objectives, and standards and guidelines. Standards and guidelines are mandatory and must be applied at the project scale, unless explicitly exempted. Standards and guidelines provide the sideboards for reaching the broad goals, objectives, and desired future conditions established in the LRMPs. Second, LRMPs establish goals and objectives regarding how many, when, and where goods and services will be produced. This second area of management direction is commonly referred to as the allocation of forest-wide resources, forest output projections or projected production of goods and services. Each National Forest's LRMP

addresses a wide array of management direction (see Appendix A). Land and resource management direction established by the LRMPs, and analyzed in this Opinion, address: (1) fish habitat and water quality, (2) road building, (3) timber outputs, (4) mineral outputs, (5) range outputs, (6) land and water classification, (7) recreation outputs, (8) other managed animals, and (9) monitoring.

In addition to management direction for the above-listed categories, LRMPs also establish management direction for several other resource categories. These include management of air quality, cultural resources, visual quality, research natural areas, wilderness areas, designated roadless areas, special areas (historic sites, monuments, etc.), and watersheds designated as domestic water supplies. The direction for some of these resource categories (e.g. air quality, visual quality and cultural resources) does not affect listed salmon or critical habitat. Other direction (e.g. implementation of wilderness, roadless, and research natural area management plans) is compatible with their survival and recovery and is considered not likely to adversely affect listed Snake River salmon or their critical habitat.

The BAs submitted by each of the eight National Forests provide an overview of management directions, but collectively provide inconsistent detail and discussion of land and resource management direction and its potential effects across the National Forests. For example, all the LRMPs provide management direction for several resource categories in the form of desired future conditions, goals, objectives, standards and guidelines, and management goals for fish. However, some BAs did not address some of these management direction categories at all. Table 1 summarizes which management categories were addressed in which BAs.

Table 1. Summary of continuing actions described in the LRMP biological assessments. Cells without entries indicate that a continuing action was not addressed in the Forest-specific biological assessment.

PROPOSED LAND AND RESOURCE MANAGEMENT DIRECTION	BOISE	CHALLIS	NEZ PERCE	PAYETTE	SALMON	SAWTOOTH	WALLOWA - WHITMAN	UMATILLA
Forest Management Goals for Fish				X		X		
Resource-specific DFCs[1]	X	X	X		X	X	X	X
Forest Plan Monitoring			X					
Forest Management Objectives	X	X		X	X	X	X	
Standards/Guidelines (Forest-wide)	X			X		X	X	X
Management Goals (Forest-wide)	X	X			X		X	X
Management Direction (Forest-wide)		X			X		X	X
Specific Management Area Direction	X	X			X			

[1] DFC - Desired Future Condition

PACFISH, as described in the Final EA/FONSI, updated the standards and guidelines and objectives applicable to riparian areas in the eight LRMPs. In this Opinion, NMFS evaluated the LRMPs standards and guidelines as amended by PACFISH. PACFISH is a commendable effort by the action agencies to develop an interim approach to addressing concerns for degraded salmon habitat that exists on USFS and BLM lands. By improving protective measures for riparian and aquatic habitats, PACFISH should help reduce adverse effects to listed species and designated critical habitat from future land management actions in many instances, relative to what might have occurred by following the LRMPs' guidance without PACFISH.

Regarding the production of goods and services, the LRMPs address a variety of categories and provide for varying land and resource allocations, as displayed in Table 2. The USFS attempts to achieve average annual production (schedules for these goals are summarized in Table 2) through site-specific actions that are planned within and tiered to the LRMPs.

Timber sales are explicitly described in Activity Schedules appended to each subject LRMP. These Activity Schedules illustrate how goals and objectives, standards and guidelines, and the production of goods and services are intertwined.

Table 2 summarizes projected average annual resource outputs and activity levels over a 10-year period from Activity Schedules appended to each LRMP. These schedules set forth the actions necessary to achieve projected outputs and achieve the production of goods and services for timber and non-timber resource categories during the decade following each LRMP's implementation. The Activity Schedules, organized by calendar year, list specific actions and implementation techniques necessary to accomplish the economically efficient production estimates derived for each analysis area.

Table 2. Land allocations and projected average annual resource outputs and activity levels by National Forest for initial 10-year LRMP planning periods as described in LRMP EIS (Records of Decision, signed 6/87 - 6/90).

CATEGORY OF RESOURCE ALLOCATION	NATIONAL FOREST							
	SAWTOOTH	CHALLIS	SALMON	PAYETTE	WALLOWA-WHITMAN	UMATILLA	BOISE	NEZ PERCE
Subcategory	LRMP	LRMP	LRMP	LRMP	LRMP	LRMP	LRMP	LRMP
Fish								
Habitat Improvement Structures (#/Year)	28	20	ND[1]	ND	ND	ND	40	ND
Habitat Improvement (Acres/Decade)	2	643	240	ND	ND	ND	40	400
Anadromous Fish User Days (Thousands/Year)	47	37	ND	26	92[2]	45	84[2]	ND
Resident Fish User Days (Thousands/Year)	97	166	ND	140	—[2]	117	—[2]	31
Roads								
Collector Road Construction (Miles/Year)	0	0	2	ND	69[3]	33[3]	4[3]	ND
Collector Road Reconstruction (Miles/Year)	8.7	11	6	ND	—[3]	—[3]	—[3]	ND
Timber Road Construction (Miles/Year)	13	4	28	41	180[3]	93[3]	27	83
Timber Road Reconstruction (Miles/Year)	3	1	10	ND	—[3]	—[3]	43	28
Timber								
Allowable Sale Quantity Board Feet (Millions/Year)	11	5	24	81	144	124	85	108
Suitable Acres (Thousands)	99	331	407	432	837	619	656	912
Sawtimber Board Feet (Millions/Year)	9	5	24	83	144	124	85	103
Fuelwood Cubic Feet (Millions/Year)	3	5	7	10	5	3	3	5
Minerals								
Lease Permits (#)	210	149	183	100	354	ND	203	ND
Acres of Potential for Locatable Minerals (Thousands)	764	808	ND	ND	423	ND	741	1476
Acres Open for Locatable Mineral Entry (Thousands)	ND	1728	1374	1380	195	872	1930	698
Acres of Potential for Leasable Minerals (Thousands)	546	321	131	ND	ND	ND	ND	140
Acres Open for Leasable Mineral Entry (Thousands)	ND	1728	1374	ND	ND	ND	ND	110
Range								
Suitable Acres (Thousands)	ND	765	188	539	1300	528	843	314
Animal Unit Months of Use (Thousands/Year)	198	114	55	102	186	58	115	43
Land and Water								
Land Acres to be Acquired (Thousands)	ND	64	68	5	ND	ND	64	ND
Wilderness Acres (Thousands)	488	942	426	982	583	304	250	926
Existing Roadless Acres[4] (Thousands)	ND	1392	830	945	251[5]	281	959	503
Roadless Acres Available for Timber Harvest (Thousands)	ND	ND	606	734	130	86	ND	376
Water at State Quality Standard (Million Acre-Feet)	ND	2.5	1.1	ND	2.7	2.5	3.5	ND
Sediment Accelerated (Thousand Tons/Decade)	7	65[6]	37[6]	ND	229	197	20[7]	49[8]
Fuel Break and Fuel Treatment Acres (Thousands/Year)	ND	0.3	5.6	15.2	22.4	9.2	8.7	4.5
Recreation								
Developed Recreation Visitor Days (Thousands/Year)	1085	124	115	180	399	280	694	162
Undeveloped Recreation Visitor Days (Thousands/Year)	903	379	272	589	796	1194	999	668
Wilderness Use Visitor Days (Thousands/Year)	86	164	102	50	78	115	18	146
Trail Construction and Reconstruction (Miles/Year)	ND	6	2	14	4	30	20	ND

[1] ND - No data or unable to locate due to various formats.
[2] Fish User Days represents anadromous and resident fishing combined.
[3] Road mileage listed includes both construction and reconstruction.
[4] Roadless area acreage is for roadless areas outside of Wilderness Areas.
[5] Does not include Hell's Canyon National Recreation Area.
[6] Expressed in percentage above natural level.
[7] Does not include South Fork Salmon River drainage.
[8] Sediment estimated in tons/square mile/year.

PACFISH is designed to reduce adverse effects from project-specific actions to listed species and their critical habitat. The original LRMPs contain a wide variety of goals, objectives, desired future conditions, and decadal predictions of available goods and services; PACFISH designed to reduce or avoid project-specific adverse effects potentially influenced by these original directions. From this context, NMFS considered the continuing action as LRMP directions revised by the PACFISH requirements. However, in several land management categories, PACFISH may require additional clarity or additional development insure that harmful effects are minimized or avoided. These land management categories include: 1) fish habitat and water quality including Riparian Management Objectives, instream habitat structures, and water conveyances; 2) road management directions, including road building upside of riparian habitat conservation areas, and road maintenance; 3) timber management direction, including silvacultural treatment within RHCAs, logging in RHCAs following catastrophic events, equivalent clear cut areas, and fire suppression; 4) mining direction; 5) grazing direction; 6) land and water classification; and 7) recreation management. An evaluation of the potential influence of these land management categories is considered in Section VII, Effects of the Continuing Action: Land and Resource Management Directions.

III. CONSULTATION APPROACH

A. Relevance of Plan-level Decision making to Site-specific Effects

As discussed in Section II, above, the National Forest System is managed under a two-level system of decision making. In NMFS' view this is a system whereby level-two project decisions are tiered to level-one LRMP decisions. NMFS' consultation approach for application of ESA standards at both levels of decision making mirrors the tiered approach followed by the USFS in its National Environmental Policy Act (NEPA) compliance. Federal NEPA regulations (40 CFR 1502.20 and 1508.28) provide for the tiering of environmental documents. Through the NEPA tiering process, the USFS has connected forest-wide National Forest programmatic LRMPs to site-specific second-tier (level-two) EISs and EAs. Through this tiering process, all management direction, goals, and standards and guidelines contained within the LRMPs are potentially realized in site-specific actions. Thus, plan level consultation may reduce adverse effects at the site-

specific level and increase agency efficiency by considering programmatic issues, identifying common characteristics of site-specific actions and evaluating potentially cumulative effects of numerous site-specific activities at the earliest opportunity.

Each LRMP sets upper limits for resource outputs and activity levels (Table 2). Nonetheless, the total number, intensity, and timing of actions that will actually be implemented under each LRMP cannot be determined at this time. The full potential of a given LRMP may never be realized because individual activities may be scaled back due to site-specific legal, fiscal, environmental, or technical constraints. NMFS finds, however, that to help prevent extinction and promote the recovery of listed salmon, the USFS must consider both the immediate, localized effects of site-specific actions, which are best known when a project is proposed, and the broad aggregated incremental effects to the species and its habitat. This latter factor may be best addressed in a plan-level analysis of the species' biological requirements across its range. In this plan-level opinion, NMFS provides guidelines for avoiding jeopardy actions at the watershed and project scales thus making such subsequent site-specific consultations more efficient.

Given these considerations, there is a broad range of possible aggregate effects on the listed species that would be caused by the site-specific actions that fall within an LRMP. The actual aggregate effect (and cumulative effect) depends upon the extent to which the full development potential of an LRMP is realized. It would be reasonable for NMFS to conclude that the aggregate of site-specific activities is likely to jeopardize the species and adversely modify their critical habitat <u>if</u> the extent to which activities under a particular LRMP exceed a threshold of adverse effect on the species. The best available science may not now allow quantification of that threshold. Nevertheless, NMFS advises the USFS, in this biological opinion, how it may best avoid exceeding that threshold in the course of managing the forests until the existing LRMPs are amended. NMFS defines a set of criteria that it intends to apply in <u>future</u> consultations on site-specific forest activities while the LRMP amendment process runs its course. That set of criteria also provides important guidance for the development of LRMP amendments.

The objective of this LRMP consultation is to evaluate the potential broad-scale effects on the listed species and their critical habitat of potential forest activities that may be

implemented within the scope of the existing LRMPs' direction. Based upon its analysis of these potential effects, NMFS sets forth its guidelines for ongoing and proposed actions contained in the 47 watershed BAs, and other activities that may be proposed, whereby such site-specific actions could be designed and implemented to avoid jeopardy. NMFS also identifies considerations for the two EISs which are in preparation. These EISs should provide the analyses of impacts for an objective comparison of alternative management parameters pertaining to the allocation of forest-wide resources, forest output projections and the production of goods and services. The EISs are critical to the USFS process to amend these eight LRMPs.

Implementation of NMFS' guidelines following the conclusion of this consultation would not eliminate the need to consult on most site-specific actions. However, meeting these guidelines should eliminate or reduce potentially harmful impacts to listed salmon from many actions. Thus, NMFS expects that by providing these guidelines at the plan-level of decisionmaking, watershed and site-specific ESA consultations will be streamlined. For example, the number of formal consultations needed should be reduced. With fewer formal consultations, many site-specific actions should proceed in a more timely and efficient manner, and the USFS effort otherwise expended on formal consultations could be focused instead on implementation and monitoring of actions.

B. Application of ESA Standards to Pacific Salmon

NMFS evaluates the effects of proposed Federal actions on the listed Snake River salmon in this and every section 7 consultation by applying the standards of section 7(a)(2) of the ESA, 16 U.S.C section 1536(a)(2), as interpreted by the NMFS/Fish and Wildlife Service (FWS) joint consultation regulations (50 CFR Part 402). The discretionary continuation of an action is also a proposed action in this context. Using the best scientific and commercial data available, when NMFS issues its biological opinion, it determines whether a proposed Federal action is likely to 1) jeopardize the continued existence of a listed species, or 2) destroy or adversely modify the designated critical habitat of a listed species. See ESA section 7(a)(2).

The consultation regulations define "jeopardize the continued existence of" to mean:

> ...to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 C.F.R. § 402.02).

The regulations also define the statutory term "destruction or adverse modification" of critical habitat to mean:

> . . . a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical. (50 C.F.R. § 402.02)

Additionally, NMFS and FWS have recently issued, for public comment, a document that further describes the application of these standards entitled "Draft Section 7 Endangered Species Consultation Handbook -- Procedures for Conducting Section 7 Consultations and Conferences", 59 Federal Register 65781 (December 21, 1994)(hereafter "the Draft Handbook").

The regulatory terms "survival" and "recovery" are defined by the Draft Handbook for use in the jeopardy/critical habitat analysis as follows:

> **Survival**: the species' persistence, beyond conditions leading to its endangerment, with sufficient resilience to allow recovery. Said another way, survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a species with a sufficiently large population, represented by all age classes, genetic heterogeneity, and a number of sexually mature individuals producing viable offspring, that exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter.

> **Recovery:** improvement in the status of a species and the ecosystems upon which they depend. Said another way, recovery is the process by which species' ecosystems are restored so they it can support self-sustaining and self-regulating populations of listed species as persistent members of native biotic communities.

In implementing these standards for Pacific salmon species NMFS recognizes certain characteristics of Pacific salmon species that require special consideration. The Columbia River Basin, in which the Snake River salmon originate, drains a vast area of the Pacific Northwest; approximately 259,000 square miles in size, the Basin is located in the states of Washington, Oregon, Idaho, and Montana, as well as British Columbia. The life cycle of these listed fish begins in small mountain streams, lakes and rivers (depending on the species) of the Snake River system in Idaho and eastern Oregon and Washington where eggs are deposited and fertilized by spawning adults, incubate within gravel substrates, hatch and subsequently emerge to rear before they begin, as yearlings or subyearlings, their migration down the mainstems of the Snake and Columbia River systems to the Pacific Ocean. There they range from the mouth of the Columbia in all directions; to the north they range at least as far as ocean waters off of Alaska. The listed species grow to adult size in the ocean and then complete their life-cycle by reversing their migration from the ocean, up the Columbia and Snake Rivers to return to their natal habitat to spawn for the next generation.

In each consultation concerning these Snake River salmon NMFS follows the following analysis to apply these ESA standards to these unique characteristics of salmon:

1. Define the biological requirements of the listed species.

To determine whether a proposed or continuing action is likely to jeopardize the continued existence of listed species or adversely modify its habitat, it is first necessary to know what is required for the species' continued existence, which is more specifically expressed by the regulations in terms of the species' survival and recovery. The biological requirements of Snake River salmon may be described in a number of different ways. For example, they can be expressed as a ratio of recruits to spawners, as a survival rate for a given life stage or set of life stages, as a positive

population trend line, or as a threshold population size. Biological requirements may also be described as the environmental conditions necessary to ensure the species' continued existence, expressed in terms of physical, chemical, and biological prerequisites (e.g., for a particular river reach, the prerequisite would include water temperature, velocity, dissolved gas saturation, etc.). The manner in which these requirements are described varies according to the nature of the action under consultation and its likely effects on the species. For example, the consultation on the FCRPS is primarily in terms of individual salmon mortalities whereas a consultation on an action in spawning and rearing habitat may be defined more by changes in environmental conditions.

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

The environmental baseline, to which the effects of the proposed or continuing action would be added, "includes the past and present impacts of all Federal, State, or private activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process." See 50 C.F.R. section 402.02, definition for "effects of the action".

Consistent with this definition, the environmental baseline does not include future discretionary activities within the action area that have not undergone ESA consultation. Thus the current status of the species is described in relation to the risks presented by the continuing effects of all previous actions and resource commitments that are not subject to further exercise of Federal discretion. For a new project, the environmental baseline represents the risks to the species of the pre-project action area. For an ongoing Federal action, it is necessary to evaluate the effects of previous resource commitments separately from the effects that would be caused by that action's future prosecution as proposed.

An initial consideration in identifying the environmental baseline is to delineate the "action area" for the proposed or continuing action. It is the environmental baseline of the action area that the regulations specify for use in the jeopardy determination. The "action area" is defined by the consultation regulations as "all areas to be affected directly

or indirectly by the Federal action and not merely the immediate area involved in the action." 50 CFR § 402.02.

The purpose of considering status of the species under the risks presented by the environmental baseline without the proposed or continuing action is to better understand the relative significance of the action's effects upon the species' likelihoods of survival and recovery when those effects are added to the environmental baseline. The greater the risks faced by the species at the time of consultation the more significant are any additional adverse effects to the listed species caused by the proposed or continuing action.

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

In this step of the analysis, NMFS examines the likely effects of the proposed agency action on the species. The analysis may consider the impact in terms of mortalities inflicted during a particular life stage and that mortality's effect upon the species' population size and variability, or the analysis may consider the impact on species' environmental, such as water temperature, sediment load, total dissolved gas levels, etc. These are the effects that are, or with further authorizations and appropriations could be, within the action agencies' discretion to impose or not, a decision that is influenced by NMFS advice in this biological opinion.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the environmental baseline and any cumulative effects, and considering measures for survival and recovery specific to other life stages.

In this step of the analysis NMFS determines whether the specific action under consultation is likely to jeopardize the continued existence of the listed species. This step has two parts for Pacific salmon species. NMFS must first focus on the action area and add up the effects of the proposed or continuing action, together with those of the environmental baseline and all cumulative effects. NMFS must determine the significance of that aggregate effect upon the particular biological requirements of the listed species in that action area. At this point NMFS considers effects such as, for example, the frequency of mortality to individual members of

the species, or any sublethal effects, caused directly by the action or through the action's adverse modification of environmental conditions important to the species.

The second part of the analysis calls for NMFS to place the effects of the proposed or continuing action in the context of the full salmon life cycle. This comprehensive analysis is necessary to fully evaluate the significance of each action under consultation to the biological requirements of the listed species in all life stages. NMFS looks beyond the particular action area for this analysis to consider measures likely to be necessary in all life stages that, in combination, would insure that the biological requirements of the listed species will be met and thereby insure its continued existence.

At the species level, NMFS considers that the biological requirements for survival, with an adequate potential for recovery, are met when there is a high likelihood that the species' population will remain above critical escapement thresholds over a sufficiently long period of time.

Additionally, the species must have a moderate to high likelihood that its population will achieve its recovery level within an adequate period of time. The particular thresholds, recovery levels and time periods must be selected depending upon the characteristics and circumstances of each salmon species under consultation.

Recovery plans for listed salmon call for measures in each life stage that are based upon the best available scientific information concerning the listed species' biological requirements for survival and recovery. As the statutory goal of the recovery plan is for the species' conservation and survival it necessarily must add these life-stage specific measures together to result in the survival of the species, at least, and in its recovery and delisting at most. For this reason, the Recovery Plan is the best source for measures and requirements necessary in each life stage to meet the biological requirements of the species across its life cycle. This information is currently being developed in a working draft of the Recovery Plan for listed Snake River salmon.

In circumstances faced by these listed Snake River salmon, where their current status, as affected by environmental baseline, is such that there is a low expectation of survival

with an adequate potential for recovery, the proposed or continuing actions must reduce risks to the listed species in the action area to insure that the likelihood of the species' survival and recovery is not appreciably reduced. The amount of risk reduction necessary to determine that the action will not likely jeopardize the listed species will depend upon the current status of the species. Again, the Recovery Plan will be the best evidence of the amount of improvement required in each life stage and the measures likely to accomplish that reduction sufficient to satisfy the requirements of section 7(a)(2).

5. Identify reasonable and prudent alternatives to a proposed or continuing action that is likely to jeopardize the continued existence of the listed species.

If the proposed or continuing action is likely to jeopardize the listed species NMFS must consider potential reasonable and prudent alternatives that would comply with ESA section 7(a)(2). In that case, the Snake River Salmon Recovery Plan, the current draft of which lays out measures "for the conservation and survival of endangered species", ESA section 4(f), is the best source of reasonable and prudent alternatives that the action agency may implement and thereby meet its obligations under ESA section 7(a)(2).

In approaching this particular consultation, NMFS recognizes that land management activities tiered from LRMPs are most readily characterized by their effects on critical habitat than by their quantifiable effects (such as observed mortality) on individual fish. This is especially true at the landscape scale of this consultation. As discussed in more detail in following sections, the evidence demonstrates that Snake River Basin spawning and rearing habitat is significantly degraded and that good habitat is hyper-fragmented across the basin.

The particular focus of this programmatic consultation, therefore, will be to avoid extinction and improve survival by a three-fold strategy: (1) protect the best remaining habitat; (2) restore habitat that is salvageable in the near-term; (3) protect and improve connectivity throughout the network of good and restorable habitat.

IV. LISTED SPECIES AND CRITICAL HABITAT

The three Snake River salmon populations listed as endangered under the ESA occur within the eight National Forests addressed in this Opinion. Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered (November 20, 1991, 56 FR 58619). Snake River spring/summer chinook salmon (*O. tshawytscha*) and Snake River fall chinook salmon (*O. tshawytscha*) were originally listed as threatened (April 22, 1992, 57 FR 14653), but are proposed for reclassification as endangered (interim emergency rule, August 18, 1994, 59 FR 42529 and proposed rule, December 28, 1994, 59 FR 66784).

Critical habitat was designated for Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River fall chinook salmon on December 28, 1993 (58 FR 68543), effective on January 27, 1994. The designation of critical habitat provides notice to Federal agencies and the public that these areas and features are vital to the conservation of listed Snake River salmon.

Snake River sockeye salmon use the mainstem Snake River and mainstem Salmon River as a migration corridor to and from Redfish Lake, Idaho. This species spawns and rears only within the Sawtooth National Recreation Area on the Sawtooth NF. The sockeye salmon migration corridor extends through all other National Forests within the action area, except the Boise and Umatilla NFs. With respect to sockeye salmon, only those actions which could potentially affect sockeye salmon spawning and rearing habitat on the Sawtooth NF and in the Snake and Salmon River migration corridor will be addressed in this Opinion.

Snake River fall chinook salmon do not spawn, rear, or migrate through the Boise, Challis, Salmon, or Sawtooth NFs. They may spawn, rear, and migrate in certain stream reaches on the Payette, Nez Perce, Umatilla, and Wallowa-Whitman NFs.

Snake River spring/summer chinook salmon spawn, rear, and migrate in streams on all eight National Forests covered by this Opinion. The effects of actions addressed in this Opinion will be most noticeable in relation to Snake River spring/summer chinook salmon, since their spawning and rearing habitat is mainly located in upper river reaches and tributaries in which habitat quality and, therefore, spawning

and rearing success, is closely linked to the effects of land management direction and site-specific actions.

Essential Snake River salmon habitat consists of four components: (1) Spawning and juvenile rearing areas, (2) juvenile migration corridors, (3) areas for growth and development to adulthood, and (4) adult migration corridors. Only habitat for salmon growth and development to adulthood is not present within the action area.

Essential features of the spawning and juvenile rearing areas for Snake River sockeye salmon include adequate: (1) Spawning gravel, (2) water quality, (3) water quantity, (4) water temperature, (5) food, (6) riparian vegetation, and (7) access.

Essential features of the spawning and juvenile rearing areas for Snake River spring/summer chinook salmon and Snake River fall chinook salmon include adequate: (1) Spawning gravel, (2) water quality, (3) water quantity, (4) water temperature, (5) cover and shelter, (6) food, (7) riparian vegetation, and (8) space.

Essential features of the juvenile and adult migration corridors for Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River fall chinook salmon include adequate: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover and shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions. Food is an additional essential habitat feature for juveniles of all three listed salmon species.

V. BIOLOGICAL INFORMATION

Each Pacific salmon species is composed of numerous geographically isolated breeding units (stocks). The stock structure of the Pacific salmon is the result of their propensity for returning to their native stream to spawn and their individual adaptations to local environments (Helle 1981). Preserving a species of Pacific salmon means perpetuating the genetic differences caused by individual stock adaption to unique local environments.

In small populations, random processes can lead to two major types of risk: demographic and genetic. Demographic risk is

the risk of extinction due to environmental fluctuations, random events affecting individuals in the population, and possible reductions in reproduction or survival resulting from low population sizes. Genetic risk is the risk of losing genetic variability or population fitness through inbreeding and genetic drift. Both types of risk increase rapidly as population size decreases.

Severe, short-term genetic problems from inbreeding are unlikely unless population size remains very low for a number of years. However, the erosion of genetic variability due to low population size is cumulative; thus, long-term effects on a population (even if it subsequently recovers numerically) are also a concern.

During the course of three sessions during the fall of 1994, a Biological Requirements Work Group (BRWG) composed of scientists and fishery managers representing the Federal agencies and sovereign parties (states and tribes) developed threshold population levels (which were adopted by NMFS) for Snake River spring/summer chinook salmon subpopulations and Snake River fall chinook salmon (BRWG 1994). The BRWG exercised considerable scientific and professional judgment in considering these factors and in defining potential numerical thresholds. The primary threshold level recommended by the BRWG was 150 natural spawners annually (for small, concentrated subpopulations of Snake River spring/summer chinook salmon) or 300 natural spawners annually (for larger, dispersed Snake River spring/summer chinook salmon subpopulations and Snake River fall chinook salmon).

The threshold levels recommended by the BRWG do not represent levels at which the trend toward extinction is expected to be irreversible. The BRWG's suggested threshold escapement levels and suggested methods of analysis indicate that populations will be able to fall below these levels periodically and recover to higher levels, even when depensation at low population levels is taken into account. This interpretation is consistent with the observation that the proposed levels are substantially higher than any directly identifiable risk levels such as genetic or demographic bottlenecks.

The BRWG's threshold population levels for survival correspond to "Draft Section 7 Endangered Species Consultation Handbook--Procedures for Conducting Section 7 Consultations and

Conferences" definition of survival as used by the BRWG, which requires "sufficiently large populations" to ensure persistence into the future under conditions that will retain the potential for recovery. In an independent peer review of the BRWG report, Barnthouse et al. (1994) concluded that the BRWG's method of developing threshold levels was credible.

A. Snake River Sockeye Salmon

Snake River sockeye salmon adults enter the Columbia River primarily during June and July. Arrival at Redfish Lake, which now supports the only remaining run of Snake River sockeye salmon, peaks in August and spawning occurs primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for three to five weeks, emerge in April through May, and move immediately into the lake. Juveniles feed on plankton in the lake for one to three years before they migrate to the ocean (Bell 1986). Smolts leave Redfish Lake from late April through May (Bjornn et al. 1968), and migrate almost 900 miles to the Pacific Ocean. For detailed information on the Snake River sockeye salmon, see Waples et al. (1991a) and 56 FR 58619 (November 20, 1991).

Downstream passage at Lower Granite Dam (the first dam on the Snake River downstream from the Salmon River) occurs from late April to July, with peak passage taking place from May to late June (Fish Passage Center 1992). Once in the ocean, sockeye smolts remain near shore or within the Columbia River plume influence during the early summer months. Later, they migrate through the northeast Pacific Ocean (Hart 1973; Hart and Dell 1986). Snake River sockeye salmon usually spend two to three years in the Pacific Ocean and return in their fourth or fifth year of life.

Historically, the largest numbers of Snake River sockeye salmon returned to headwaters of the Payette River, where 75,000 were taken one year by a single fishing operation in Big Payette Lake (Bevan et al. 1994). During the early 1880s, returns of Snake River sockeye salmon to the headwaters of the Grande Ronde River in Oregon (Wallowa Lake) were estimated between 24,000 and 30,000 at a minimum (Cramer 1990, cited in Bevan et al. 1994). During the 1950s and 1960s, adult returns to Redfish Lake numbered more than 4,000 fish (Bevan et al. 1994).

Snake River sockeye salmon returns to Redfish Lake since at least 1985, when the Idaho Department of Fish and Game began operating a temporary weir below the lake, have been far below the 150-300 spawner escapement threshold level that would be consistent with BRWG (1994) recommendations (Table 3). Snake River sockeye salmon have a very limited distribution relative to critical spawning and rearing habitat. Redfish Lake represents only one of the five Stanley Basin lakes historically occupied by Snake River sockeye salmon and designated as critical habitat for the species.

Table 3. Returns of Snake River sockeye salmon to Redfish Lake, as determined by trapping at Redfish Lake creek weir and spawning ground surveys. Threshold escapement level is between 150-300 natural spawners and recovery escapement level is at least 1000 natural spawners (excluding first-generation progeny of the captive broodstock program) in Redfish Lake and at least 500 natural spawners in each of two other lakes.

Year	Adults Observed
1985	12
1986	29
1987	16
1988	4
1989	1
1990	0
1991	4
1992	1
1993	8
1994	1

Based on smolt-to-adult returns to the mouth of the Columbia River for the 1991 and 1992 outmigrating cohorts (0.51% and 0.26%, respectively), the expected return in 1995 from the 521 smolts that migrated from Redfish Lake in 1993 will be two adults (LaVoy 1994).

Since 1991, a captive broodstock program has been in effect and all returning adults have been spawned in captivity. The first adults produced by this program (from the 1991 returns) were released into Redfish Lake to spawn in 1993 and their progeny are expected to outmigrate in the spring of 1995. The surviving 1993 brood year adults will return to spawn in one to three years, and their progeny (the first cohort of naturally-produced spawners) will not return to spawn in Redfish Lake until three to five years after that (1999-2003). Therefore, it will be well into the next century before natural production of Snake River sockeye salmon, based upon several cohorts, can begin to be evaluated.

Given the extremely low population size, which has necessitated the captive broodstock program as an emergency measure to reduce the likelihood of imminent extinction, the biological requirements of Snake River sockeye salmon are clearly not being met and are unlikely to be met under the continuing effects of the environmental baseline. The risk is high that listed sockeye will be below the threshold escapement level of 150 fish (which applies only to naturally-produced spawners), before NMFS adds the effects of the continuing or proposed action, because of great uncertainty associated with the success of the captive broodstock program. The likelihood of recovery (which only applies to spawners at least two generations removed from captive broodstock) is even less certain, since there is no recent empirical evidence to evaluate the productivity of second-generation wild fish.

In summary, it does not appear that biological requirements of listed Snake River sockeye salmon would be met unless there is a substantial improvement in the environmental conditions from those currently available under the environmental baseline.

B. Snake River Spring/Summer Chinook Salmon

1. Life History Summary

The present range of naturally-spawned Snake River spring/summer chinook salmon is primarily limited to the Salmon, Grande Ronde, Imnaha, and Tucannon Subbasins. Most Snake River spring/summer chinook salmon enter individual subbasins from May through September. Juvenile Snake River spring/summer chinook salmon emerge from spawning gravels from February through June (Perry and Bjornn 1991). Typically, after rearing in their nursery streams for about one year,

smolts begin migrating seaward in April through May (Bugert et al. 1990; Cannamela 1992). After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit nearshore areas before beginning their northeast Pacific Ocean migration, which lasts two to three years. For detailed information on the life history and stock status of Snake River spring/summer chinook salmon, see Matthews and Waples (1991), NMFS (1991a), and 56 FR 29542 (June 27, 1991).

2. Population Status and Trends

The number of wild adult Snake River spring/summer chinook salmon in the late 1800s was estimated by Bevan et al. (1994) to be more than 1.5 million fish annually. By the 1950s, the population had declined to an estimated 125,000 adults. Escapement estimates indicate that the population continued to decline through the 1970s. Redd count data also show that the populations continued to decline through about 1980. See Table 4 for the estimated annual number of wild adult Snake River spring/summer chinook salmon returning over Lower Granite Dam (escapement) in recent years.

Table 4. Estimates of "wild-natural" Snake River spring/summer chinook salmon counted at Lower Granite Dam in recent years.

Estimates through 1993 from Tables 26 and 33 of WDFW and ODFW (1994). Preliminary estimate for 1994 from TAC (1994).

Year	Spring Chinook	Summer Chinook	Total
1985	6048	3196	9244
1986	7925	3934	11,859
1987	8928	2414	11,342
1988	10,915	2263	13,178
1989	3900	2350	6250
1990	4152	3378	7530
1991	2706	2814	5520
1992	8196	1148	9344
1993	6224	3959	10,183
1994	1517	305	1822

Adult returns of Snake River spring/summer chinook salmon in 1994 were the lowest on record. The return of the spring component in 1995 is projected to be even lower, based on a strong relationship between Snake/Columbia River spring chinook jacks and the 4-year old component of adult spring chinook returns in the following year. The 1994 spring chinook jack count was less than half of the 1993 jack count, which represented the previous record low (Roler 1994). The projection for 1995 summer chinook returns is approximately the same as 1994 returns (TAC 1994), which were the lowest on record.

It is unlikely that the biological and ecological requirements of listed Snake River spring/summer chinook salmon will be met under the substantial adverse effects of the environmental baseline alone. The significance of these effects is magnified by the current small population size, projected poor returns in the next one to two years, the influence of those poor returns on subsequent cohorts in 1998-2001, and the poor environmental conditions affecting the species throughout its life stages. Substantial improvements in environmental conditions under the environmental baseline are necessary to ensure the continued existence of this species.

The Snake River spring/summer chinook salmon Evolutionarily Significant Unit (ESU) consists of 39 local spawning populations (subpopulations) spread over a large geographic area (Lichatowich et al. 1993; see Table 5). The number of fish returning to a given subpopulation would therefore be much less than the total run size. Based on recent trends in redd counts in major tributaries of the Snake River, many subpopulations could be at critically low levels. Subpopulations in the Grande Ronde River, Middle Fork Salmon River, and Upper Salmon River basins at particularly high risk. Both demographic and genetic risks would be of concern for such subpopulations, and in some cases, habitat might be so sparsely populated that adults could not find mates.

NMFS agrees that the BRWG-recommended threshold level of 150-300 spawners annually per subpopulation, depending upon size of the subpopulation, is reasonable. Therefore, NMFS adopts that threshold for purposes of the jeopardy analysis applicable to Snake River spring/summer chinook salmon.

The BRWG did not identify a threshold level for the entire Snake River spring/summer chinook ESU, nor did it suggest a method of relating results for individual subpopulations to a conclusion for the entire ESU (i.e., what percentage of the available subpopulations must have an acceptable probability of exceeding the threshold to conclude that the ESU has an acceptable probability as well). With respect to the first issue, it is reasonable to assume that because the ESU is composed of approximately 39 subpopulations with thresholds ranging from 150-300 spawners annually, the aggregate threshold is at least 6000-12,000 spawners annually. This estimate assumes that spawners are distributed among all subpopulations in proportion to each subpopulation's threshold. If this assumption is not valid, the aggregate threshold would be higher than 6000-12,000 spawners annually.

With respect to the second issue, it is only possible to estimate the likelihood of survival for a few of the 39 subpopulations identified by the BRWG (1994). Section 4 of BRWG (1994) indicated that five "index stocks" (Marsh Creek, Sulphur Creek, Bear Valley/Elk Creek, Minam River, and Imnaha River) were "viable candidates for future assessments" because they had sufficient data for forward projections. A sixth potential "index stock," Poverty Flats, was analyzed but not recommended for use in determining likelihood of survival because: (1) the habitat of this subpopulation was

considerably degraded in recent history, so the probability of the population being above the threshold under relatively good conditions is unknown; and (2) variation in points around the production function for this subpopulation is so great that it should not be used for predictive purposes.

Table 5. Snake River spring/summer chinook salmon classification by subbasin (metapopulations) and subpopulation. Based on Lichatowich et al. 1993, SRSRT Table VI-1, and BRWG 1994. SP = spring chinook population; SU = summer chinook population

RIVER SYSTEM/SUBBASIN	BREEDING UNIT/SUBPOPULATION
TUCANNON RIVER	WATERSHED POPULATION (SP)
GRANDE RONDE RIVER	MINAM RIVER (SP)
	LOSTINE AND UPPER WALLOWA TRIBUTARIES RIVER (SP)
	WENAHA RIVER (SP)
	CATHERINE CREEK (SP)
	UPPER GRANDE RONDE (SP)
IMNAHA RIVER	MAINSTEM (SP/SU)
	BIG SHEEP AND LICK CREEK
SNAKE RIVER MAINSTEM	ASOTIN CREEK (SP)
	MAINSTEM, SHEEP, GRANITE (SP)
LOWER SALMON RIVER	MAINSTEM TRIBUTARIES, MOUTH TO AND INCLUDING HORSE CREEK (SP)
LITTLE SALMON RIVER	WATERSHED EXCEPT RAPID RIVER (SP)
	RAPID RIVER (SU)
SOUTH FORK SALMON RIVER	MAINSTEM, BLACKMARE TO STOLLE (SU)
	MAINSTEM, MOUTH TO POVERTY FLATS (SU)
	SECESH RIVER (SU)
	JOHNSON CREEK (SU)
	EAST FORK SOUTH FORK (SU)
MIDDLE FORK SALMON RIVER	MAINSTEM, MOUTH TO INDIAN CREEK (SU)
	MAINSTEM, INDIAN TO BEAR VALLEY CREEK (SP)
	MARSH CREEK AND TRIBUTARIES (SP)
	BEAR VALLEY AND ELK CREEK (SP)
	SULPHUR CREEK
	UPPER LOON CREEK AND TRIBUTARIES (SP)
	LOWER LOON CREEK (BELOW TM 23) (SU)
	CAMAS CREEK (SP)
	LOWER BIG CREEK (BELOW TM 23) (SU)
	UPPER BIG CREEK AND TRIBUTARIES (SP)
LEMHI RIVER	WATERSHED POPULATION (SP)
PAHSIMEROI RIVER	WATERSHED POPULATION (SU)
UPPER SALMON RIVER	NORTH FORK SALMON RIVER (SP)
	EAST FORK, MOUTH TO HERD CREEK (SU)
	HERD CREEK AND UPPER EAST FORK (SP)
	YANKEE FORK AND TRIBUTARIES (SP)
	VALLEY CREEK ABOVE STANLEY CREEK (SP)
	LOWER VALLEY CREEK (SU)
	MAINSTEM SALMON BELOW REDFISH LAKE CREEK (SU)
	MAINSTEM SALMON ABOVE REDFISH LAKE CREEK (SU)
CLEARWATER RIVER	NOT LISTED UNDER ESA

C. Snake River Fall Chinook Salmon

1. Life History Summary

Adult Snake River fall chinook salmon enter the Columbia River in July and migrate into the Snake River from August through October. Snake River fall chinook salmon spawning is primarily limited to the Snake River below Hells Canyon Dam, and the lower reaches of the Clearwater, Grand Ronde, Imnaha, Salmon, and Tucannon rivers. Fall chinook salmon generally spawn from October through November, and fry emerge from March through April. Downstream migration generally begins within several weeks of emergence (Becker 1970; Allen and Meekin 1973), with juveniles rearing in backwaters and shallow water areas through mid-summer prior to smolting and migration. Fall chinook spend one to four years in the Pacific Ocean before beginning their spawning migration. For detailed information on the life history and stock status of Snake River fall chinook salmon, see Waples et al. (1991b), NMFS (1991b) and 56 FR 29542 (June 27, 1991).

2. Population Status and Trends

No reliable historic estimates of abundance are available for Snake River fall chinook salmon (Bevan et al. 1994). Estimated returns of Snake River fall chinook salmon declined from 72,000 annually between 1938 and 1949, to 29,000 from 1950 through 1959 (Bjornn and Horner 1980, cited in Bevan et al. 1994). Estimated returns of naturally produced adults from 1985 through 1993 range from 114 to 742 fish (Table 6).

Table 6. Estimates of naturally-produced adults to Lower Granite Dam (adjusted to include naturally-produced adults trapped at Ice Harbor Dam). Estimates for 1985-1993 are from Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife 1994. Preliminary estimate for 1994 from Loch (1995).

Return Year	Natural Adults
1985	435
1986	449
1987	252
1988	368
1989	295
1990	78
1991	318
1992	549
1993	742
1994	[Natural Count Not Available; Total Count = 852]

Unless there is information from the completed 1994 return to indicate otherwise, it is reasonable to expect that the returns will continue to decline in 1995. Fall chinook returns in the Snake River system are typically dominated by 4-year old fish. The 1994 run was dominated by 5-year olds with relatively weak returns of 3- and 4-year old fish. The low return of 3-year olds is based on a record low return of 2-year old fish in 1993. The low 4-year old return in 1994 was based on the relatively low 3-year old return in 1993. A tentative forecast for 1995 suggests that the return will be about 60% of that in 1994, or about 500 fish to the river mouth. The expected escapements to the Snake River would be proportionately low as well.

Specific projections for returns of fall chinook over the next three to five years (1996-1998) cannot be made, but it is possible to comment generally on the prospects for greater returns. The 1991 brood is weak, based on the record low return of jacks in 1993. There was certainly sufficient escapement in 1992 and 1993 to allow for increased returns after 1995, but higher returns will depend largely on improved passage and ocean survival conditions.

NMFS finds that the likelihood of survival and recovery of listed fall chinook salmon in the immediate future is low because of a combination of factors: 1) Escapements are well below threshold levels in most years since 1985 and 2) that, even assuming only the continuing direct and indirect effects of the environmental baseline, and without factoring in cumulative effects or the likely effects of the continuing action, escapement will continue to be extremely low, at least through 1995.

Although risks associated with small population sizes are also a general concern for Snake River fall chinook salmon, there is currently no evidence of multiple subpopulations of naturally-spawning Snake River fall chinook salmon (Waples et al. 1991b). Thus, the anticipated short-term reduction in escapement during the next few years would not raise major genetic concerns of inbreeding, but would raise demographic concerns. Genetic and demographic risks increase dramatically as the number of consecutive years of depressed populations increases.

NMFS finds that the threshold level recommended by the BRWG of 300 spawners annually is reasonable and adopts that threshold for the portion of this jeopardy analysis applicable to Snake River fall chinook salmon.

VI. ENVIRONMENTAL BASELINE

A. Biological Considerations

According to 50 CFR 402.02 "the environmental baseline includes past and present impacts of all Federal, State, or private actions and other human activities in the action area that have already undergone formal or early section 7 consultations, and the impacts of State or private actions which are contemporaneous with the consultation process." The action area for this consultation is the mainstem Snake River Basin (below Hells Canyon Dam), and the Salmon, Grande Ronde, Tucannon, Imnaha, and Clearwater Rivers Basins (excluding the North Fork Clearwater River above Dworshak Dam). This

encompasses the current and potential range of listed salmon spawning and rearing habitat.

The sharp decline of salmon production in the action area has resulted from a variety of activities including small hydropower development, harvest, artificial propagation, and land management activities. Land management activities that have contributed to degraded habitat and increased egg-to-smolt mortality include water withdrawals, unscreened water diversions, small hydropower development, road construction, timber harvest, mining, livestock grazing, outdoor recreation, and their associated activities. In general, land management actions that disturb ground and remove vegetation have: (1) Reduced connectivity (i.e. the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands; (2) significantly increased watershed sediment yields, leading to pool filling and elimination of spawning and rearing habitat; (3) reduced or eliminated in-stream replenishment of large woody debris that traps sediment, stabilizes stream banks, and helps form pools; (4) reduced or eliminated vegetative canopy that minimizes temperature fluctuations; (5) caused streams to become straighter, wider, and shallower, which has the tendency to reduce spawning and rearing habitat and increase temperature fluctuations; (6) altered peak flow volume and timing, leading to channel changes and potentially altered fish migration timing; (7) altered water tables and base flows, resulting in riparian wetland and stream dewatering; and (8) contributed to degraded water quality by adding toxicants through mining and pest control (Eastside Forests Scientific Society Panel 1994; McIntosh et al. 1994; Rhodes et al. 1994; Wissmar et al. 1994).

Representative examples of these disturbances can be found throughout the Snake River Basin. For example, streams in the Upper Grande Ronde River Subbasin have been heavily degraded by livestock grazing, road construction, timber harvest, mining, and stream channelization on private and Federal lands (Anderson et al. 1992; McIntosh et al. 1994). Ten streams resurveyed in the Grande Ronde River Basin showed declines in the frequency of large pools by 20 to 90% over the period 1941-1990, with a total decline of 66% (McIntosh et al. 1994). Dominant substrate particle size generally decreased in the basin over the same period of time, and large woody debris was scarce in recent surveys of managed watersheds of the basin. Peak flows had shifted to as much as 30 days earlier in the spring.

Similar kinds of habitat perturbations are widely distributed throughout managed watersheds in the Columbia River Basin (Chapman et al. 1991; Rhodes and McCullough 1994). In

general, portions of the Salmon River outside designated wilderness areas suffer from habitat degradation. In the areas of timber management, related road construction, and mining, measurable impacts on listed salmon habitat have persisted for decades in the South Fork Salmon River, Panther Creek, and numerous first and second order streams throughout the Snake River Basin.

Federal land management policy has not prevented loss of salmon habitat. The principal ways in which land management policy have contributed to the decline of salmon habitat are: (1) Overemphasis on production of non-fishery commodities, resulting in incremental losses of riparian and fish habitat; (2) failure to take a biologically conservative or risk-aversive approach to planning land management actions when inadequate information exists about the relationship between land management actions and fish habitat; (3) failure to include the best available scientific information in planning of project actions; (4) planning actions on a site-specific basis, rather than based upon broader watershed and river basin conditions and capabilities; and (5) reductions in the number, size, and distribution of remaining high-quality habitat areas (such as roadless and minimally developed areas) that serve as biological refugia for salmon subpopulations (Eastside Forests Scientific Society Panel 1994; FEMAT 1993; Rhodes et al. 1994).

B. Relationship of Past Programmatic Management Direction to Baseline Conditions

The USFS developed and signed the subject LRMPs prior to the ESA listing of Snake River salmon. Management parameters contained in the LRMPs arose from an attempt to balance the issues, technologies, and scientific knowledge current at the time of LRMP signature. Scientifically-based ecosystem concepts and aquatic strategies have evolved significantly since that time. Therefore, the current LRMPs do not encompass salmon-related ESA considerations or fully endorse an ecosystem-based approach to land management. The Federal land management agencies have recognized these points, as evidenced by their decision to implement PACFISH and their Notices of Intent to prepare EISs for coordinated ecosystem management on Federal lands (February 1, 1994, 59 FR 4680; May 23, 1994, 59 FR 26624; and December 7, 1994, 59 FR 63071).

To characterize how programmatic LRMPs relate to potential effects from site-specific actions, it is relevant to consider the project and watershed consultations completed with the USFS since Snake River salmon were listed. In the past, ESA salmon consultations for these listed species were conducted exclusively at the site-specific level.

NMFS reviewed its completed Snake River Salmon consultations on USFS site-specific actions to determine whether NMFS concurred with the effects determination and whether NMFS' consultation resulted in an incidental take statement, or determined that jeopardy or adverse modification of critical habitat would result. This review, and the list of consultations reviewed, are summarized in Tables 7, 8, and 9. The information in these tables indicates LRMP management direction's effectiveness of the LRMPs themselves in furnishing independent assurance of avoiding adverse effects to listed salmon and critical habitat. All original LRMPs (prior to PACFISH modifications) included biologically conservative objectives and standards and guidelines to protect riparian and aquatic areas. Riparian area objectives extracted from LRMPs direct managers to: "maintain riparian successional stages giving priority to the natural pattern of fire and disease-dependent stages." The objectives also ensure that "management decisions will be made in favor of riparian dependent resources where conflicts exist with man's use." Since strong direction in the LRMPs was written before salmon were listed under ESA, completed project and watershed consultations should reflect this direction.

However, many of the project-scale actions that the USFS determined "may affect" listed salmon or critical habitat have led to formal consultation under the regulations as a result of NMFS' identification of adverse effects. This indicates that LRMPs provide sufficient management latitude to allow actions to be proposed which may adversely affect listed salmon or their critical habitat. NMFS concludes that the LRMP management framework has not provided sufficient guidance to identify and avoid the proposal of projects with adverse effects at the earliest opportunity. The lists of site-specific actions in Tables 7, 8 and 9, which each underwent ESA salmon consultation, were drawn from all eight National Forests. These completed consultations range from site-specific actions to watershed-scale actions, involving timber harvest, grazing, mining, road permits, recreation, etc. They help demonstrate the variety of actions authorized and tiered to LRMPs and the wide range of effects that are possible under the LRMPs' umbrella.

Tables 7, 8, and 9 summarize consultations between the USFS and NMFS after three ESA decisions: listing, critical habitat designation, and reclassification of Snake River chinook from threatened to endangered, respectively. Many actions listed in Table 7 and ultimately classified by the USFS as "not likely to adversely affect," would initially have required formal consultation. Formal consultations for these actions would have concluded with a no jeopardy or jeopardy determination and included an incidental take statement.

However, because the USFS adopted NMFS' recommendations during informal ESA consultations and revised the proposed action, formal consultations were avoided[1]. The number and types of actions where these negotiations occurred are not specified in Tables 7, 8, and 9. However, the many actions that were found to need modification during informal consultation were taken into consideration when NMFS determined what revisions of LRMPs to suggest to furnish standards and guidance in the LRMPs themselves that would in general furnish needed protection to the listed species.

[1] Examples of actions that were modified during informal consultation to arrive at a mutually agreed upon "not likely to adversely affect" determination include Scott Salvage Timber Sale (Nez Perce NF), Silver Creek Bridge (Salmon NF), and Camas Creek Road Reconstruction (Challis NF).

Table 7. Summary of consultations between the USFS and NMFS prior to designation of critical habitat, January 24, 1994.

National Forest Date and Consultation Title	USFS BA Determ-ination[1]	NMFS Reply (Agree/ Disagree)	Consultation (Formal/ Informal)	ITS or RPA[2]
USFS Regions 1,4, & 6				
5/8/92: Snorkeling as a Fisheries Monitoring Technique	NLAA	Agree	Informal	None
8/6/93: Pacific Yew EIS	NLAA	Agree	Informal	None
Sawtooth				
4/23/92: Construction of Comfort Station at Redfish Lake Comfort Station at Redfish Lake	NLAA	Agree	Informal	None
8/13/92: Proposed Fish Weir Renovation/Rec Marsh Creek	NLAA	Agree	Informal	None
Challis				
5/21/92: Grouse Creek Mine on Snake River Spring/Summer Chinook & Snake River Sockeye Salmon	NLAA	Agree	Informal	None
8/4/92: Proposed Camas Creek Road Reconst.	NLAA	Agree	Informal	None
8/7/92: Gene Moon Claims-Jordan Creek Patent Application Drilling Proposal	NLAA	Agree	Informal	None
8/18/92: Rapid River Mine Exploration, Phase One	NLAA	Agree	Informal	None
11/15/93: Forty Buckets Placer Mine, Pre Winter 1993 Season Closure & Erosion Control Measure	NLAA	Disagree	Formal	BA Not Submitted
Salmon				
1/27-93: Squaw Creek, Spring Creek, & Twin Creek Culvert Rehabilitation Project	NLAA	Agree	Informal	None
4/22/93: Proposed Silver Creek Bridge Replacement	NLAA	Agree	Informal	None
Payette				
8/3/93: Amendment to BA of Potential Effects of South Fork Salmon River Road Improvement	NLAA	Agree	Informal	None
8/4/92: Proposed Water at the Red Ledge Mine	NLAA	Agree	Informal	None
8/11/92: Zena Creek Sediment Research Project	NLAA	Agree	Informal	None
8/18/92: Deep/Copper Timber Sale on Deep Creek, of the Snake River	NLAA	Agree	Informal	None
9/1/92: Walla Walla Mining, Proposed for the Maxwell/ Calif. Creek Drainage & Lake Creek/Secesh River Drainage	NLAA	Agree	Informal	None
9/17/92: Potential Effects on Snake River Spring/Summer and Fall Chinook Salmon of Constructing a Buttress to Retain a Rock Slide Near Krassel Work Center, SFSR	NLAA	Agree	Informal	None
10/14/92: Potential Effects of Vehicular Traffic Across Buttress to Retain Rock Slide Near Krassel Work Center, SFSR, on Snake River Spring/Summer Fall Chinook Salmon	NLAA	Agree	Informal	None
12/3/92: Snow Plowing the South Fork Salmon River Road	LAA	Agree	Emergency Formal	ITS
1/27/93: Proposed West Face Parking Area	NLAA	Agree	Informal	None
4/8/93: Reconstructing, Paving, & Snowplowing of South Fork Salmon River Road	NLAA	Disagree	Formal	ITS
7/16/93: Payette National Livestock Grazing (1993; some allotments through 1996)	LAA	Agree	Formal	ITS
12/15/93: South Fork Salmon River Watershed Mining Operations	NLAA	[3]	[3]	None; Draft RPA

National Forest Date and Consultation Title	USFS BA Determ-ination[1]	NMFS Reply (Agree/ Disagree)	Consultation (Formal/ Informal)	ITS or RPA2
Wallowa-Whitman				
8/7/92: Starkey Forest Study Activity	NLAA	Agree	Informal	None
8/10/92: Grande Ronde River Boulder Placement, Fisheries Habitat Enhancement Project	NLAA	Agree	Informal	None
9/16/92: Mount Emily Houselogs Timber Sale	NLAA	Agree	Informal	None
1/11/93: Topple Timber Sales: Park HFR & Cantrell	NLAA	Agree	Informal	None
6/9/93: Wallowa-Whitman Timber Sales (Sheep Creek, Banty, Tower, JC, Horn, Bugout, Prong, RD, & Johnsale Salvage Park HFR & Cantrell Timber Sales	NLAA	Disagree	Formal	ITS
Umatilla				
7/21/93: Tucannon River Subbasin	NLAA	Disagree	Formal	ITS
Boise				
8/10/92: Proposed Cambior Mining Exploration	NLAA	Agree	Informal	None
4/19/93: Teapot Fuels/Wildlife Burn Project	NLAA	Agree	Informal	None
6/1/93: Bear Valley Cattle & Horse Allotment & the Elk Creek Cattle & Horse Allotment 1993 Annual Mngt Plans	NLAA	Disagree	Formal	ITS
7/28/93: Bear Valley Basin Salvage Timber Harvest-Cache Creek Timber Sale	NLAA	Disagree	Formal	ITS
10/5/93: Annual Operating Plans for Sand Creek & Hanson Hanson Creek Cattle & Horse Allotments	NLAA	Disagree	Formal	ITS
Nez Perce				
6/30/92: Snake River Chinook Salmon Million Dollar Placer Mine - U.S. Gold Lease	NLAA	Agree	Informal	None
7/7/93: Scott Salvage Timber Sale	NLAA	Agree	Informal	None
9/7/93: Selway Salvage Timber Sale	NLAA	Agree	Informal	None
10/1/93: Actions on Main Salmon River Tributaries (NW)	NLAA	Agree	Informal	None

[1] NLAA--Not Likely to Adversely Affect
LAA--Likely to Adversely Affect

[2] RPA--Reasonable and Prudent Alternatives
ITS--Incidental Take Statement

[3] 19 of 20 Projects Agree; 1 disagree/19 Informal; 1 formal

Table 8. Summary of consultations between USFS and NMFS following designation of critical habitat January 24, 1994.

National Forest Date and Consultation Title	USFS BA Determ-ination[1]	NMFS Reply (Agree/ Disagree)	Consultation (Formal/ Informal)	ITS or RPA[2]
Region 6				
3/9/94: Timber Sale "Screens" For Nine East-Side National Forests in OR & WA	NLAA	Agree	Informal	None
Sawtooth				
5/6/94: Stanley Basin Cattle & Horse Allotment Management Plan	NLAA	Disagree	Formal	ITS; Lawsuit Pending
Salmon				
3/31/94: Beartrack Mine (Cobalt R.D.)	NLAA	Disagree	Formal	ITS, Lawsuit Pending
5/13/94: Lower Salmon River Watershed	NLAA	Disagree	Formal	ITS
Payette				
4/1/94: Managing the Payette National Forest Timber Sales in the Main Salmon River Tributaries on Snake River Spring/Summer Chinook Salmon	NLAA	Agree	Informal	None
5/6/94: Soulen Livestock Grazing Allotments	NLAA	Agree	Informal	None
Nez Perce				
3/29/94: Castle Creek Reclamation	NLAA	Agree	Informal	None
6/16/94: Salmon River Seed Orchard Development	NLAA	Agree	Informal	None
Clearwater				
6/7/94: Proposed Activities in the Lochsa River Section 7 Analysis Area	No Eff. & NLAA	Disagree	Formal	BA Not Submitted

[1] NLAA--Not Likely to Adversely Affect

[2] RPA--Reasonable and Prudent Alternatives
LAA--Likely to Adversely Affect
ITS--Incidental Take Statement

Table 9. Summary of consultations between the USFS and NMFS following the August 19, 1994, reclassification of Snake River chinook salmon from threatened to endangered species.

National Forest Date and Consultation Title	USFS BA Determ-ination[1]	NMFS Reply (Agree/ Disagree)	Consultation (Formal/ Informal)	ITS or RPA[2]
Sawtooth				
8/94: Recreational Floatboating on Main Salmon River Amendments	LAA	Agree	Formal	ITS
Challis				
10/31/94: Jordan Creek Stream Alteration/Grouse Creek Mine Project	LAA	Agree	Emergency Formal	Await Final BA
Salmon				
8/19/94: Panther Creek Watershed	NLAA	Disagree	Formal	Draft RPA
Payette				
12/15/93: South Fork Salmon River Watershed Mining Operations	NLAA	[3]	Formal	Draft RPA
Nez Perce				
8/19/94: Main Salmon River Tributaries (NE)	NLAA	Disagree	Formal	ITS Required

[1] NLAA--Not Likely to Adversely Affect
LAA--Likely to Adversely Affect

[2] RPA--Reasonable and Prudent Alternatives
ITS--Incidental Take Statement

[3] 1 of 20 Actions Disagree

New direction was issued by John Lowe, Regional Forester for USFS Region 6, in a December 30, 1993, letter to Snake River Basin Forest Supervisors and Deputy Regional Foresters (Mr. Lowe signed for USFS Regions 1 and 4, as well as 6). The letter directed managers to use the science behind the draft EIS for management of Federal lands in the range of the northern spotted owl and in an Executive Summary of the (then) draft PACFISH strategy, unless the National Forests had site-specific data to demonstrate alternative measures that afforded sufficient protection for streamside areas and listed salmon populations.

Implementation of the Regional Forester's directive should have resulted in improved, consistent levels of fishery resource protection. However, results were variable as illustrated in the following examples. These cases: (1) illustrate that conflicting resource uses within riparian areas are not always resolved in favor of riparian-dependent resources, and (2) demonstrate that programmatic management frameworks are often broad enough that they do not foreclose site-specific departures from the intended course of fishery resource protection.

> In the first example, the Nez Perce NF did not apply sufficient riparian protection to streams within the Main Salmon River and Northeast Tributaries. Regional and National Forest managers were initially not aware of the December 30, 1993, direction. When made aware at interagency meetings, managers maintained a course of direction that would have led to adverse effects on listed species if an Opinion had not been issued (August 19, 1994, Biological Opinion).
>
> In a second example, managers of the Payette NF were aware of the December 30, 1993, direction yet submitted the Brush Mountain Timber Sale (Little Salmon River Watershed BA) for a section 7 consultation with insufficient riparian protection. NMFS returned the BA to the Payette NF so the action could be modified to adhere with the direction set forth in the December 30, 1993, letter.

In these cases, their was failure to apply programmatic direction consistently with the intent of protecting fish habitat.

Since the Regional Forester's letter, additional developments have occurred that amplify concern and the need for increased protection for the declining populations of Snake River salmon and their habitat. These developments include designation of critical habitat effective on January 27, 1994, and the interim emergency reclassification of Snake River

spring/summer chinook salmon and Snake River fall chinook salmon from threatened to endangered on August 18, 1994 (proposed rule to permanently reclassify Snake River salmon was published on December 28, 1994). However, watershed BAs and their site-specific actions are still being developed using outdated management direction contained in the LRMPs. Prior site-specific consultations have made clear that site-specific actions that are consistent with the existing plans may lead to adverse effects on the listed salmon and their critical habitat. This information is displayed in Table 7 and further illustrated in Tables 8 and 9 by effects that occurred after critical habitat was designated and Snake River chinook were reclassified from threatened to endangered.

VII. EFFECTS OF THE CONTINUING ACTION: LAND AND RESOURCE MANAGEMENT DIRECTIONS

A. Determination Standard for Effects of Proposed Direction

LRMPs present a special case for analyzing the effects of actions because in order to carry out activities in the forests covered by the plans, the USFS has to conduct additional layers of environmental review to meet NFMA, NEPA, and ESA requirements. Even though LRMPs set important parameters for the authorization of specific projects, with some exceptions (e.g., some mines), LRMPs typically do not provide the final authorization for project implementation. Therefore, this Opinion's analysis of on-the-ground effects considers the potential effects of site-specific activities that may be taken consistent with the plans. Although project-scale actions will still be subject to section 7 consultation, NMFS finds that it is appropriate to consider the efficacy of LRMP direction to minimize and avoid adverse effects at the earliest project planning level.

B. Potential Effects to the Listed Species of Project Level Actions Likely to Follow From LRMP Direction

As previously stated, the LRMPs under consultation were developed before Snake River salmon were listed under the ESA. Consequently, the biological requirements of endangered salmon populations were not always taken into account in the parameters set by the LRMPs. As discussed under "Environmental Baseline," the past application of LRMP standards and guidelines, goals and objectives, and goods and services, in connection with site-specific actions, has not

prevented the decline of listed Snake River salmon and the degradation of their designated critical habitat. Generally, adverse effects on listed salmon and their habitat result from the aggregation of impacts which occur at the site-specific level.

Based on NMFS' experience to date, the range of potential effects from projects within the parameters set out in an LRMP depends to a large extent, on individual Forest managers' interpretation of those parameters.

Management of forests to maximize the production of goods and services would contribute to further degradation of habitat and continued decline in egg-to-smolt survival. The accumulation of effects at the landscape level from numerous actions, in the event they are not fully arrested at the project specific level, would reduce the likelihood of both survival and recovery of the species. On the other hand, management of forests for the benefit of listed salmon, emphasizing protection of aquatic and riparian areas, with landscape-scale strategies for protecting the best remaining habitat and restoring salvageable habitat, could allow for the salmon's survival and increasing prospects for recovery derived from improvements to their critical habitat. NMFS finds that consultation on the site-specific level of forest management activities is enhanced when there has been an opportunity to consider the full range of effects, or to achieve increased survival and recovery of listed salmon, at the species-level under an ecosystem-based strategy. Consideration of the needs of listed salmon is important at both levels of forest activity decision making. LRMPs set goals, allocations, and expectations for goods and services, but do not directly require specific actions. However, expectations for goods and services in the existing LRMPs may not be realistic and may create conflicts until the needs of listed salmon are fully considered.

Advances in science and changes in issue emphasis have surfaced since the subject LRMPs were prepared. The current state of scientific analysis has a strong focus on ecosystem management, biological diversity, old growth trees, and aquatic resource conservation. State-of-the-art ecosystem management strategies at watershed- and landscape-scales are rapidly replacing traditional land management concepts which formed the basis for standards and guidelines and resource allocations in the subject LRMPs. These new strategies may provide a scientifically-based process for addressing incremental effects across the landscape. These strategies include: Eastside Forests Scientific Society Panel (1994) in an assessment of eastside forests; Thomas et al. (1993) in a Scientific Advisory Team's (SAT) review of westside forests; the President's Forest Plan (FEMAT 1993); and Frissell et al.

(1993) in an Integrated, Biophysical Strategy for Ecological Restoration of Large Watersheds; and PACFISH (USDA and USDI 1994).

Even though PACFISH substantially improves many of the standards and guidelines in the LRMPs, a comprehensive, landscape-scale conservation strategy is still lacking. The LRMPs, as amended by PACFISH, do not address how to: provide for a network of well-distributed watersheds containing high quality spawning and rearing and readily restorable habitats, reduce risk to these habitats, prioritize restoration, plan activities and conservation strategies after landscape-scale analysis, conduct implementation monitoring and begin gathering data for effectiveness and validation monitoring.

The LRMPs also do not integrate or adjust the production of goods and services to comport with the needs of endangered salmon. NMFS believes that there is tension between LRMP direction that emphasizes production of goods and services, and LRMP direction that requires avoidance of adverse effects to anadromous salmonids and their habitat. NMFS finds that this tension from these internal inconsistencies places the particular national forest project-level managers in the position of reconciling conflicting programmatic direction. NMFS is concerned that relying upon such reconciliation at the project management level will lead to inconsistent and inadequate proposals across the salmon's habitat that will be time-consuming to address in project-specific consultations.

NMFS anticipates that the geographically specific EISs will propose alternative approaches to assure that goals for production of goods and services are reconciled with the needs of endangered salmon. In the interim, while these EISs are being prepared, landscape-scale attributes of the Snake River salmons' unique life history and subpopulation must be considered and provided for in the upcoming site-specific consultations.

LRMP standards and guidelines evaluated in this consultation pertain to: achieving riparian management objectives (RMOs); instream structures; water conveyances; hydrologic regimes; road building outside RHCAs; road maintenance; silvicultural treatments within riparian habitat conservation areas (RHCAs); equivalent clearcut areas; fire suppression; mining; range management; recreation; monitoring; and other managed animals. Standards and guidelines in LRMPs for these management categories are manifested in site-specific actions where incremental adverse effects to listed salmon and their designated critical habitat may continue to result.

The potential on-the-ground effects to listed species and critical habitat that could accrue through adherence to standards and guidelines provided by LRMPs as amended by PACFISH, if production of goods and services are not balanced across the landscape with the needs of endangered salmon, are discussed in detail below:

1. Fish Habitat and Water Quality

The LRMPs provide a management framework pertaining specifically to actions which affect fish habitat and water quality. The recent PACFISH EA/FONSI has amended that framework. Conflict between resource protection and outputs may continue even after adjustments required by PACFISH, if other resource areas are not adjusted to reflect requirements of anadromous fish. The potential effects of RMOs, use of instream structures, and oversight of water conveyance as established by the interim PACFISH strategy are presented in this section.

a. Riparian Management Objectives

The unamended LRMPs established general goals to provide for maintaining or improving riparian-dependent resources including fish, water, vegetation, soil, and wildlife. However, none of the LRMPs listed quantitative RMOs. The RMOs, as established in the amended Final PACFISH EA/FONSI and NMFS Opinion, provide a consistent set of interim targets for riparian areas and fish habitat. In managed watersheds, where current habitat conditions are worse than the RMOs, the interim PACFISH strategy may result in some improvement. It is important to note that even the unamended LRMPs afforded riparian areas considerable protection, yet degradation of these areas has continued. For instance, the unamended LRMPs called upon managers to err in favor of riparian resources when conflicts existed. In NMFS opinion, it is clear that this direction has not always been followed.

The PACFISH strategy adds new conservation goals for anadromous fish habitat, but does not relieve Forest managers from meeting other resource allocation targets. NMFS identified several areas of concern with RMOs, as established by PACFISH. These were: (1) no decision framework was provided for land managers to decide which actions will retard or prevent attainment of RMOs; (2) no timeframe for attainment of the RMOs; (3) data requirements were not described for determining whether RMOs are met; (4) no direct guidance to prevent degradation of areas that currently surpass the RMOs; (5) the PACFISH strategy allows RMOs and RHCAs to be adjusted based on site-specific, rather than watershed analysis; and

(6) the PACFISH strategy does not provide clear guidance for areas where existing data (prior to watershed analysis) indicates that watershed or stream reach habitat capabilities surpass the RMOs.

b. Instream Structures as Related to Watershed Restoration

The amended LRMPs contain no specific guidance on instream structures; however, they do provide management direction regarding fish habitat enhancement in which instream structures are commonly used. Often instream structures are intended as site-specific improvement actions.

Watershed restoration programs either can be part of a watershed analysis or developed individually. Important elements of restoration in the Snake River Basin include:(1) control and prevent road-related runoff and sediment production; (2) improve and restore the condition and complexity of riparian vegetation; (3) improve habitat structure in stream channels; and (4) remove water temperature, water quality, and physical blockages to passage of adults and juvenile salmon.

In the past 10 years, large instream habitat modification programs have been undertaken on Federal lands. Many instream projects proceeded with inadequate planning and pre- and post-project evaluation. Consequently, instream structures have been recently criticized (Beschta et al. 1991; Frissell and Nawa 1992). Beschta et al. (1991) were also critical of instream structures in the Grande Ronde and John Day Rivers in eastern Oregon because too little attention was paid to correcting sources of habitat damage.

Instream structures are typically a small, but sometimes an integral part of a watershed restoration program whose goal is to restore anadromous fish habitat, riparian habitat, and water quality. Incorporating instream structures into a broader watershed approach will broaden the focus to include causes of degradation and alternatives to avoid the continuation of those problems. Instream measures are inherently short-term and must be accompanied by watershed-wide restoration and protection to achieve long-term restoration. Short-term solutions, while not complete, may be, in unusual circumstances, a necessary part of a program to recover fish stocks while long-term restoration measures have time to become effective. The use of instream structures cannot, however, be viewed as a substitute for habitat protection (Reeves et al. 1991).

c. Water Conveyances

Each LRMP contained management direction for the protection of instream flows through an analysis of proposed water uses, diversion, and transmission (conveyance) applications. Water users are required to obtain special use permits from the USFS to convey water across Federal forest land. PACFISH provided some interim direction on the issuance of leases, permits, rights-of-way, and easements.

Water withdrawal and conveyance can kill and injure listed salmon and adversely modify their designated critical habitat. Juvenile chinook salmon can be killed by getting sucked into unscreened water intakes or stranded in water diversion canals. These canals can attract juvenile chinook salmon by providing spring and early summer rearing habitat. When summer low stream flows occur and high water use begins, many of these water canals dry up. This results in juvenile fish being trapped in pools where they may eventually die. Diversions may also cause thermal blockages to adult salmon returning to spawn dewatering natal spawning streams. Migration of adult chinook salmon to their natal streams can be physically blocked by in-stream water diversion berms and low water levels caused by excessive water withdrawal.

2. Road Management Direction

[Road construction has been a primary cause of salmonid habitat decline (Everett et al. 1994; Wissmar et al. 1994).] Each LRMP presented general management direction regarding road construction, reconstruction, and maintenance. PACFISH improves LRMP direction by requiring watershed analysis prior to construction of new roads or landings in RHCAs[2], requiring that fish passage be provided and maintained at all road crossings, and requiring practices that minimize sediment delivery to streams from road surfaces. Construction of roads in RHCAs could have long-term impacts or irreversible effects on listed salmon or their critical habitat. Therefore, results of watershed analysis must be carefully considered to ensure that roads are designed to be within the boundaries of a watershed's capabilities. The LRMPs, as amended by PACFISH, do not revise direction for road building outside RHCAs (although PACFISH does apply to any action outside RHCAs if Forest managers decide the action will degrade the RHCA).

[2] PACFISH allows RHCAs to be adjusted in size prior to watershed analysis.

a. Road Building Outside Riparian Habitat Conservation Areas

In general, roads have been a primary source of sediment impacts in developed watersheds (Everett et al. 1994; Rhodes et al. 1994; Wissmar et al. 1994). Furniss et al. (1991) stated that "Roads may have unavoidable harmful effects on streams, no matter how well they are located, designed or maintained... Roads modify natural hillslope networks and accelerate erosion processes. These changes can alter physical processes in streams, leading to changes in stream flow regimes, sediment transport and storage, channel bank and bed configurations, substrate composition, and stability of slopes adjacent to streams. These changes can have significant biological consequences that affect virtually all components of stream ecosystems."

Studies in Idaho indicate that, without exception, road construction accelerates surface erosion rates compared to undisturbed conditions (Megahan 1987). According to these studies, sedimentation increases greatly during and after road construction, and then decreases rapidly. However, surface erosion rates and sedimentation generally continue to exceed undisturbed conditions.

Fine sediment degrades salmonid spawning and rearing habitat (Chapman and McLeod 1987; Bjornn and Reiser 1991). Fine sediment deposition in stream gravel and in pools impairs chinook salmon spawning, rearing, and over-wintering habitat (Chapman and McLeod 1987). Specifically, high sediment levels can impair chinook salmon spawning, rearing, and over-wintering habitat by:

1) trapping chinook salmon fry in redds when they are attempting to emerge;

2) depleting intergravel oxygen levels in redds, smothering salmon eggs contained within;

3) limiting aquatic invertebrate populations used as a food source by rearing juvenile chinook salmon;

4) filling and thereby reducing the number of large pools which serve as primary feeding and resting areas for juvenile chinook salmon; and

5) filling interstitial spaces that serve as over-wintering habitat for juvenile chinook salmon.

Cobble embeddedness provides a measure of salmonid over-wintering habitat quality (Chapman and McLeod 1987). Sediment loading increases cobble embeddedness over natural levels,

thereby negatively affecting chinook salmon over-wintering habitat. Increased cobble embeddedness is an indication that sediment loading is contributing to decreased egg-to-fry survival in chinook salmon redds (Chapman and McLeod 1987).

Fine sediment deposited in a stream is directly related to chinook salmon egg-to-fry survival. As fine sediment increases above approximately 19%, chinook salmon egg-to-fry survival starts to decline (Stowell et al. 1983). As fine sediment reaches 30%, egg-to-fry survival declines rapidly (Tappel and Bjornn 1983; Chapman and McLeod 1987; Burton et al. 1993). As sediment becomes deposited in interstitial spaces, rearing habitat for juvenile salmonids is also reduced.

Additionally, stream turbidity can be a problem for salmonids. Migrating salmonids avoid waters with high silt loads and, often, cease migration when such loads are unavoidable (Cordone and Kelley 1961). Newly emerged fry are more sensitive to turbidity than are older fish. Salmon and steelhead, *Onchorynchus mykiss*, juveniles exhibit reduced growth and emigrate sooner from streams containing turbidity in the range of 25-50 nephelometric turbidity units (Sigler et al. 1984).

b. Road Developments in Watersheds with High Quality Habitat

Wilderness, roadless, and large blocks of primitive lands contain most of the best available remaining habitat for chinook salmon spawning and rearing (Thomas et al. 1993; Eastside Forests Scientific Society Panel 1994; Rhodes et al. 1994). For example, in impacted portions of Bear Valley Creek, Idaho, chinook salmon populations have declined compared to unimpacted Middle Fork Salmon River tributaries (Rich et al. 1992). Similar comparisons were made in coastal Oregon, Washington, and California (FEMAT 1993) where primitive areas were shown to retain the best habitat and strongest fish populations. Eastside streams impacted by logging, grazing, and mining have lost 50 to 75% of their large pools since the 1940s, while the number and quality of large pools in comparable streams in less-developed (wilderness or primitive) areas has changed little (Sedell and Everest 1991; McIntosh et al. 1994). These large pools serve as important holding areas for adult chinook salmon and rearing areas for juvenile chinook salmon.

Many roadless areas are steep, unstable, high elevation lands where road construction is likely to increase mass failure rates, erosion, and sediment yield, thereby degrading some of the best habitat remaining for salmon. These areas also moderate flow regimes and deliver high quality, low

temperature water and organic and inorganic materials at natural rates to downstream habitats. Many of these undeveloped areas now serve as habitat and species strongholds from which chinook salmon could re-colonize other areas as habitats recover. A map denoting those undeveloped areas and the location of listed salmon (presently and historically) is unavailable. Such information is necessary to ensure that good habitat is maintained and poor habitat is restored, until more comprehensive strategies are available.

In parts of the Snake River Basin, roadless regions are extremely fragmented, often relatively small, and most are not directly protected from road construction and subsequent timber harvest, even in steep areas. For example, in four eastside National Forests including the Umatilla and Wallowa Whitman considered by the Eastside Scientific Society Panel (1993), only 10% of roadless regions on slopes >60% are protected; only 15% of roadless areas on slopes of 30-60% are protected. Protection of roadless regions smaller than the 5000 acre size included in the RARE (Roadless Area Review and Evaluation) II inventory may be important for maintenance of salmon spawning and habitat support functions because they constitute a significant percentage of remaining roadless patches (Eastside Scientific Society Panel 1993), and because only a small percentage of RARE II roadless areas are protected. For example, in the Wallowa-Whitman NF, 39% of 41 remaining roadless patches are <5000 acres in size, and only 15% of late successional/old growth forest in RARE II areas was protected administratively or in wilderness (data on other forest types in RARE II areas was not provided). In the Umatilla NF, 32% of 19 remaining roadless patches are <5000 acres in size, and only 35% of late successional/old growth forest in RARE II areas was protected administratively or in wilderness.

c. Road Maintenance

The LRMPs as amended by PACFISH provide standards and guidelines for road maintenance. The primary goal is to mitigate sediment production to a level that would meet or exceed state water quality standards.

Severe erosion is almost inevitable if roads are not regularly maintained, and thus regular maintenance is a high priority. Some short-term increase in sediment transport may result from grading of road surfaces or installation of improved drainage structures. Snowplowing methods that cast snow onto unstable fill-slopes and road shoulders may result in increased slope erosion or slumping. With a snow shoulder at roadside, rain

can accumulate along the road and cause rilling of road surfaces. Traffic on a rain soaked or recently thawed road can contribute to surface rutting and erosion. However, failure to properly maintain road drainage can result in much larger sediment inputs to streams.

Because of the potential for short-term adverse effects from such earthwork and related activities, proposed road obliteration projects must be meticulously implemented to minimize adverse effects. NMFS believes that most road maintenance and obliteration, where carefully implemented, is not likely to result in adverse effects to listed salmon or their habitat. This belief is based on the recognition that maintenance and obliteration of roads are generally necessary and beneficial for long-term maintenance and restoration of stream habitat (Furniss et al. 1991).

3. Timber Management Direction

LRMPs provide timber management parameters regarding silviculture and vegetation treatment, establishment of allowable sale quantities (ASQ), and fire management. PACFISH removes RHCAs from the base for scheduled timber harvest. It also requires watershed analysis prior to salvage logging in RHCAs and only allows salvage in RHCAs if it does not retard or prevent attainment of RMOs and does not result in adverse effects to listed species and critical habitat. However, RHCAs can be adjusted on a site-specific basis or following watershed analysis. PACFISH also provides interim direction on silvicultural practices within RHCAs and harvest following catastrophic events.

Presumably, watershed analysis should provide technical information to assure that adverse effects due to timber management in RHCAs are avoided. However, the removal of vegetation from stream banks, riparian areas and adjacent slopes (as could occur following adjustment of RHCAs based on a site-specific analysis) could affect stream habitats and their biota in a number of ways (Chamberlin et al. 1991). Removal of vegetation that contributes shade during summer could cause higher stream temperatures and increased diurnal temperature variation. Canopy reductions can reduce winter water temperatures by increasing heat loss via evaporation, convection, and long-wave radiation. This can slow salmon egg development and increase instream ice development, destabilizing stream banks (Beschta et al. 1987; Chamberlin et al. 1991).

Logging within RHCAs could reduce inputs of large fallen wood into stream channels and onto adjacent banks. Large pieces of wood stabilize stream banks and adjacent hill slopes, capture and store fine sediment, and increase the volume (Carlson et

al. 1990) and diversity of pool habitat that is crucial to survival of juvenile salmonids (Bisson et al. 1987; Hicks et al. 1991).

Logging and subsequent prescribed burning activities also can increase soil exposure, runoff, and surface erosion (reviewed by Chamberlin et al. 1991). Logging increases the risk of surface erosion and mass soil movement due to lower evapotranspiration, higher water yield, and increased stream flow (Heede 1991; Chamberlin et al. 1991).

The potential influence of LRMP management direction on silviculture and vegetation treatment, logging in RHCAs after catastrophic events, the use of equivalent clearcut acres, and fire suppression are discussed below.

a. Silviculture and Vegetation Treatment

The LRMPs as amended by PACFISH provide for silvicultural treatments and salvage logging only if those actions would not retard or prevent attainment of the RMOs or adversely affect listed salmon or critical habitat. A set of specific limitations on silvicultural treatments to make them consistent with the attainment of RMOs and avoiding adverse effects was not established by the LRMPs and PACFISH. Increased sedimentation and delivery of herbicide chemicals into anadromous fish streams are examples of adverse effects to listed species that could result from these projects if not conducted with the utmost care, based on the best available information, such as that provided through watershed analysis.

Certain silvicultural treatments could have potential long-term benefits in restoring habitat functions of RHCAs. Possible beneficial silvicultural treatments include planting to stabilize soil, underplanting to establish native tree species, introduction of prescribed fire and, in some instances, thinning of overdense stands to encourage tree growth. As long as these activities are conducted with non-mechanical methods and all trees are left on site, habitat benefits might be realized from these activities.

Experts disagree on whether silvicultural treatments can be justified in RHCAs, given the lack of data on their effects on salmon habitat. Some silviculturists point out several possible benefits for vegetative manipulation in some riparian areas. Others, however, argue that insufficient data exist to warrant the use of silvicultural treatments in riparian areas with listed species. Silvicultural approaches that involve removal of vegetation have a high risk of causing adverse

effects to salmon habitat, have low reversibility, and their effectiveness is speculative (Rhodes et al. 1994). With the information base from watershed analysis, land managers would be better equipped to assess whether active management is needed in RHCAs of eastside watersheds.

b. Logging in Riparian Habitat Conservation Areas Following Unplanned (Catastrophic) Events

Catastrophic events are part of the natural disturbance regime which helps maintain diversity of eastside ecosystems (Everett et al. 1994). Such events are often caused by wildfire, insect-related mortality, and disease. Research on effects of fire shows that riparian areas are the first to recover from catastrophic events and may actually benefit from being burned.

Salvage logging can potentially damage critical habitat of listed species and retard the attainment of RMOs. Salvage logging in riparian areas after fire should usually be avoided because the areas are then extremely fragile and cannot withstand roading, yarding, and other salvage activities. Furthermore, wildfire-damaged trees may enhance or accelerate large woody debris recruitment potential and rates. Wildfire dramatically increases runoff and fine sediment while decreasing shading and cover from undercut banks and woody vegetation (Minshall et al. 1989; Minshall et al. 1990; Minshall and Brock 1991). Salvage logging can exacerbate these impacts.

Salvage logging presents several potential problems because of soil disturbance and sediment generated during road construction, yarding, and trucking (Chamberlin et al. 1991). Soil can be disturbed and compacted by logging equipment or by logs being dragged over the ground (Everest et al. 1987). Infiltration capacity of soils is then reduced, and water runs off rather than through the soil, increasing sediment transport. Skid trails and landings can trigger increased mass wasting and sediment delivery to streams.

Besides these potential problems with sediment production, salvage logging can also retard attainment of RMOs by removing trees that are sources of large woody debris for the stream. Large woody debris plays important roles in creating fish habitat by providing cover, retaining spawning gravel, forming pools, retaining organic detritus, and slowing the movement of sediment to downstream reaches (Bisson et al. 1987) especially following wildfires. In eastside ecosystems, new debris principally enters the stream in pulses after fire, rather

than by slow continuous recruitment (Minshall et al. 1990). Cutting and removing trees from the RHCA could leave fewer trees to replace the stream's debris as it is depleted by decay, fragmentation, and transport.

New sources of large woody debris are critical to the stream's recovery after fire. After fire, existing woody debris in the stream channel is often removed by high stream discharge and exported downstream or deposited along the floodplain (Minshall et al. 1990). Beginning after about two years, new woody debris gradually begins to accumulate in stream channels from the undercutting and blowdown of fire-killed trees (Minshall et al. 1990). This large debris serves as accumulation points for sticks and fine detritus, forms pool habitat, and creates new storage sites for sediment.

Large woody debris from fire-killed trees has important roles in sediment routing, not only in streams, but also on hillslopes (Wilford 1984). As the fire-killed trees fall or blow down across the slope, they form cross-slope obstructions. Sediments and small debris from upslope mass movements are deposited behind these obstructions, forming a series of terraces which delay the delivery of sediments to stream channels. Salvage of fire-killed trees could reduce the formation of these beneficial sediment-storage elements on hillslopes, resulting in gully erosion and transport of previously stored sediments into stream channels.

Although salvage logging can have adverse effects on stream ecosystems, it might be warranted in some situations. Effects of wildfire and insect outbreaks under current eastside conditions can be more severe than in natural landscapes because of years of fire suppression (Arno and Ottmar 1994; Mason and Wickman 1994). Therefore, some management activities, including salvage logging, might help to ease the transition to a more natural disturbance regime (S. Chan, pers. comm.).

Salvage of insect-killed trees in riparian areas has been attempted in some situations to protect integrity of riparian vegetation from further insect damage (Daterman 1994). Removal of infested trees from RHCAs, however, would probably be unsuccessful in stopping insect damage because: 1) not all infested trees can be found and removed; 2) infested trees are usually removed after the beetles have emerged in spring; and 3) pest management on a "stand level" is ineffective because of the beetle's strong flight capability (Daterman 1994). To improve success in controlling insect epidemics, a pest management plan for the ecosystem must be implemented on a landscape scale (Daterman 1994).

Salvage to reduce fuel loads might be justified in some situations. Fish may be killed when riparian areas along small streams burn in high-intensity fires (Minshall and Brock 1991). Theoretically, salvage of a proportion of insect-killed trees could be beneficial in reducing risk of high-intensity fires in riparian areas. However, such efforts still must be considered experimental due to a lack of data indicating such actions can be conducted without adverse effects to fish habitat (Rhodes et al. 1994).

Many of the potential adverse effects of salvage logging described above vary depending on watershed conditions. Watershed analysis could be useful in providing information on routing of sediment, large wood recruitment, and hydrology needed to plan benign or potentially beneficial salvage logging actions. Without watershed analysis, forest managers would be less likely to avoid adverse effects on listed species during salvage logging.

c. Equivalent Clearcut Area

Amended LRMPs do not set a limit on timber harvest by watershed. Allowable sale quantities are established for each National Forest as a whole. Some LRMPs provide guidelines regarding the number of times per decade that a given watershed may be entered for the purpose of timber harvest.

In cleared forest areas, the combination of more precipitation reaching the ground, rain-on-snow events, and less evapotranspiration of water by trees can combine to significantly increase soil moisture and water yield from cut areas compared to uncut areas (Chamberlin et al. 1991; Hicks et al. 1991; Satterlund and Adams 1992). Greater water inputs from logged areas can combine on a watershed scale to increase the volume of peak flows and the frequency of channel-modifying flows. These events can increase bed scour and accelerate bank erosion, resulting in higher stream sediment load and lower habitat diversity (Chamberlin et al. 1991), and may disturb or destroy redds (USDA 1982; Bjornn and Reiser 1991). Such problems may manifest throughout the entire downstream basin (Sedell and Swanson 1984). Therefore, individual harvest units must be considered in the context of all other ongoing and prior activities in the watershed.

The concept of Equivalent Clearcut Area (ECA), which is a measure of created forest openings, provides a method for establishing thresholds of concern for cumulative management effects. Because the effect of timber harvest, wildfire, prescribed fire, insect kills, and other natural or management-induced disturbances can result in the same types of cumulative impacts on sediment, streamflow, and water temperature, all these disturbances should be included in

determining an ECA level. ECA can be considered equivalent to the total area of young forest age classes (less than 30 years old; McCammon 1993).

In many watersheds, peak flows appear to rise in a curvilinear fashion with increased timber harvest (Grant 1988), rather than failing to change until after a threshold of forest clearing has been reached. Hydrologic impacts may appear when less than 20% of a watershed is clearcut. For example, peak winter storm flows increased 13% after 19% of a coastal British Columbia watershed was clear-cut (Golding 1987). However, related effects such as sediment mobilization and channel modification may not be evident until a threshold has been reached (Grant 1988; Satterlund and Adams 1992). An ECA level of no more than 15% of a watershed in young age classes (defined as stands less than 30 years old by McCammon {1993}) should confer a low risk of hydrologic effects on streams based on the cumulative effects procedure developed by McCammon (1993) and studies reviewed by Satterlund and Adams (1992).

d. Fire Suppression

The Final PACFISH EA/FONSI establishes goals for fire and fuels management to be designed to allow achievement of RMOs and minimize impacts in RHCAs and streams. These general requirements do not provide specific direction on how to achieve the goals. Three primary sources of watershed disturbance can result from fire suppression actions. These sources include the use of land-disturbing equipment, chemical fire retardants and fuel, and the location of fire camps and fire personnel relative to listed salmon and critical habitat.

Use of heavy fire suppression equipment such as tractors causes vegetation and soil disturbances which can increase sediment delivery to streams. Fire suppressing chemicals and fuels can contaminate streams and kill salmon. All potential sources of contamination need to be identified, and specific plans and methods established to avoid or minimize the potential for contamination of these streams. Location of fire suppression crew camps, staging areas, and heliports within RHCAs in critical habitat can create substantial ground disturbance which may affect listed salmon and their critical habitat. Careful rehabilitation of areas disturbed by wildfire and fire suppression activities can minimize long-term adverse effects to listed salmon and their critical habitat.

4. Mining Direction

All eight LRMPs presented management direction regarding mineral exploration, extraction, and processing. The LRMPs as amended by PACFISH may not provide parameters sufficient to avoid the proposal of mining activities that are likely to adversely affect salmon or their critical habitat. Amended standards and guidelines address mine reclamation requirements "for impacts that cannot be avoided" in RHCAs, but do not clearly instruct managers to avoid salmon impacts from mining. In effect, the standards and guidelines allow the proposal of future mining activity in RHCAs so long as reclamation bonds and plans are prepared. In addition, no guidance is provided on how forest managers should decide whether "impacts (from mineral operation)...cannot be avoided," "no alternative to situating facilities in RHCAs exists," and "no alternative to locating mine waste...facilities in RHCAs exists." Amendments to these LRMPs can be expected to facilitate compliance with the ESA.

Possible effects of mining activities on fish and fish habitats include acid mine drainage, release of toxic metals into streams, sediment production, changes in channel morphology, changes in stream flow regimes, and releases of chemicals used in ore processing (Nelson et al. 1991). Placer and lode mining and associated activities can cause many long-term adverse effects to listed salmon and their critical habitat. These include adverse effects on surface and subsurface water quality and quantity, and on the food base for juvenile anadromous fish.

Recovery of a stream segment from a major spill of toxic chemicals used in mining would likely require a minimum of three years. A high potential exists that a toxic spill would eliminate much of the aquatic life in the affected streams. For example, if a large diesel spill does occur, it could kill 100% of the chinook salmon juveniles, adults, alevins, and eggs for a considerable distance (several miles) downstream of the accident. A spill in the fall could kill all of the one year old juveniles and zero age eggs and alevins, thus eliminating two years of chinook salmon progeny. Spill diesel fuel could mix with spawning gravels and sand and be retained in the stream substrate for a year or more, and thereby negatively affect chinook salmon eggs, alevins, and juveniles for several years (Moles 1980; Korn and Rice 1981; Moles et al. 1981).

Water quantity is sometimes affected through the redirecting and diverting of surface and subsurface water flows, and the elimination of wetlands in the mining area. Mining and associated activities could eliminate natural meadow and riparian wetlands within a drainage. Wetlands are important

in maintaining water quality and hydrologic functions in streams. Sediments, inorganic nutrients, and organic toxicants are removed from water that flows across wetlands. Removal of sediment prior to its reaching streams is important in maintaining the quality of spawning and rearing habitat for Snake River spring/summer chinook salmon, as discussed above. Wetlands also act as storage areas for water during dry periods, thus maintaining a more constant stream flow which also is important for successful salmon spawning and rearing.

5. Grazing Direction

The Final PACFISH EA/FONSI alters the LRMPs by establishing "an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats." This goal is intended to supersede the previous range management riparian goal found in several LRMPs which state that "fair" ecological condition (i.e., less than full ecological function) is adequate. PACFISH will also modify the LRMPs by establishing riparian management objectives (RMOs). PACFISH standards and guidelines require that cattle grazing actions that the USFS determines to be "likely to adversely affect" listed salmon be eliminated or modified so that the action does not retard or prevent attainment of the RMOs. PACFISH will not apply to other grazing actions.

The RMOs define important aspects of stream and streambank condition which need to be attained or preserved to restore or maintain "good" fish habitat. However, timeframes are not provided for the attainment of RMOs; nor are specific grazing standards provided which set a course toward improvement of degraded streambanks and channels and restoration of plant species composition, density, and vigor. Lastly, it is difficult to determine how RMOs can be achieved when a mechanism to control free-ranging cattle has not been developed. Livestock management direction provided by the PACFISH-amended LRMPs is intended to avoid adverse effects from grazing to listed salmon and their critical habitat. Extensive effectiveness monitoring will be needed to ensure that management goals are being achieved under amended standards and guidelines.

Numerous symposia and publications have documented the detrimental effects of livestock grazing on stream and riparian habitats (Johnson et al. 1985; Menke 1977; Meehan and Platts 1978; Cope 1979; American Fisheries Society 1980; Platts 1981; Peek and Dalke 1982; Ohmart and Anderson 1982; Kauffman and Krueger 1984; Clary and Webster 1989; Gresswell et al. 1989; Kinch 1989; Minshall et al. 1989; Chaney et al. 1990.) These publications describe a series of synergistic effects that can occur when cattle overgraze riparian areas. Over time, woody and hydric herbaceous vegetation along a

stream can be reduced or eliminated; trampling by livestock causes streambanks to collapse; without vegetation to slow water velocities, hold the soil, and retain moisture, floods cause more erosion of streambanks; the stream becomes wider and shallower and in some cases downcut; the water table drops; and hydric, deeply rooted herbaceous vegetation dies out and becomes replaced by upland species with shallower roots and less ability to bind the soil.
The resulting instability in water volume, increased summer water temperature, loss of pools and habitat adjacent to streambanks, and increased cobble embeddedness adversely affect listed salmon and their habitat.

The only grazing strategies generally considered to have a good chance for rehabilitating degraded streams and riparian areas are light or tightly controlled uses such as winter-only grazing or riparian pastures, and certain strategies incorporating a full season rest (Platts 1991). Other strategies have proven effective in some studies; however, most research has taken place under experimental conditions where fences control livestock distribution and vegetation use, such circumstances are rarely available on open rangeland with free ranging cattle. Relatively conservative strategies such as rest-rotation can be inadequate if use is not carefully regulated between periods of rest. In general, even where specific grazing standards have been applied, inability to control livestock use of National Forest rangelands (especially on large allotments such as Bear Valley in Boise NF and Morgan Creek in the Salmon and Challis NFs), has resulted in substantial degradation of riparian areas.

Clary and Webster (1989) consolidated a number of studies to outline measures needed for maintenance and restoration of fully functioning riparian areas. They recommend resting most poor ecological condition (percent similarity of riparian vegetation to the potential natural community/composition < 25%; or stream bank/channel condition rating of "poor") riparian areas and applying "riparian grazing management practices" such as spring-only grazing and residual vegetation requirements to riparian areas in fair (percent similarity of riparian vegetation to the potential natural community/composition 26-50% or better; and stream bank/channel condition rating of at least "fair") or better ecological condition. They stress that even ecologically conservative grazing systems will not succeed without good range management such as adequate fencing, good distribution of water and salt, and adequate riding to ensure uniform cattle distribution. The PACFISH-amended LRMPs do not require implementation of these or other range management approaches designed to achieve habitat restoration at rates at or near watershed capability.

The PACFISH RMOs define important aspects of stream and streambank condition which need to be attained to restore or maintain "good" fish habitat. However, timeframes are not provided for the attainment of RMOs; nor are specific grazing standards provided that would set a course toward improvement of degraded streambanks and channels and restoration of plant species composition, density, and vigor. Also, it is difficult to determine how RMOs can be achieved when an effective mechanism to control free-ranging cattle has not been developed. Extensive effectiveness monitoring will be needed to ensure that management goals are being achieved under the amended standards and guidelines.

6. Land and Water Direction Associated with their Classifications

Each LRMP provided management direction regarding various land classifications and land exchange. PACFISH provides interim direction on land acquisition, exchange, and conservation easements. Land exchanges could potentially benefit listed salmon and their critical habitat, if private lands are obtained by Federal agencies and ESA requirements applied. However, when Federal lands are transferred to private ownership, authority to conserve listed salmon may be relinquished. This could result in adverse effects to listed salmon.

7. Recreation Management Direction

Management direction provided by LRMPs proposed to provide a broad range of recreational opportunities in developed and dispersed areas of the Forests. PACFISH standards and guidelines restricted construction of recreational facilities and management of various recreation activities if they retard attainment of RMOs or adversely effects listed salmon or their critical habitat.

Both developed and dispersed camping areas can result in alteration or destruction of riparian vegetation, decreased streambank cover, and resultant decreases in streambank stability. Changes in vegetation from recreational activities in upland and riparian areas appear to be generally similar in type but not in magnitude to effects of livestock grazing (Clark and Gibbons 1991). Burton et al. (1993) found that decreases in streambank stability correspond to increases in surface fine sediment. Increases in stream surface fine sediment result in decreased salmonid egg-to-fry survival (Scully and Petrosky 1991).

Float boating and power boating may also affect listed salmon through disturbance of spawning adults or by physical disturbance of redds. Float boaters may step on redds as they

push their boats over shallow riffle areas where listed salmon are likely to spawn. Jet boats passing over or in close proximity upstream from redds may increase intragravel pressure from high speed motors or disturb sediment which could settle out on listed salmon eggs and reduce egg-to-fry survival.

Anglers can harass listed salmon (intentionally or unintentionally) while fishing for other species; or there may be direct take of adults or juveniles. Humans wading on salmonid redds can measurably decrease egg-to-emergent fry survival (Roberts and White 1992).

Hikers, horseback riders, off-road vehicles, and swimmers also may affect listed salmon through harassment of spawning adults or by physical disturbance of redds. If redds are located at or downstream from heavily used trail crossings, disturbed fine sediment may settle out on listed salmon eggs and reduce egg-to-fry survival.

8. Direction Applied to "Other Managed Animals"

The LRMPs amended by PACFISH also address wild horses and burro management, establishing the standard that management shall be consistent with attainment of RMOs. However, the amended LRMPs do not address big game animals specifically with respect to attainment of RMOs. The interim PACFISH strategy establishes general goals of maintaining or restoring riparian vegetation and natural vegetation functions; those vegetation characteristics may be affected by animals other than domestic livestock.

Big game animals such as deer, elk, and moose may affect listed salmon and their critical habitat by altering riparian vegetation and stream bank stability, especially in meadow areas along C-type stream channels. Available information indicates that additional monitoring of big game impacts is necessary in portions of the Upper Grande Ronde River. In general, however, alterations caused by big game animals are usually minimal and very localized in nature. Watersheds where big game animals may hinder recovery of riparian habitats should be monitored with techniques designed to distinguish between big game and livestock impacts.

9. Monitoring Direction

The Final PACFISH EA/FONSI strategy potentially improves monitoring specificity by identifying RMOs; however, the strategy does not describe how RMOs are to be monitored, and only mentions monitoring in very general terms in relation to

evaluating the effects of resource uses. The amended LRMPs generally give insufficient monitoring guidance to provide consistent, focused evaluations of the effects of land management actions on listed salmon or their critical habitat.

Monitoring is very important, because it provides essential feedback to Forest managers on whether standards and guidelines are being met, whether standards and guidelines are effective, and whether goals and objectives are being met. In addition, monitoring is essential in understanding the ecological foundations of programs, and helps to improve the quality of management activities.

Certain monitoring activities may affect listed salmon and their critical habitat if they are improperly conducted or conducted during spawning time or while eggs remain in the gravel. These monitoring activities include: core sampling for sediment, electrofishing, seining or trapping, and snorkeling. Core sampling can disturb substrate sediment which may settle out in salmon redds located downstream from the sample site. If the core sample is taken within the redd itself, eggs will be damaged or killed. Regarding electrofishing, fish size is important in determining efficiency; larger fish receive a greater body voltage and a more intense "shock" than do small fish (Reynolds 1983). If electrofishing is conducted during a time when adult salmon are present in a stream, they could be injured or killed by voltages used to effectively sample smaller non-listed species. Seining or trapping can injure or kill listed salmon if they are not handled properly; these activities may also harass adult salmon when they are holding or spawning in a stream. Snorkeling is probably the most benign of aquatic monitoring techniques. However, snorkelers should avoid entering streams where they could damage redds or harass adult or juvenile salmon.

C. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purposes of this analysis, the action area includes all USFS lands and adjacent, affected non-Federal land in all watersheds that contain designated critical habitat for listed Snake River salmon and those lands that do not contain designated critical habitat but on which land management actions are subject to section 7 consultation for "may affect" actions (this has, at times, included portions of the Clearwater River basin excluding the North Fork Clearwater River above Dworshak Dam).

In the Snake River Basin, non-Federal lands have been subjected to as great or greater degradation in terms of fish habitat than have Federal lands. Although no information on non-Federal lands was provided in the LRMP BAs, it is apparent that most of the remaining high-quality fish habitat is on Federal lands since non-Federal lands generally are less remote, more accessible, and subject to a somewhat larger array of impacts than Federal lands. However, a substantial portion of the historic salmon spawning and rearing habitat does occur on non-Federal lands. Many of these areas have been degraded by the effects of agriculture, water withdrawals and diversions, urbanization, riparian road building, logging, and livestock grazing (Bevan et al. 1994, Wissmar et al. 1994). This has resulted in loss of riparian vegetation, increased water temperature, increased nutrient loading, loss of pools, and increased fine sediment (for an example of stream conditions on non-Federal land see the discussion of the Tucannon River in USDA 1982a and Theurer et al. 1985). These impacts have substantially reduced the survival of Snake River spring/summer chinook salmon in many watersheds and of Snake River fall chinook salmon in some river reaches.

To some extent, the protective measures included in LRMPs as amended by the PACFISH EA and revised by the NMFS Opinions may reduce the availability of Federal timber, rangeland, and mineral and recreational resources. For example, the draft PACFISH EA predicted that some timber sales within the Clearwater and Nez Perce NFs would be cancelled due to new restrictions. A reduction in livestock grazing in riparian areas is also predicted. Depending on other economic factors that are impossible to predict within the scope of this Opinion, these restrictions could lead to increased resource use on non-Federal lands which, in turn, could result in riparian and fishery habitat damage. There is, however, inadequate information to determine whether these changes in non-Federal actions are reasonably certain to occur.

For the purposes of this landscape scale consultation, NMFS considers that the level of non-Federal activities that are reasonably likely to occur within the action area will continue at the same level as that considered as part of the environmental baseline. NMFS anticipates that the environmental impact statement for LRMP amendments currently underway will better assess the effects of such non-Federal activities for consideration in future ESA consultations.

D. Project-level consultations under current LRMPs

Many site-specific actions with adverse effects on listed salmon species have been proposed under the current LRMPs. Tables 7, 8, and 9 summarize the project-level consultations since Snake River salmon listings. The eight LRMPs as amended

by PACFISH include general and specific direction to protect anadromous fish resources and their habitat and to comply with all environmental laws, including the ESA. NMFS expects that forest managers will continue to have the discretion to propose site-specific land management actions in locations or with sufficient mitigation to minimize or avoid adverse impacts to listed salmon or designated critical habitat. However, based on completed site- and watershed-scale consultations, NMFS finds, based on its experience with these consultations, that the LRMPs do not guide managers to meet their ESA responsibilities at the earliest opportunity when planning project-scale actions.

VIII. CONCLUSION

NMFS' conclusion in this biological opinion is reflective of the programmatic nature of the continuing action under consideration. There is a broad range of possible landscape-level effects on the listed species that would be caused by a correspondingly broad range of potential site-specific actions that would each be consistent with the parameters provided by each existing LRMP considered. The actual broadly distributed effects on the listed salmon that would result from activities that are consistent with plan-level parameters depends upon the extent to which site-specific activities are implemented, thereby realizing some degree of the fullest development possible under the LRMP framework.

In reaching this conclusion, NMFS considered the extremes of the range of effects that could be proposed at the site-specific level, while still consistent with the existing LRMPs even as amended by PACFISH. In NMFS' biological opinion, if managers maximized site-specific development of forest resources permissible under existing LRMPs, the biological requirements of the listed species would not be met; there would be an appreciable reduction in the likelihood of both survival and recovery, and the standards of ESA section 7(a)(2) would not be satisfied.

When, as now, numbers of listed species are below critical escapement levels, it is NMFS' biological opinion that substantial improvements in their spawning and rearing habitat are necessary to ensure that the likelihood of their survival and recovery is not appreciably reduced. Such improvement is therefore essential, together with similar measures in other life stages of these salmon, as presented in NMFS' Draft Recovery Plan, to avoid jeopardy and critical habitat modification.

This conclusion also recognizes the environmental baseline and those cumulative effects reasonably certain to occur as a result of non-Federal land management activities. These factors increase the significance of any adverse effects caused by future proposed site-specific activities consistent with these existing LRMPs.

As stated at the outset, there are several categories of parameters in the LRMPs (e.g. air quality, visual quality and cultural resources) which generally do not affect listed salmon or critical habitat. Others (e.g. implementation of wilderness, roadless, and research natural area management plans) are compatible with their survival and recovery and is considered not likely to adversely affect listed Snake River salmon or their critical habitat.

However, NMFS is concerned that in many other respects the existing LRMPs currently do not foreclose site-specific activities likely to adversely affect the listed species. This fact places great reliance on site-specific ESA consultations to address the effects at the broad-scale as well as the localized, site-specific effects. NMFS believes that the USFS would be better able to ensure the standards of ESA section 7(a)(2) are satisfied by amending its LRMPs to reflect the biological requirements of these listed salmon than to rely exclusively upon site-specific consultations.

For this reason, NMFS recommends that USFS amend or replace the existing LRMPs to provide management direction in the LRMPs themselves which ensures conditions in which the listed species continue to exist into the future and retain the potential for recovery. Because the USFS, along with other agencies, has already published notices of intent to prepare EISs in the Snake River Basin to amend their forest plans, NMFS believes that the USFS has taken an appropriate first step to address the long-term needs of listed salmon. In anticipation of that process, this biological opinion will provide direction for the USFS' investigations, analysis and planning in developing plan amendments.

In Section IX, elements are suggested for inclusion in the EISs to address the long-term needs of the species. In the interim, NMFS has identified a set of goals, objectives, and guidelines that it will apply to watershed and site-specific consultations and that NMFS expects the USFS to address in their ecosystem EISs. These address both site-specific and landscape-scale concerns. Complying with these would give reasonable certainty that ongoing and proposed watershed and site-specific activities would not present the broad-scale or localized effects that would result in jeopardy to listed salmon or adverse modification to their critical habitat. Conformance with these guidelines, in combination with the

implementation of PACFISH, will have the added incidental benefit of preventing further degradation of habitat for other fish species including bull trout, *Salvelinus confluentus*, and steelhead.

IX. GOALS, OBJECTIVES, AND GUIDELINES TO AVOID JEOPARDY ON INDIVIDUAL PROJECTS AND LONG-TERM APPROACHES FOR ECOSYSTEM MANAGEMENT

This suggested strategy and its related guidelines apply to the spawning, rearing and migratory habitat of Snake River spring/summer chinook salmon, Snake River of fall chinook salmon, and Snake River sockeye salmon as it occurs on USFS lands. There are separate guidelines which apply only to Priority Watersheds. The goals, objectives, and guidelines serve as the basis for the conservation of Snake River salmon and their designated critical habitat during the development of a strategy for long-term ecosystem management. They also provide guidance for land management agencies in their development of the upper Columbia River EISs which will amend the LRMPs. These objectives also apply to USFS lands outside designated critical habitat where in management may affect spawning, rearing or migratory habitat for any of the three listed species that are located downstream of USFS lands[3]. Supplemental guidelines that apply specifically to Snake River fall chinook salmon and Snake River sockeye salmon are described in sections IX.K. and IX.L.

A. Overall Goal

The overall goal is to assure that ecological processes that create and sustain designated critical habitat for Snake River salmon are protected and restored to avoid jeopardy to listed species and adverse modification of designated critical habitat.

B. Strategy to Meet Overall Goal

Short-term and long-term strategies are needed to assure that the overall goal is met. The objective of the short-term strategies is identical to one of the main objectives of PACFISH: to avoid further degradation of Snake River salmon habitat. NMFS expects that the requirements of PACFISH and those described in this Opinion will be included in proposed site- and watershed-specific consultations. Additionally, priority should be given to protecting a well distributed,

[3] Because fall chinook salmon spawning areas are located in mainstem rivers relatively far downstream in watersheds or larger subbasins, linkages to land management actions on Federal land often are harder to demonstrate than for the other two species.

interconnected network of watersheds containing the highest quality habitats and habitats with the best potential for restoration. If such "priority" watersheds are managed to ensure a *de minimis*[4] risk of adverse effects to listed salmon and its critical habitat, a slightly higher risk in other watersheds would be acceptable.

Long-term strategies need to provide conditions that foster the maintenance and creation of well distributed, high quality habitats over time. To provide these conditions, disturbance regimes from natural and anthropogenic forces need to be understood. Anthropogenic disturbances must be managed to ensure that ecological processes and functions are maintained and allow for the development of needed habitat conditions in the future. NMFS expects the geographically-specific EISs to propose such strategies.

Until long-term strategies are developed, short-term strategies must be implemented now to protect the best remaining habitat and to begin restoration of the next generation of high quality habitat. Furthermore, short-term management must not further erode options for developing long-term ecosystem strategies. A comprehensive short-term strategy should: 1) set goals and ecological objectives for aquatic/riparian area conditions; 2) set specific riparian management objectives; 3) establish riparian habitat conservation areas (RHCAs); 4) protect RHCAs from further degradation throughout designated critical habitat; 5) provide for a network of well-distributed watersheds containing high quality spawning and rearing habitat and the best potential for restoration (Priority Watersheds); 6) provide for management of Priority Watersheds in a manner that minimizes risk to the existing physical and ecological conditions; 7) provide for and prioritize restoration in Priority Watersheds to help assure that the "next generation" of high quality habitat evolves and that high quality habitats expand and reconnect; 8) require that land management be planned after the best available information on watershed processes and functions is analyzed; 9) develop baseline information and

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[4] *De minimis* is defined as very small or of little significance. The land management activities which represent greater than *de minimis* risk to listed salmon or their habitat may vary by location. Criteria for determining *de minimus* risk will be determined by the USFS and NMFS during the Watershed BA consultation process.

monitor the effects of land management both for consistency with implementation requirements and for progress in achieving ecological objectives; and 10) begin gathering information for developing and not foreclosing options for long-term ecosystem strategies. Where the above elements were not fully completed by PACFISH (see Table 10) the following sections outline additional guidance to fill the gaps.

Table 10. Elements of a short term Aquatic Ecosystem Strategy and needs remaining after PACFISH to complete these elements.

Elements of Comprehensive Short Term Strategy	Needs Remaining After PACFISH to Complete These Elements
1) Ecological Goals and Objectives	Greater Specificity
2) Riparian Management Objectives	(complete)
3) Establish RHCAs	(complete)
4) Anti-degradation of RHCAs	Greater Specificity
5) System of Priority Watersheds	Identify Priority Watersheds
6) Low Risk Management of Priority Watersheds	Stratify Management Requirements
7) Prioritize Restoration in Priority Watersheds	Greater Specificity
8) Analysis of Watershed Processes and Functions Prior to Planning Land Management Actions	Plan Beyond Pilot Projects
9) Develop Baseline Information and Monitor Effects of Actions	Greater Specificity
10) Gather Information for Long Term Ecosystem Strategy	Greater Specificity

C. Ecological Goals

PACFISH established a set of riparian goals to provide a common set of characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. The goals provide an outline of ecological processes and functions under which aquatic and riparian ecosystems developed and unique anadromous fish populations evolved. NMFS has refined and restated the PACFISH goals to provide added detail on ecological function needed for listed salmon and to include landscape and habitat connectivity perspectives. These goals are also established to provide consistency with NMFS basin-wide set of goals that are in the current Draft Recovery Plan for Snake River salmon (NMFS 1995). Consistency with these goals will help NMFS determine whether actions avoid jeopardy or adverse modification of critical habitat during watershed-scale and project-scale consultations:

1. Maintain and restore[5] the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. Maintain and restore timing, volume and distribution of large woody debris (LWD) recruitment by protecting trees in riparian habitat conservation areas. Addition of LWD to streams is inappropriate unless the causes of LWD deficiency are understood and ameliorated.

5. Maintain and restore the water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

6. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

7. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats, retain patterns of sediment, nutrient, and wood routing,

[5] Maintain, where adequate, or restore, where inadequate.

and optimize the essential features of designated critical habitat. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows should be maintained, where optimum, and restored, where not optimum.

8. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

9. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

10. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

D. Riparian Management Objectives

Consistency with the ecosystem objectives above (IX.B.) will be measured in part by progress toward attainment of more specific, riparian management objectives (RMOs) which apply to aquatic and riparian habitats for salmon. These objectives were established in PACFISH to describe good habitat for anadromous fish. The RMOs quantify several of the designated critical habitat features needed for the conservation of salmon. PACFISH established initial, temporary values for the RMOs that could be adjusted on the basis of site-specific data, or following watershed analysis. NMFS assumes the PACFISH RMOs will be implemented.

PACFISH also established a requirement that habitat should not be degraded, regardless of whether current conditions are better or worse than those represented by the RMOs. NMFS assumes that the initial values assigned the RMOs represent a starting point - some watersheds may have lesser capability than the RMO standard and some may have greater capability. Until watershed analysis or other credible scientific analysis provides a basis for adjusting RMOs, NMFS and USFS should use these values as general targets. They will be valuable as

common monitoring criteria and as an indication of where improvements are needed. NMFS recognizes that, especially as field estimates approach these values, inherent limitations in the precision of measurements may constrain the ability to demonstrate attainment of RMOs. Nevertheless, when proposing actions that NMFS will review for ESA section 7(a)(2) compliance, the USFS should ensure that these actions do not retard or prevent attainment of RMOs or degrade existing habitat conditions. For Priority Watersheds, where management should focus on striving for full habitat capability and monitoring essential features of salmon habitat, NMFS identified two minor revisions to the PACFISH RMOs and added an RMO for sediment.

E. Riparian Habitat Conservation Areas

Protection and management of RHCAs is a principal means by which the ecological objectives and RMOs may be attained. RHCAs are areas comprising the stream channel, adjacent riparian areas, unstable areas, and other areas that are directly linked to geomorphic, hydrologic, and ecological processes that determine the quality of fish habitat and that serve as connecting corridors. The definition of RHCAs, their implementation, and standards and guidelines for conserving them are given in PACFISH. NMFS assumes the PACFISH RHCAs will be implemented.

PACFISH allows RHCAs to be adjusted based on either watershed analysis or consideration of existing stream-reach or site-specific data. NMFS believes that reducing RHCA widths prior to watershed analysis poses a risk that important watershed-scale considerations that may affect RHCA effectiveness would not be considered.

F. Priority Watersheds Guidelines

1. Contribution of Priority Watersheds to the Overall Goal

Frissell (1993) described the urgency of protecting high quality habitats:

> "Instead of the ideal matrix of high-quality habitat with patches of disturbed habitat, we find that we have created a matrix of disturbed, degraded, and depauperate habitat, surrounding a few tattered remnants of high-

> quality habitat that still support locally abundant and diverse assemblages of native fish."

Anadromous salmonids exist in dynamic environments. Natural and anthropogenic disturbances have caused temporal and spatial variability in fish habitat within and between watersheds. If areas of good quality habitat are isolated, then there is the risk that they could be further fragmented, resulting in restrictions on salmon migration and dispersal and possible extirpation due to disturbance events. Priority areas need to be large enough to accommodate for inevitable natural and anthropogenic disturbances, and to allow for the temporal and spatial evolution of varying ecological features, including adequate areas of interconnected high-quality fish habitat.

An ecosystem-based approach that considers entire watersheds and river subbasins is needed to ensure that all the physical, biological and chemical processes and conditions that contribute to the development of productive salmon habitat at watersheds and smaller scales are maintained (Eastside Forests Scientific Society Panel 1994; Forest Ecosystem Management Assessment Team {FEMAT} 1993). FEMAT (1993) summarized several papers emphasizing the importance of a watershed-scale approach in protecting "refugia, or designated areas providing high quality habitat":

> "Although fragmented areas of suitable habitat may be important, Moyle and Sato (1991) argue that to recover aquatic species, refugia should be focused at a watershed scale. Naiman et al. (1992), Sheldon (1988) and Williams et al. (1989) noted that past attempts to recover fish populations were unsuccessful because the problem was not approached from a watershed perspective."

2. Identification of Priority Watersheds

NMFS, with the assistance of and technical information from the USFS, will identify the priority watersheds. NMFS undertakes this to fulfill its obligation to utilize the best science available to meet the Snake River salmons' needs in their currently endangered status. Priority Watersheds should be well distributed across the landscape inhabited by the

Snake River spring/summer chinook metapopulations (see Table 5 in Opinion). Criteria for identifying Priority Watersheds should include:

Watersheds that meet any of the Habitat Criteria or the Subpopulation Criterion below should qualify as Priority Watersheds:

Habitat Criteria

a. Habitat for spring/summer chinook is in good condition[6] and the watershed also is in good condition (i.e. minimal disturbance); **or**

b. Habitat for spring/summer chinook is in good condition but the watershed is in marginal condition (i.e. biologically significant disturbance history) with a high potential (relative to other watersheds) for being restored; **or**

c. Habitat for spring/summer chinook is in marginal condition but habitat and watershed have a high potential (relative to other habitat/watersheds) of being restored. Focus for this category should be on small (i.e. 3rd - 5th order) watersheds that are within larger watersheds (i.e. section 7 watersheds) containing other category 1 and 2 Priority Watersheds. This will enhance the likelihood of expanding and reconnecting high quality habitat and foster salmon recolonization of marginal habitat; **or**

d. Area is not known to be populated by spring/summer chinook but provides important support to downstream habitat as described in categories 1, 2, and 3 above, through export of high quality water and organic/inorganic materials and by moderating flow regimes. Generally these will be moderately steep to steep, relatively pristine areas with constrained stream channels.

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[6] Include spawning and rearing habitat. "Good habitat" may include:
(1) low-gradient, unconstrained, generally Rosgen C-type channel "flats" with high productivity historically or currently, as well as;
(2) steeper gradient, constrained, moderately productive reaches (generally Rosgen B-type channels).

Subpopulation Criteria

a. Area contains spawning or rearing habitat for a metapopulation for which adequate habitat has not been identified using the above Habitat Criteria. Subpopulations should also be considered, especially where they are hanging on in marginal or degraded habitat. Because of their potential importance to the spring/summer chinook ESU, the watershed should be designated as a Priority Watershed.

Considerations:

1). Subpopulations may need multiple habitat areas identified within or across Priority Watersheds due to the risk of catastrophic habitat loss at the reach scale from fire, landslides, etc. That is, the risk to any subpopulation is higher if only one area of good habitat has been identified for protection in a Priority Watershed.

2). Current spring/summer chinook salmon subpopulation sizes should not, by itself, prevent a watershed from being considered a Priority Watershed. Areas with low escapement today but high or potentially high egg to smolt survival are crucial to the survival and recovery of the listed species.

3. Management Application to Priority Watersheds

In Priority Watersheds, the risk of degradation to existing physical and ecological conditions should be minimized, and the probability of maintaining good habitat conditions maximized. Although there is abundant information on the risks of individual land management actions to listed salmon, procedures for assessing the risk of aggregated land management activities are not presently available. NMFS expects the geographically-specific EISs to address this shortcoming (see IX.K). In the meantime, there are some actions that cause known direct and indirect/aggregated effects. These effects should be avoided, where possible, or reduced to negligible significance to listed salmon. After careful scrutiny of the PACFISH standards and guidelines, NMFS establishes the guidelines listed below to enhance protection in priority watersheds.

4. Riparian Management Objectives for High Priority Watersheds

NMFS believes that, to reduce risks of habitat degradation in Priority Watersheds, the numeric values for the RMOs should only be adjusted to reflect less-optimum salmon habitat conditions if watershed analysis (as described below) indicates that watershed capabilities cannot support the initial values. However, values for the RMOs could be adjusted to reflect more optimum habitat conditions on a temporary basis prior to watershed analysis without increasing risks to listed salmon.

For Priority Watersheds, where management should focus on striving for full habitat capability and monitoring essential features of salmon habitat, NMFS identified two minor revisions to the PACFISH RMOs and added an RMO for sediment (see Table 11). A sediment RMO is necessary because of the potential for sediment to effect listed salmon and their habitat, as outlined in effects section of this Opinion. NMFS assumes PACFISH RMOs will be implemented for the Snake River Basin and that the following additions and changes apply to Priority Watersheds:

a. **Substrate Sediment:** The addition of objectives related to sediment production and quantifying sediment presence is necessary because of the significance of sediment to salmon reproduction. Sediment can degrade or destroy spawning and rearing habitat and smother or alter the development of salmon eggs and fry. This problem is particularly acute in the Snake River Basin because of highly erodible granitic and ash soils.

The recommended objective based on a review of disturbed and undisturbed watersheds (Rhodes et al. 1994) is as follows: Limit stream surface fine sediment (<6.4 mm in diameter) or fine sediment by depth to <20% in spawning habitat[7]. Alternatively, cobble embeddedness may be used if procedures already are in place[8]. Adjust land management practices to

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[7] A depth component may be appropriate where substrate armoring is a concern.

[8] The likely lack of consistent methodology among National Forests/Ranger Districts and within subbasins is a concern for monitoring (refer to section H.1., below).

reduce fine sediment delivery, increase residual pool volumes, and reduce fine sediment volumes where fine sediment is higher than natural. NMFS realizes that fine sediment levels are highly variable and that effective monitoring for sediment is difficult and costly. For example, some undisturbed watersheds may have fine sediment levels in excess of 20%. Like all RMOs, this is not intended to be a management requirement rather, it is included as a general benchmark that USFS managers should aim toward until such time that watershed analyses support a change.

b. **Cobble Embeddedness**: If used, limit to <30% in rearing habitat.

c. **Width/Depth Ratio**: As stated in PACFISH, stream width-to-depth ratios of greater than 10/1 indicate habitat degradation. NMFS believes this objective should be stratified by Rosgen channel type.

d. **Streambank Stability**: At least 90% of all stream banks should be stable. PACFISH established an RMO of 80%; however, the best available data for the Snake River Basin indicate that almost all stream channel/substrate types are capable of streambank stability greater than 85% (USDA Forest Service 1992). Striving for a full complement of stable streambanks is important because of the essential functions stable streambanks have in providing cover for juvenile fish, reducing sediment inputs, and helping regulate flow, which in turn increases habitat suitability and complexity.

Table 11. Riparian Management Objectives (RMOs) in the PACFISH EA and as addressed by this Opinion.

Habitat Feature	RMOs in PACFISH	Expectations for RMOs in this Opinion
Pool frequency (all systems)	Varies by channel width from 9 mi^{-1} for 200-foot wide streams to 96 mi^{-1} for 10-foot wide streams	Same
Water Temperature (all systems)	No measurable increase in maximum temperature; maximum temperatures <64F in migration and rearing habitats and <60F within spawning habitats	Same
Large Woody Debris (forested systems)	>20 pieces mi^{-1}; >12 inch diameter, >35 foot length	Same
Substrate Sediment (all systems)	No objectives established	Fine Sediment: <20% in spawning habitat. If cobble embeddedness used, <30% in rearing habitat
Streambank Stability (non-forested systems)	80%	90%
Lower Bank Angle (non-forested systems)	>75% of banks with <90^0 angle (i.e., undercut)	Same
Width/Depth Ratio (all systems)	<10	<10; stratify by channel type

5. Guidelines for Specific Actions Affecting Priority Watersheds

Land management actions should be planned and executed such that the direct, indirect and aggregate effects of land management within Priority Watersheds pose no more than a *de minimis* risk of adverse effects to riparian/aquatic habitats and listed salmon. The aggregated land management actions within these watersheds should demonstrate a high probability that high quality habitats will be maintained, expanded, and reconnected. The guidelines described below apply in conjunction with the PACFISH standards and guidelines for project-specific actions. The guidelines that are within the discretion and authority of the USFS should be implemented.

a. Mining

Some guidance is provided in PACFISH for mining actions within RHCAs. However, these guidelines allow for impacts within RHCAs when no alternative can be identified outside these RHCAs. Mining activities can adversely affect salmon and their habitat by producing acid drainage, releasing toxic metals and chemicals, producing sediment, and changing stream channel morphology and flows (Nelson et al. 1991). The guidelines below pertain to new mining activities and are intended to build on the PACFISH approach to ensure attainment of the RMOs and ecological objectives:

1) In Priority Watersheds, the USFS should use the full extent of its authorities to ensure that new mines, including hard-rock, placer, sand and gravel, and other mining operations (ore body, waste rock, spent ore, tailings, roads, milling, chemical storage, housing, etc.) are located outside of RHCAs. There may be some exceptions for activities with a *de minimis* risk of adverse effects. Examples of activities that may pose more than a *de minimis* risk include: 1) new roads, and 2) actions with impacts greater than 3 acres, and 3) actions which cause modifications that cannot be restored within one year.

2) The USFS should complete watershed analysis in Priority Watersheds prior to approving plans of operation for mineral activities outside RHCAs that are likely to adversely affect listed salmon, designated critical

habitat, or the ecological processes and functions described in the ecological goals above. Based on watershed analysis results, the USFS should adjust proposed plans of operation or, if necessary, prohibit mining operations to prevent degradation of the ecological processes and functions and adverse effects to listed salmon and designated critical habitat. Watershed analysis may not be necessary for mineral activities with *de minimis* risk of adverse effects. Examples of mineral activities outside RHCAs that pose more than a *de minimis* risk include: a) actions that will retard or prevent attainment of the RMOs; and b) actions that will degrade any of the essential features of designated critical habitat (as described at 58 FR 68543) that would diminish the value of the habitat for the survival and recovery of listed salmon.

b. Timber

PACFISH prohibits scheduled timber harvest in RHCAs and requires watershed analysis prior to salvage cutting in RHCAs of watersheds with designated critical habitat. PACFISH requires that other silvicultural practices in RHCAs not retard or prevent attainment of the RMOs. While these are good general requirements, NMFS believes that additional precautions to avoid and minimize the risk of habitat degradation in Priority Watersheds are warranted.

Experts disagree on whether silvicultural activities such as thinning can be justified in RHCAs due to a lack of data on their effects to salmon habitat (Rhodes et al. 1994). Furthermore, PACFISH allows for adjustment of RHCAs prior to watershed analysis. Timber management activities within RHCAs, in the absence of watershed analysis are likely to vary between National Forests and Ranger Districts. Given this uncertainty, there is risk that timber management activities in RHCAs could degrade salmon habitat by altering recruitment of large woody debris, sediment delivery, temperature, and other ecological features.

Furthermore, timber management guidelines outside RHCAs were not established by PACFISH. Excessive even-age harvesting outside RHCAs could intensify water yield, peak flows and alter peak flow timing, thereby changing temperature regimes, destabilizing streambanks, and raising sediment loads in

Priority Watersheds. The guidelines below are designed to avoid such adverse effects and to promote attainment of the RMOs.

1) PACFISH requires watershed analysis prior to salvage cutting within RHCAs in watersheds with designated critical habitat. NMFS adds that in Priority Watersheds, the potential significance of adverse effects to salmon and their habitat is heightened. Therefore, if the USFS proposes any salvage or silvicultural activities within RHCAs that pose more than a ***de minimis*** risk of adverse effects to listed salmon or critical habitat, NMFS expects the USFS to demonstrate clearly, based on both watershed and site-specific analyses, how these actions will avoid adverse effects to salmon and their habitat and how they will not retard or prevent attainment and maintenance of ecological goals and RMOs. Examples of actions that pose more than a ***de minimis*** risk in RHCAs include: machinery-related ground disturbance; b) cutting of live fire-resistant tree species (e.g. ponderosa pine, Douglas fir, western larch and lodgepole pine); c) cutting of any native species of trees or shrubs that are contributing shade to the stream; and d) cutting or removal of any large trees[9] from RHCAs that could contribute to maintaining or restoring a natural regime of large woody debris recruitment.

2) a) For new/proposed timber sales, the USFS should evaluate equivalent clearcut area (ECA) in Priority Watersheds. If the ECA[10] exceeds 15% of the potentially forested area, a watershed analysis should be conducted prior to initiating actions that

[9] The Eastside Forests Scientific Society Panel (1993) recommended no cutting of any tree species older than 150 years or with a diameter at breast height of greater than 20 inches. NMFS believes this to be a prudent recommendation, particularly within RHCAs.

[10] Properly designed and implemented salvage operations in burned over areas should have little impact or no effect on ECA, depending upon watershed-specific factors. The USFS, with NMFS, should develop watershed-specific criteria to evaluate the effects of such salvage operations on ECA.

would increase ECA. Actions that would increase ECA should proceed after watershed analysis only if there is low to *de minimis* risk of adversely affecting fish habitat and if attainment and maintenance of ecological goals and RMOs will not be retarded or prevented.

b) For ongoing (sold/awarded) timber sales that USFS has determined are likely to adversely affect listed salmon or their designated critical habitat, the USFS and NMFS should use existing information to evaluate whether these sales, when added to the aggregated effects (environmental baseline) of timber activity in the watershed, would retard or prevent the attainment of ecological goals and RMOs in the watershed.

3) For proposed/new actions, watershed analysis should be conducted prior to reducing RHCA widths in Priority Watersheds.

c. Roads

The PACFISH guidelines for road management generally were adequate for road management. However, for ongoing actions such as road maintenance, the PACFISH guidelines apply only if land managers decide they are necessary to prevent an unacceptable risk of habitat degradation or adverse effects to listed salmon. Many scientific studies support these guidelines that address the link between forest roads and changes in drainage networks and instream sediment, both of which can adversely affect salmon habitat. The guidelines below build on the PACFISH guidelines by prioritizing road restoration and management actions for Priority Watersheds. PACFISH called for development of Road Management and Transportation Management Plans that will address road closure, obliteration, maintenance, and inspection plans for each road. The USFS informed NMFS during the PACFISH consultation that these plans will not be completed during the interim PACFISH period.

1) a) For proposed/new roads, where road density is greater than 2 miles/square mile in Priority Watersheds, the USFS should reduce road mileage and

emphasize road closure, obliteration, and revegetation. McCammon (1993) described water and sediment delivery effects associated with road densities greater than 2 miles/square mile.

b) For ongoing road development actions, the USFS should demonstrate that new roads are being offset by concomitant reductions in road mileage and road restoration in Priority Watersheds.

2) Road Management Plans and Transportation Management Plans required by the interim PACFISH guidance should be completed and implemented in Priority Watersheds as soon as feasible. The status of these plans, schedules for completion, and effects of not completing these plans should be analyzed and described in the EISs for ecosystem management. The EISs should include a strategy for completing these plans.

d. Roadless Areas

Many roadless areas are relatively steep, unstable lands where road construction and logging is likely to increase mass failure rates, erosion, and sediment yield, thereby degrading some of the best habitat remaining for salmon. These areas also moderate flow regimes and deliver high quality, low temperature water and organic and inorganic materials at natural rates to downstream habitats. Many of these undeveloped areas now serve as habitat and species strongholds from which chinook salmon could re-colonize other areas as habitats recover.

Protection of roadless regions smaller than the 5000 acre size included in the RARE (Roadless Area Review and Evaluation) II inventory may be important for maintenance of salmon spawning and habitat support functions because they constitute a significant percentage of remaining roadless patches in some Eastside Forests (Eastside Scientific Society Panel 1994), and because only a small percentage of RARE II roadless areas are Congressionally or administratively protected. NMFS agrees with the Eastside Forests Scientific Society Panel's finding that roadless areas of 1000 acres or larger are significant. These areas should be carefully evaluated for their importance in meeting ecological goals and RMOs in Priority Watersheds for Snake River salmon.

A comprehensive inventory of these areas and their spatial and ecological relationship to salmon habitat (presently and historically) is unavailable. Such information is necessary to ensure that good habitat within or downstream of roadless areas is maintained. In parts of the Snake River Basin, roadless regions are fragmented, often relatively small, and most are not protected from road construction and subsequent timber harvest, even in steep areas.

The functions and values of roadless areas for maintaining and restoring ecological conditions in Priority Watersheds should be carefully evaluated prior to proposing new actions in these areas. Collectively, the actions must pose no more than a *de minimis* risk of degrading these functions and values.

1) The USFS should provide to NMFS following the issuance of this biological opinion the following information to facilitate project-level consultations. NMFS requires the following information to adequately describe proposed effects of actions involving road construction in roadless areas under consultations under 50 C.F.R. 402.02:

    a) a map of roadless areas to include inventoried and non-inventoried roadless areas of 1000 acres or greater in the Snake River Basin;

    b) descriptions of the roadless areas including names, locations, sizes and general geomorphological characteristics;

    c) a description of any planned or proposed road construction in these areas during the next two years;

    d) an analysis of the impacts of the proposed road system on ecological goals, RMOs, Snake River salmon and their designated critical habitat.

e. Restoration

Restoration activities should initially be focused in Priority Watersheds selected as such due to their restoration potential. The USFS should prioritize watershed restoration for funding as soon as possible. Ultimately, watershed

restoration planning should be based on watershed analysis. However, the USFS should not wait to commence restoration efforts. The following guidelines apply to the short term:

1) Watershed restoration plans should be developed for Priority Watersheds within the context of broader area plans (subbasin, Forest, etc.) where possible.

2) Special emphasis should be provided to implement multi-agency restoration plans in readily restorable habitat.

3) Direct restoration of RHCAs or stream channels, including but not limited to additions of large woody debris, should be only be undertaken concurrent with a corresponding change to the management regime responsible for the habitat degradation.

4) Priority should be give to watershed restoration actions that will help improve degraded stream reaches adjacent to or connected to remaining reaches of high quality habitat (Frissell 1993, Frissell et al. 1993). This will help restore connectivity and bolster recolonization.

G. Forest-Wide Guidelines

The following guidelines apply Forest-wide to both priority and non-Priority Watersheds. These are needed in addition to those in PACFISH to assure that direct harm to listed salmon and indirect harm through habitat impacts is avoided:

1. Access to Spawning Habitats and Redds

To prevent harassment of spawning salmon and damage to spawning substrate and redds, the USFS should eliminate or adequately restrict access, including livestock, off-road vehicles, anglers, etc., during spawning and incubation periods. The effectiveness of this effort could be maximized by expanding outreach and education programs in cooperation with state agencies to promote awareness of the need for protection of spawning fish and redds. This effort may also require additional enforcement of ESA regulations prohibiting take.

2. Transport of Toxic Chemicals

PACFISH prohibits the storage of toxic chemicals in RHCAs but does not address transportation. The USFS should minimize risk of toxic fuel spills during transport through RHCAs by using alternative routes where feasible, and taking all other possible precautions.

3. Water Conveyance Management

PACFISH guideline LH-3 provided some interim direction on the issuance of leases, permits, rights-of-way, and easements but did not specifically address water conveyances. Juvenile and adult listed salmon could be killed, their spawning and rearing habitat reduced and degraded, or their migration adversely altered by water conveyances and their associated intake structures and pipes. NMFS assumes that PACFISH guideline LH-3 addresses these concerns to the extent of USFS discretion and authority. In particular, NMFS expects implementation of LH-3 to assure that water conveyance intakes with the potential to trap or impinge listed salmon would meet NMFS' established intake screening criteria before use is approved and that permits would be authorized or re-authorized only if streamflows are adequate to not retard or prevent attainment of RMOs and not adversely affect listed salmon.

4. Mining Management

Some interim guidance is provided in PACFISH for mining actions within RHCAs. These guidelines still allow for impacts to RHCAs when no alternative can be identified outside these corridors. Mining activities can adversely affect salmon and their habitat by producing acid drainage, releasing toxic metals and chemicals, producing sediment, and changing stream channel morphology and flows. The guidelines below are intended to build on the PACFISH approach and ensure compliance with the RMOs.

The following mining management guidelines that are within the discretion and authority of the USFS should be implemented:

a. The USFS should work with the Environmental Protection Agency and the State water quality agency to ensure that draft plans of operation for new mines that have the potential to produce acid rock drainage (either in the ore body, pregnant ore storage area, waste rock storage

area, or mine tailings storage area) are conditioned so that the mines will not adversely affect groundwater or surface water quality in a manner that would adversely affect fish habitat or retard or prevent attainment and maintenance of ecological goals and RMOs.

5. Fire Suppression Management

PACFISH included general guidelines but left some uncertainty about control of possible effects of various methods that could be used during fire suppression. This uncertainty, combined with the requirement for quick suppression decisions, could result in salmon habitat impacts from ground disturbance or vegetation removal that are more harmful than effects of the fire. Ground disturbing activities used in fire suppression may alter natural water drainage patterns and timing and increase sediment delivery to salmon habitat. The guidelines below are intended to clarify the existing guidelines and reduce existing uncertainty.

a. The USFS should submit to NMFS, by June 1 before each fire season, an outline that the National Forests will use to brief Fire Overhead Teams regarding responsibilities for protecting salmon habitat under the ESA.

b. Following a fire that affected RHCAs in watersheds with designated critical habitat, the USFS should review the suppression and rehabilitation efforts to determine whether the requirements and tactics identified in the Fire Situation Analysis or Escape Fire Situation Analysis were successfully implemented and if the revegetation and rehabilitation of the burned area were successful. A report should be submitted to NMFS for review within 15 months following fire containment.

H. Procedural Guidelines for Existing Watershed Bas

1. The USFS plans to screen ongoing actions[11] by March 26, 1995 (30 days after the signing of the PACFISH decision notice). Continuation of the activities that have successfully passed through these PACFISH screens is not anticipated to pose a significant threat of harm to listed salmon. NMFS anticipates that ongoing activities that do not pass the PACFISH screens will be modified to comport with PACFISH and that watershed consultations will be completed rapidly after this occurs.

2. Upon identification of Priority Watersheds the USFS will continue consultations on new/proposed actions in the 47 watershed BAs that have been submitted. In those consultations, the USFS will have the opportunity to modify all proposed actions so that they comport with the salmon and habitat protection requirements in PACFISH and this Opinion; or NMFS may set forth such modifications as reasonable and prudent alternatives to the actions proposed where appropriate. This process should ensure that both the direct and indirect aggregated and cumulative effects of ongoing and proposed actions in the BAs should have a low risk of damaging or delaying recovery of Priority Watersheds.

3. Forty-seven watershed biological assessments have already been submitted for ongoing grazing activities that may affect listed salmon or their critical habitat. For grazing activities which are likely to adversely affect listed salmon, the USFS should document how the grazing activity will be modified to meet the PACFISH grazing standard of "do not retard or prevent attainment of RMOs or adversely affect listed salmon."

I. Monitoring and Reporting

Monitoring and reporting are essential to ensure that standards and guidelines are being implemented, that progress is made toward achieving ecological and riparian management

[11] Ongoing actions are defined as those actions that have been implemented, or contracts awarded, or permits issued and (within the range of listed anadromous salmonids) for which BAs have been prepared and submitted for consultation prior to the signature of PACFISH, February 24, 1995.

objectives, and that the goals and objectives are effective in achieving the conservation of listed salmon. Monitoring procedures were not provided in PACFISH; however, a PACFISH monitoring committee is being formed. The following guidelines pertain to monitoring and reporting, and should be made part of PACFISH implementation and included in development of the EISs:

1. The PACFISH monitoring committee should oversee experimental design, data collection, quality control and analysis methodologies, and reporting. Sampling and analysis protocols should be developed in cooperation with a statistician and should be scientifically valid and repeatable.

2. The PACFISH monitoring committee should provide NMFS with a schedule for development of the monitoring program within 14 days of the signature of this opinion.

3. The following components of a monitoring program should be carried out, with priority for effectiveness monitoring given to Priority Watersheds:

    a. implementation monitoring and reporting for all actions included in watershed BAs that may affect listed salmon or their designated critical habitat;

    b. effectiveness monitoring and reporting annually for groups of actions (by activity type, time, and subwatershed or watershed) that may affect listed salmon or their designated critical habitat. Priority should be given to Priority Watersheds and to actions that receive incidental take statements. Effectiveness monitoring should entail periodic measurement of important habitat components, including but not necessarily limited to the attributes comprising the RMOs;

    c. permanent photo-monitoring plots to enhance continuity in monitoring efforts and establish baseline information against which landscape modifications can be compared and future decisions can be weighed; and

d. plan and begin validation monitoring to determine whether the assumptions used in forming the aquatic ecosystem strategy described in this biological opinion are valid.

4. The USFS should provide to NMFS an annual report on implementation of the guidelines in this Opinion until such time as the LRMPs undergo significant amendment, which would cause a reinitiation of consultation.

5. NMFS and the USFS should establish a monitoring quality control team to conduct and oversee random spot checks of the implementation of PACFISH and LRMP directives. The team will report its findings to the NMFS Regional Director and USFS Regional Foresters.

J. Watershed Analysis

Watershed analysis provides a potentially valuable tool for watershed management. For this reason, NMFS strongly recommends that the USFS complete as many watershed analyses as feasible before completion of the two EISs.

Watershed analysis emphasizes the importance of determining watershed status, resilience and capabilities, examining ecological relationships, and identifying watershed restoration and monitoring objectives, strategies, and priorities prior to planning actions in the watershed (Watershed Analysis Coordination Team 1994). Watershed analysis ideally should be completed before actions are planned, rather than in response to actions that already are planned.

Ideally watershed analysis should be carried out in Priority Watersheds prior to planning and implementing new land management actions that may affect listed salmon or their designated critical habitat. PACFISH requires watershed analysis prior to road building in RHCAs, salvage logging in RHCAs of watersheds with designated critical habitat, and new recreation facilities in RHCAs. However, PACFISH did not establish a schedule for watershed analysis or an agreed-upon protocol.

The USFS should ensure that watershed analyses are conducted in a consistent, scientifically credible manner. Therefore, there should be a process established for quality control,

which could include peer review or interagency quality review. Watershed analysis should be designed and carried out to meet the goals described on p. C-18 to C-19 of the March 18, 1994 Draft PACFISH EA, in accordance with the following steps and timeframes:

1. Watershed analyses should follow the protocol developed and now under revision by the Interagency Watershed Analysis Coordination Team.

2. Within 30 days of the implementation of PACFISH, the USFS should provide NMFS with a schedule of proposed watershed analyses in 1995 and 1996, and should provide NMFS with copies of the resulting analyses when completed.

K. Additional Guidelines for Snake River fall chinook salmon

1. Strategy considerations

The combination of Priority Watersheds and the general requirement to not degrade habitat conditions should help protect watershed functions that support fall chinook salmon spawning and migratory habitat. However, quantitative cumulative effects analyses have not been provided to NMFS to determine how land management actions affect downstream fall chinook critical habitat.

2. Guidelines for Management at the Landscape and Watershed Scales:

Assess cumulative effects of upstream land management activities on mainstem fall chinook critical habitat, particularly in the Clearwater River.

L. Additional Guidelines for Snake River sockeye salmon.

1. Strategy considerations:

Snake River sockeye salmon should be adequately protected in Redfish Lake by the Guidelines that apply to sections C. through K. of this Opinion. However, broodstock may be outplanted into other Snake River Basin lakes, necessitating additional measures to protect this species.

2. Guideline for future outplanting efforts:

To protect emerging populations of sockeye from human impacts during critical life stages, the USFS, in cooperation with the State of Idaho and fishing and boating organizations, should undertake a public information program a year in advance of outplanting sockeye salmon broodstock progeny in any Snake River Basin lake. The purpose of this program would be to enlist public approval of, and support for, management measures designed to protect fisheries resources.

M. Long-Term Approaches for Ecosystem Management at the Landscape and Watershed Scales

Long-term strategies need to allow for landscapes and watersheds to create and maintain well distributed, high quality fish habitat over time. To do this, disturbance regimes from natural and anthropogenic forces need to be understood and accommodated. Anthropogenic disturbances must be managed such that ecological processes and functions are maintained and to leave a legacy that allows for the development of needed habitat conditions at the stream reach and watershed scales (see the Ecosystem Objectives at Section IX.C.). The long time horizon covered by LRMPs provides an appropriate time scale in which to achieve intermediate and long term goals for habitat restoration and recovery of populations of listed species. As previously stated, NMFS anticipates that the geographically-specific EISs will propose LRMP strategies that foster the maintenance and creation of well distributed, high quality habitat over time. Additionally, broad scale evaluation makes it possible to identify and evaluate cumulative impacts of multiple activities, many of which may individually appear insignificant but which in the aggregate may jeopardize the continued existence of listed species.

Baseline information on the physical, chemical and biological attributes of the forests and their watersheds has not been collected, synthesized and used in a cohesive and consistent manner. NMFS expects this to occur during development of the two broad USFS EISs that will apply to these eight forests.

The LRMP EISs should evaluate one or more alternatives with a high probability of ensuring the survival and recovery of listed salmonid species. The EISs should evaluate alternative

land allocations, allowable sale quantities, grazing intensities, management area prescriptions, desired future conditions, and other decisions that affect the intensity and timing of management actions on USFS lands, thereby affecting the ecological processes and functions that create and sustain salmon habitat.

The following additional information and analyses, which are landscape- and watershed-scale topics, should be addressed in the EISs. This information is necessary to comply with National Environmental Policy Act requirements (e.g. for describing the affected environment, evaluating alternatives, etc.):

1. Develop a strategy that establishes adequate high quality habitat at the basin-wide scale for healthy salmon subpopulations and metapopulations over the long term. This includes consideration of spatial and temporal variability in salmon habitat so that future gains in high quality habitat will counteract the losses caused by natural processes as well as anthropogenic activities. The strategy should include determination of levels of resource use which have a high probability of maintaining high quality habitat, restoring degraded habitat, and restoring connectivity (FEMAT 1993; Frissell et al. 1993) between high quality habitats. It should also consider and refine criteria for prioritizing restoration actions among watersheds. To accomplish this, the following steps may be necessary:

2. Describe the range of historic conditions and disturbance regimes.

    a. Describe historic aquatic habitat condition and flow regimes.

    b. Describe natural disturbance regimes and frequencies.

    c. Explain and model the relationship between natural and human-induced disturbance events.

3. Describe desired future conditions.

   a. Describe desired future conditions in terms of the range of natural variation rather than discrete values. Modify and develop existing values in response to this information.

   b. Develop linkages or models to explain relationship between local habitat features and broader, landscape scale features.

4. Refine the delineation of important areas of biological diversity within watersheds.

5. Adjust land allocations and outputs of goods and services to reflect the ecological requirements of listed salmon. This adjustment should include allocating habitats for salmon survival and recovery in accordance with the importance of those habitats and acceptable levels of risk outlined above.

6. Identify and protect enough pristine or relatively pristine well-studied watersheds (section 7) to serve as "reference areas" or benchmarks against which long-term effects of restoration and land management projects can be measured.

7. Develop a monitoring program that will:

   a. document subbasin-scale trends in habitat quality and quantity, and (in cooperation with state agencies) fish populations; and

   b. monitor and evaluate reference watersheds, and other watersheds where restoration and land management projects are more active than reference watersheds, to determine if watershed restoration and management programs are meeting the habitat maintenance and improvement objectives.

8. Coordinate with the fishery agencies, Tribes, BPA, EPA, BOR, BLM, NRCS, NPPC, local governments, and private landowners to develop long-term subbasin habitat management plans.

9. Establish as one of the purposes of the EISs that all LRMPs should promote the survival and recovery of listed salmon.

10. All water conveyances across national forest lands should be catalogued and the state-granted water rights associated with each identified. Efforts should be taken to resolve discrepancies and conflicts identified between water conveyances, state water rights, and the RMOs. Proposed conveyances affecting Priority Watersheds should be given a priority for this analysis.

X. REINITIATION OF CONSULTATION

The Ninth Circuit in Pacific Rivers Council v. Thomas, supra, has held that existing LRMPs are continuing agency "actions" within the meaning of the ESA and implementing regulations. That holding presumably implies that the plans remain subject to the requirements of 50 C.F.R. 402.16. Under that provision, consultation must be reinitiated if: (1) new information reveals that management direction may affect listed species or critical habitat in a manner or to an extent not previously considered; (2) the direction is modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this Opinion; or (3) a new species is listed or critical habitat designated that may be affected by the management direction.

In Section IX, NMFS provides guidance for the USFS to address concerns at two scales: the immediate effects of project actions and the broad aggregate effects across the species' range. Implementation of this guidance should achieve the goals of: (1) maximizing likelihood of compliance with section 7(a)(2) at the earliest opportunity in planning site-specific actions; (2) increasing the efficiency and allowing speedy conclusion of consultation for site-specific actions; (3) establishing common understandings of project-scale protections and information needs between the USFS and NMFS; and (4) clarifying the broad parameters contained in current plans to meet the stated goals of improving anadromous fish resources and riparian habitat on USFS lands. NMFS advises the USFS, in its compliance with ESA section 7(a)(2), to monitor the effectiveness of these expectations in meeting the above goals.

If, through this monitoring, it is clear that these goals are not fulfilled, NMFS would consider that to be new information for the basis of a reinitiation of consultation on the LRMPs.

In this consultation, NMFS assumed that the USFS will continue to develop the eastside EISs, with a goal of releasing a draft EIS for public comment in October, 1995. NMFS, in this consultation, identified elements that the USFS should include in these EISs that will address long-term needs of listed salmon. If development of the EISs is cancelled, suspended or delayed (past December, 1995), NMFS would consider that to be a change in the proposed action relevant for a reinitiation of this consultation.

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XII. APPENDIX A
CONTINUING ACTION: LAND AND RESOURCE MANAGEMENT DIRECTION

Each National Forest's LRMP and Record of Decision address a wide array of management direction to be applied to its respective lands. The management direction (or continuing action) is programmatically applied in the form of desired future conditions, goals, objectives, and standards and guidelines. Table A1 summarizes ten broad categories of management modified by the management direction developed in each of the LRMPs. Within each broad category there are more resource entries that add clarity and bring definition to that broader land or resource category. These subcategories are subject to LRMP management direction and National Forest regulatory and permitting oversight that NMFS considers to be the "continuing action". The ten broad categories are: (1) fish and water quality management, (2) road management, (3) timber management, (4) minerals management, (5) range management, (6) land and water classifications, (7) recreation management, (8) other managed animals, (9) monitoring, and (10) miscellaneous management activities. Immediately following Table A1 is a description of LRMP management direction for each of the categories.

Table A1. Summary of broad and specific land and resource management categories over which each National Forest maintains authorizations or oversight responsibilities. A description of the management direction applied to each category immediately follows this table. Blank cells indicate that the land or resource category was not addressed in a Forest-specific LRMP or ROD.

#	PROPOSED LAND AND RESOURCE MANAGEMENT CATEGORIES	NATIONAL FORESTS [1]							
		STNF	CNF	SNF	PNF	WWNF	UNF	BNF	NPNF
1. Fish and Water Quality Management									
a.	Anadromous Fish Habitat	x	x	x	x	x	x	x	x
b.	State Water Quality Standards	x	x	x	x	x	x	x	x
c.	Water Quality (Sediment, etc.)	x	x	x	x	x	x	x	x
d.	Riparian Areas	x	x	x	x	x	x	x	x
e.	Resident Fish	x	x	x	x	x	x	x	x
f.	Water Rights (Diversions, etc.)	x	x	x	x	x	x	x	x
g.	Hydropower	x			x	x	x	x	x
h.	Soils (Productivity, Erosion)	x	x	x	x	x	x	x	x
i.	Domestic Water Supply Watersheds	x		x	x	x	x		x
2. Road Management									
a.	Access	x	x	x	x	x	x	x	x
b.	Transportation	x	x	x	x	x	x	x	x
3. Timber Management									
a.	Silviculture and Vegetation Treatments	x	x	x	x	x	x	x	x
b.	Allowable Sale Quantity (ASQ)	x	x	x	x	x	x	x	x
c.	Fire (Protection, Suppression, Prescribed Burns)	x	x	x	x	x	x	x	x
d.	Pest Management	x	x	x	x	x	x	x	x
e.	Firewood Cutting	x	x	x	x	x	x	x	x
4. Minerals Management									
a.	Exclusion of New Mineral Activities from Wilderness	x	x	x		x	x	x	x
b.	Lands Available for Mineral Entry	x	x	x		x	x		x

#	PROPOSED LAND AND RESOURCE MANAGEMENT CATEGORIES	NATIONAL FORESTS [1]							
		STNF	CNF	SNF	PNF	WWNF	UNF	BNF	NPNF
5.	**Range Management**								
a.	Range and Grazing	x	x	x	x	x	x	x	x
6.	**Land and Water Management**								
a.	Wilderness	x	x	x	x	x	x	x	x
b.	Research Natural Areas	x	x	x	x	x	x	x	x
c.	Management Area Direction	x	x	x	x	x	x	x	x
d.	Undeveloped Areas (Roadless)	x	x	x	x	x	x	x	x
e.	Endangered American Wilderness Act of 1978								x
f.	Central Idaho Wilderness Act of 1980		x	x				x	x
g.	Wild and Scenic Rivers	x	x	x	x	x	x	x	x
h.	Land Exchange and Acquisition	x	x	x	x	x	x	x	x
i.	Special Areas (Landmarks, Trails)	x	x	x	x	x	x	x	x
7.	**Recreation Management**								
a.	Public Recreation	x	x	x	x	x	x	x	x
8.	**Other Managed Animals**								
a.	Wildlife Habitat	x	x	x	x	x	x	x	x
b.	Old-growth Wildlife Habitat	x	x	x		x	x	x	x
c.	Threatened and Endangered Species	x	x	x	x	x	x	x	x
9.	**Monitoring**								
a.	Monitor Forest Goals	x	x	x	x	x	x	x	x
10.	**Other Management Considerations**								
a.	Visual Quality	x	x	x	x	x	x	x	x
b.	Cultural Resources	x	x	x	x	x	x	x	x
c.	Treaty Rights	x			x	x	x		x
d.	Local Economy and Community	x	x	x	x	x	x	x	x

#	PROPOSED LAND AND RESOURCE MANAGEMENT CATEGORIES	NATIONAL FORESTS [1]							
		STNF	CNF	SNF	PNF	WWNF	UNF	BNF	NPNF
e.	Air Quality	x	x	x	x	x	x	x	x
f.	Law Enforcement	x	x	x	x	x		x	
g.	Database Development		x		x				
h.	Interagency Coordination	x	x	x	x	x	x	x	x

[1] STNF = Sawtooth National Forest; CNF = Challis National Forest; SNF = Salmon National Forest; PNF = Payette National Forest; WWNF = Wallowa-Whitman National Forest; UNF = Umatilla National Forest; BNF = Boise National Forest; NPNF = Nez Perce National Forest

1. Fish and Water Quality

This category covers management directions pertaining to anadromous and resident fishes, water quality standards, riparian areas, water rights, hydropower, soils, and domestic water supply watersheds. The anadromous fish program goals are similar to the resident fish habitat management and restoration programs. They include protecting, maintaining, or enhancing anadromous fish spawning and rearing habitat and riparian conditions in order to maintain or increase viable populations. These goals are to be accomplished by applying Forest-wide standards and guidelines to protect aquatic and riparian resources and by monitoring: (1) the effectiveness of riparian habitat standards, (2) fish habitat improvement projects (3) limiting factors restricting fish spawning and rearing; and, (4) impacts from National Forest activities such as timber harvesting, range, mining, recreation, and road management activities. LRMPs from the Payette, Umatilla, Boise, and Nez Perce NFs stated objectives for maintaining streams at certain percentages of habitat potential. For example, the Nez Perce NF would maintain streams containing chinook salmon habitat at 90% of potential, streams with westslope cutthroat trout, *Onchorynchus clarkii*, or steelhead at 80% of their potential, and any other streams at 70% of their potential. These objectives allow for a 10-20% reduction of habitat potential in anadromous fish streams. Other LRMPs did not list specific objectives for maintaining habitat potential.

All eight LRMPs directed that state water quality standards be met or exceeded, and some LRMPs including Federal water quality standards. The goal was to maintain or enhance water quantity, quality, and timing of streamflows to meet downstream needs. This would be accomplished through meeting fishery and water quality objectives, best management practices (the set of practices in LRMPs which, when applied during implementation of a project, ensures that water-related beneficial uses are protected and that state water quality standards are met), and improvement projects to protect streams, stream banks, riparian areas and wetlands. Objectives for minimizing soil erosion and sediment delivery to stream channels and for managing wetlands and floodplains are also included in some LRMP water quality sections.

Riparian management direction, objectives, desired future conditions, and standards and guidelines were included in all

eight LRMPs. The RMOs, as established in the Final PACFISH EA/FONSI and NMFS Opinion, provide a consistent set of interim targets for riparian areas and fish habitat. The riparian areas were to be maintained and enhanced (regarding their value for wildlife, fisheries, aquatic habitats, and water quality) by minimizing the disturbance associated with land management activities (mining, timber harvest, road construction, etc.), reducing erosion from existing roads, managing recreation use, altering grazing systems for domestic livestock, and constructing fish habitat improvements. These included maintaining vegetative cover, allowing no detrimental changes in water temperature or chemical composition, permitting no additional water blockages, and reducing erosion and sediment delivery.

Six of the eight LRMPs included management direction on hydropower. Hydropower included both Federal Energy Regulatory Commission (FERC) and non-FERC projects. Some LRMPs encouraged hydroelectric production while others recognized only a limited potential for hydroelectric developments. Other LRMPs contained statements that the National Forest would review hydroelectric projects on a case-by-case basis using the expected benefits, environmental and social consequences, and consideration of other resource objectives and activities as guidelines. Anticipated non-FERC National Forest water development projects for National Forest management purposes were primarily related to livestock and wildlife water developments.

All LRMPs contained direction on soils management. The goals were generally to maintain or enhance soil productivity. This was to be accomplished through diminishing potential erosion during actions such as revegetation after fire, using logging techniques which minimize soil disturbance, identifying and protecting lands with shallow soils, minimizing detrimental soil conditions such as compaction, puddling, displacement, and severe burning. Goals and objectives related to soils were to be met through continued efforts to prevent soil damage and to mitigate prevention techniques. The maintenance or enhancement of soil productivity inherently reduces soils eroding into streams inhabited or used by listed salmon.

Each LRMP contained management direction for the protection of instream flows through an analysis of proposed water uses, diversions, and transmission applications. A large percentage of the water draining into the Snake River and its tributaries

is used for irrigation and other agricultural and industrial purposes. Many time water users may cross Federal land during the transfer of water from the source (stream) to its use (irrigated field). In order to convey water across Federal property, the water user is typically required to obtain various special use permits for rights-of-way from USFS.

Six of eight LRMPs addressed domestic water supply watersheds. Compared with management in other parts of these National Forests, different management strategies and practices were used in public supply watersheds. The goals were to maintain or improve water quality and streamflows, and to minimize the potential for adverse impacts on water quality from sediment, petroleum products or chemicals to comply with public supply watersheds objectives. Examples of these strategies are reduced timber harvest level and road construction, and more conservative (less ground disturbing) fire suppression practices.

2. Roads

Each LRMP presented general management direction regarding road construction, reconstruction, and maintenance. The Nez Perce NF LRMP specified that all roads be designed to mitigate at least 60% of the predicted sediment resulting from new road construction; other LRMPs did not list specific sediment mitigation levels for road construction. Some LRMPs specifically addressed road closure and road obliteration policies, while others did not. Some LRMPs addressed the importance of providing fish passage at road crossings on streams which contain anadromous or resident fishes; others did not. Other factors pertaining to roads which were presented in some LRMPs, but not in others, were road density indices and entry frequency guidelines.

3. Timber

The LRMP management direction on timber includes silviculture and vegetation treatment, establishment of an allowable sale quantity (ASQ), fire management, pest management, and fuelwood (firewood) management.

4. Mining

All eight LRMPs presented management direction governing mineral exploration, extraction, and processing. In general, the direction encouraged valid exploration and development of mineral resources, while minimizing surface impacts. All National Forest lands are open to mining except those areas that have been specifically withdrawn from mineral entry. The LRMPs list areas that have been withdrawn from mineral exploration, such as wilderness areas and administrative sites. Mining claims that predate withdrawal, including those within wilderness, may continue to be worked under existing mining laws, if they contain a valid discovery of a valuable mineral. USFS designated roadless areas are not withdrawn from mineral exploration. General standards and guidelines regarding access, operating plans, mitigation, reclamation, and monitoring are presented in each LRMP.

5. Range

All eight LRMPs established management direction for livestock grazing and range management. Direction differed among National Forests. For example, Sawtooth NF, Challis NF, and Umatilla NF set a goal to maintain suitable range in satisfactory (ecological state of fair or better with an upward or stable trend) condition, and improve suitable range that is in less than satisfactory condition. By contrast, the Salmon NF, Payette NF, Boise NF, and Nez Perce NF set a goal to improve any range that was in less than good ecological condition. Several National Forests also established goals of maintaining or slightly increasing the current level of livestock use. Most National Forests also included a goal for maintaining or increasing their noxious weed control efforts.

Other range management goals and objectives that may affect listed salmon or their critical habitat mentioned for some National Forests included high quality range administration, predator control, providing forage and space for elk, completing range improvements (seeding, prescribed fire, water developments, fences, etc.), protecting threatened and endangered species, and continuing or improving range stewardship programs and coordination with private, state, and Federal entities.

With the exception of the Salmon NF and the Payette NF, LRMPs included standards and guidelines with general utilization prescriptions based on range condition. The utilization levels prescribed by each LRMP varied among National Forests.

6. Land and Water Classification

All LRMPs provided management direction for areas classified as wilderness, Research Natural Areas (RNAs), undeveloped (roadless) areas, wild and scenic rivers, special areas (historic landmarks, trails, etc.), and land exchanges. The LRMPs also divided each National Forest into "Management Areas" with different management goals, resource potentials, and limitations. Management of wilderness areas, RNAs, those roadless areas that remain roadless, and special areas are generally not likely to adversely affect listed salmon species or their critical habitat; and, in fact, their management could have restorative or beneficial effects.

The National Forests differ in their approaches to defining management areas. The Challis NF, Salmon NF, Payette NF, and Boise NF define management areas in terms of geographic blocks, with a single management prescription or set of management prescriptions within each block. The other National Forests define management areas primarily in terms of type of management prescription (Wilderness, Semi-Primitive, Timber Production, etc.) or type of location (Corridors, Backcountry, etc.) and provide maps or descriptions of where the prescriptions are applied. Management areas may encompass parts or all of other land classifications. For instance, on the Payette NF, several different management areas contain one or more RNAs, whereas on Wallowa-Whitman NF, RNAs are all grouped together as a single management area.

All eight LRMPs provided management direction for existing roadless areas. Considerable variability existed between LRMPs regarding the percentages of their roadless areas which were recommended to remain roadless and those which were considered for development. Some LRMPs recommended certain roadless areas for wilderness classification, while others recommended no additional wilderness. These classifications can be found in Table 2 in the body of this Opinion.

Every LRMP indicated that streams within their respective National Forest boundary had been evaluated for wild and scenic river eligibility. Lists of existing and potential

wild, scenic, and recreational stream segments were included; and standards and guidelines regulating management and recreational activities along these streams were presented. For example, developments proposed in or along the shorelines of these streams will not alter the potential classification of the river or stream prior to a detailed suitability study.

Each LRMP presented management direction regarding land exchanges with other Federal or state agencies or with private landowners. Adjustments made in land ownership would, theoretically, allow National Forest land to be managed more efficiently.

The Sawtooth, Payette, Wallowa-Whitman, Umatilla, Boise, and Nez Perce NFs describe special management emphases which are established for portions of their land allocations. The management emphases in some cases allow for higher levels of fish protection than those provided by the minimum standards of the draft PACFISH EA. Examples of these areas include the South Fork Salmon River, Sawtooth National Recreation Area, and Hells Canyon National Recreation Area, and some Research Natural Areas.

7. Recreation

Management direction provided by each LRMP proposed to provide a broad range of recreational opportunities in developed and dispersed areas of the National Forests. Standards and guidelines directed that recreational use be limited and distributed as necessary to protect riparian areas.

8. Other Managed Animals

Each LRMP provided direction regarding management of wildlife habitat through utilization of prescribed fire; maintenance of old-growth stands for old-growth dependent species; and protection of non-piscine endangered species such as gray wolves, grizzly bears, peregrine falcons,and bald eagles. Listed anadromous fish species were not included in this category, because the LRMPs were signed prior to the listing of Snake River salmon.

9. Monitoring

All eight LRMPs established goals and objectives for monitoring and included a monitoring plan. The basic monitoring goals were to determine if standards and guidelines and management area prescriptions are being applied as specified in the LRMPs, and to determine if goals and objectives are being achieved. Objectives of monitoring include: (1) determining how well management prescriptions are responding to public issues and management concerns and opportunities; (2) identifying if there is a need to change management strategies; (3) determining how management practices on other lands within and adjacent to the National Forests affect the achievement of goals and objectives in the LRMPs; and (4) determining the effects of LRMP implementation on the management efforts of other land and resource agencies.

Monitoring plans vary among National Forests, but each contains custodial monitoring requirements for different categories of management activities (timber, range, etc.), a general time schedule, and reporting requirements. Monitoring can provide essential data on the condition of listed fish populations and habitat and the effectiveness of management measures in protecting those resources. The success of these monitoring programs is not known because monitoring reports were not available for this consultation.

Only the Nez Perce NF considered monitoring in their BA. Although all LRMPs discussed some type of custodial monitoring, the monitoring lacks specificity in many cases. For example, the Nez Perce NF listed general monitoring requirements in NFMA, and requirements such as monitoring of riparian areas were described only as being done "through administrative field reviews." Another example is the Challis NF range management monitoring, which simply calls for "measurement of plant composition and vigor, ground cover and soil stability" and "grazing impact studies." This direction could easily allow important aspects of grazing effects on stream and riparian area functions not to be monitored. The lack of specificity raises concern for consistency between National Forests and does not promote development of widely applicable databases.

10. Miscellaneous

All eight National Forests established other miscellaneous goals, objectives, and standards and guidelines. These fell into categories including visual quality, cultural resources, local economy and community, air quality, and interagency coordination. NMFS believes that management direction in these categories would have no effect on listed salmon or their critical habitat.

APPENDIX A REFERENCES

Clark, R. N. and D. R. Gibbons. 1991. Recreation. In W. R. Meehan, (ed.). Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:459-481.