Biological Assessment/Evaluation
Threatened, Endangered, Proposed and Forest Service Sensitive Aquatic Species

Consistency with 2015 Watershed and Fisheries Restoration Program BA and BO

Smith River National Recreation Area Restoration and Motorized Travel Management

Klamath Province
Six Rivers National Forest
Smith River National Recreation Area

November 2016

Prepared by: _____ Date: 2016

Mike McCain
Fisheries Biologist

Reviewed by _____ Date: November 10, 2016

Karen Kenfield
Level 1/Fish Biologist

I. INTRODUCTION

The purpose of this Biological Assessment/Evaluation (BA/BE) is to review and evaluate the proposed Forest Service action, **Smith River National Recreation Area Restoration and Motorized Travel Management (SR RMTM) Project**, in sufficient detail to determine if the proposed action may affect any of the threatened, endangered, or Forest Service sensitive species listed below. This BA/BE is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (19 U. S. C. 1536 (c), 50 CFR 402), and standards established in Forest Service Manual direction (FSM 2672.42).

This BA/BE incorporates the information from the Watershed and Fisheries Restoration Program Biological Assessment (WFRBA) for ESA listed coho salmon and from the Forest-wide Reference Document (April 2016) for FS sensitive aquatic species. The Reference Document contains current management direction, species life history and habitat requirements information (on which effects of proposed projects are evaluated), and literature cited. The Reference Document is updated periodically as species status or other information changes.

The Smith River RMTM Project will determine which system roads are to be upgraded, downgraded, repaired, or decommissioned; and which unauthorized routes will be improved and designated as system roads and trails.

List of Species Considered

The following endangered, threatened, proposed, and Forest Service sensitive aquatic species are addressed in this document. The USFWS provides a species list through a new national website "IPaC" or "Information for Planning and Conversation" (ecos.fws.gov/ipac/). This process is under development and may not contain the most accurate list; therefore, the list of ESA listed species was confirmed during level 1 meetings with National Marine Fisheries Service. The updated species list is located in the current Reference Document (April 27, 2016). The Region 5 Forest Service Sensitive Aquatic Species that were addressed were identified from the US Forest Service – Pacific Southwest Region Sensitive Animal Species List, September 9, 2013. These species are known to or are suspected to occur on the **Smith River NRA** of the Six Rivers National Forest (SRNF).

Species known to occur in the project area.

Species	Status	Critical Habitat Designated	Essential Fish Habitat
Coho Salmon (*Oncorhynchus kisutch*) Southern Oregon/Northern California Coastal (SONCC) ESU	T	Yes	Yes
Chinook salmon (*Oncorhynchus tshawytscha*) Southern Oregon/ California Coasts (SOCC) ESU	FSS	n/a	Yes
Steelhead (*Oncorhynchus mykiss*) Klamath Mountain Province (KMP) DPS	FSS	n/a	n/a
Coastal cutthroat trout (*Oncorhynchus clarkii*)	FSS	n/a	n/a
Pacific lamprey (*Entosphenus tridentatus*)	FSS	n/a	n/a
California Floater (*Anodonta californiensis*)	FSS	n/a	n/a
Chace Juga (*Juga chacei*)	FSS	n/a	n/a
Pristine springsnail (*Pristrinicola hemphilli*)	FSS	n/a	n/a

Magnuson-Stevens Fishery Conservation and Management Act (MSA)

In addition to the ESA, the 1996 Amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), (16 U.S.C. 1801 et seq.) requires the identification of Essential Fish Habitat (EFH) for federally managed fishery species. Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The species that the MSA covers include coho and Chinook salmon. Consultation with NMFS on effects to EFH was accomplished under the WFRBA. This project may affect EFH for Chinook or coho salmon although impacts to designated critical habitat was determined to be negligible and discountable.

Location

The project area encompasses the entire Smith River National Recreation Area and Gasquet Ranger District of the Six Rivers National Forest, in Del Norte County, California (Figure 1). The legal location of the project spans from T19N R1E west to R4E, and south to T13N R2E west to R3E (Humboldt Baseline and Meridian).

II. CONSULTATION TO DATE

In 2007 SRNF consulted with NMFS on the proposed action at that time (Smith River Roads BA 2007). The SRNF received a Letter of Concurrence from NMFS concurring with the determination of “not likely to adversely affect” for the proposed action described in the 2007 BA. With the release of the 2014 SONCC recovery plan, SRNF began work on a Watershed and Fisheries Restoration Program (WFR Program) level consultation with National Marine Fisheries Service to implement actions that are identified in that recovery plan and continue to implement watershed restoration actions under the Aquatic Conservation Strategy.

The Watershed and Fisheries Restoration Biological Assessment (WFRBA) describes 16 activities (instream, riparian, road decommissioning, culvert upgrades, etc.) that meet the ACS and ESA listed fish recovery objectives. The programmatic WFRBA describes the processes, design features and checkpoints by which an activity is developed, implemented and monitored. Activities analyzed in the WFRBA were found to have the potential range of determinations: no effect, Not Likely to Adversely Affect (negligible or strictly beneficial effects) and Likely to Adversely Affect (short term negative with long term beneficial) based on the proximity of the activity to occupied habitat, the probability of an effect occurring, and the magnitude of the potential effect on habitat components and individuals. All projects covered under the WFRBA meet the Aquatic Conservation Strategy and all LRMP standards and guidelines pertaining to anadromous fish species, riparian reserves and water quality objectives.

The Forest received a Biological Opinion on the WFR Program from NMFS on December 14, 2015 due to the potential for some of the activities covered by the WFR program have the potential to result in take of ESA listed salmonids due to heavy equipment operating within occupied habitat or in close proximity to coho habitat. The WFRBA leaves the project specific determination to the NEPA phase of the consulted process.

As part of the WFRBA development, NMFS and USFS biologists reviewed projects under development, including the SR RMTM FEIS. It was determined that the road and trail actions under the FEIS were consistent with those in the WFRBA. The FEIS as a whole, implements action identified in the SONCC coho salmon recovery plan aimed at reducing sediment into the

Smith River. The FEIS, including changes from the 2007 BA, was reviewed on September 7, 2016 with NMFS during a Fish Level 1 Meeting.

This project implements recovery actions under the Final Recovery Plan for the SONCC population of coho salmon (September 2014), in that it implements important identified road-related actions of the Recovery Plan for the Smith River SONCC coho salmon Independent Population. The recovery actions identified for the Smith River Independent Population of SONCC coho salmon (Chapter 15, pp. 15-30 of the Recovery Plan) are as follows:

- Reduce delivery of sediment to reduce road-stream hydrologic connection in the Smith River population-wide including Smith River Plain, North, Middle, and South Forks and tributaries and Mill and Rowdy creeks; Mill Creek Road, and all areas where coho salmon would benefit immediately (SmiR.8.1.15, SmiR.8.1.67),
- Assess and prioritize road-stream connection, and identify appropriate treatments (SmiR.8.1.15.1, SmiR.8.1.67.1),
- Decommission roads, guided by assessment (SmiR.8.1.15.2 SmiR.8.1.67.2), and
- Upgrade roads, guided by assessment (SmiR.8.1.15.3, SmiR.8.1.67.3).

The FEIS was reviewed on September 7, 2015 with NMFS during a Fish Level 1 Meeting. The 2015 FEIS proposed actions were found to be consistent with the process, activities and monitoring described in the 2015 WFRBA and 2015 WFRBO. As required in the WFRBO, annual review of planned implementation would occur at the fisheries Level 1 meetings. Therefore, ESA Section 7 consultation requirements for coho salmon and MSA for coho and chinook have been met and no new consultation is required.

III. CURRENT MANAGEMENT DIRECTION

Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Smith River NRA Act

Section four of the Smith River NRA Act of 1990 describes the purpose of the Smith River NRA: For the purposes of ensuring the preservation, protection, enhancement, and interpretation for present and future generations of the Smith River watershed's outstanding wild and scenic rivers, ecological diversity, and recreation opportunities while providing for the wise use and sustained productivity of its natural resources, there is hereby established the Smith River NRA.

1995 Six Rivers National Forest Land and Resource Management Plan (Forest Plan)

The Forest Plan outlines management direction related to roads, as well as resource protection and watershed restoration related to road use and management. This proposal is consistent with Forest Plan management direction for the project area.

Forest Plan Management Areas

The Smith River NRA is managed under direction provided by eight management areas (or zones). The following areas provide the primary direction for managing aquatic resources:

Management Area 7 – Smith River NRA: The Smith River NRA was established in November 1990, by SB 2566/HB 4309. The primary goals are to emphasize, protect, and enhance the unique biological diversity; anadromous fisheries; and the wild, scenic, and recreational potential of the Smith River while providing sustained yields of forest products.

The Smith River NRA Act legislated specific statutes. The Smith River NRA management plan (Appendix A of the Forest Plan) provides direction to guide compliance with those statutes.

Management Area 9 – Riparian Reserves: Riparian reserves are one of the four components of the ACS as well as a land allocation. Their purpose is to maintain and restore riparian structures and functions to intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The RRs would also serve as connectivity corridors between late-successional reserves (LSRs).

The riparian reserves management direction includes restoration of riparian structures and functions, as well as habitat conservation, improved dispersal habitat, and maintenance of habitat connectivity. Aquatic and riparian habitat has been degraded due to unregulated vehicle access and recreational use, and need protection in order to recover and provide for the needs of fish and wildlife. The proposed action alternatives would improve riparian conditions by removing unneeded routes, and upgrading and stormproofing needed routes to reduce erosion and sediment delivery. The proposed action alternatives are consistent with RR management direction.

Forest Plan Aquatic and Riparian Ecosystems Direction

Pages IV-106 through IV-111 of the Forest Plan includes direction for managing and protecting aquatic and riparian ecosystems, with specific standards and guidelines for managing roads and vehicle access to protect fisheries and other aquatic biota, water quality, and riparian vegetation. Also included in this section of the Forest Plan is the direction for key watersheds. As part of the NWFP ACS, key watersheds are intended to provide a system of large refugia that are crucial to at-risk fish stocks and provide high water quality. Relevant facets of managing key watersheds are included in this section, including the specific requirement of *no net gain* in road miles. Forest Plan standard and guideline 9-17 (p. IV-111) states that watershed restoration should focus on removing and upgrading roads. The Smith River basin is designated as a key watershed. The proposed project will reduce road miles across the district. There will be no net gain in road miles.

Aquatic Conservation Strategy (ACS)

The ACS is intended as a means to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on federal lands managed by the FS and BLM within the range of the northern spotted owl.

In order to make the finding that an action *meets* or *does not prevent attainment* of the nine objectives (listed below), the analysis describes the properly functioning range and current baseline status of environmental indicators, and compare those values to the values expected to result from the effects of the proposed action (Correspondence: Compliance with ACS, May 22,

2007). So the ACS analysis includes: 1) a description of the existing baseline condition, 2) a description of the properly functioning range of natural variability of the important physical and biological components of a given watershed (i.e. indicators), and 3) how the proposed project or management action maintains the existing condition or moves it toward the properly functioning range of natural variability (i.e. effects of the proposed action). The environmental indicators are grouped into pathways that are intended to link to the nine ACS objectives. Management actions that do not maintain the existing condition or contribute to improved conditions in the long-term would not meet the intent of the ACS and thus, should not be implemented.

Implementation of the ACS is the main emphasis this project to aid recovery of fish habitat, riparian habitat, and water quality. The proposed restoration and road decommissioning actions, as well as other route treatments, would result in watershed-scale improvements in the Smith River basin and therefore is the on-the-ground implementation of the ACS.

To facilitate achieving the ACS objectives, four components were established. These four components are riparian reserves, key watersheds, watershed analysis, and watershed restoration. Implementation of these components are intended to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems. These four components are integral to the development, design, and implementation of this project and ensure consistency with ACS objectives.

Riparian Reserves

Riparian reserves are Forest Plan land allocations based on streamside corridors where riparian resources receive primary emphasis and where special riparian reserve standards and guidelines apply. Standards and guidelines for riparian reserves prohibit and regulate activities that prevent attainment of the ACS objectives. Riparian reserves were delineated as part of the process of the 1995 NWFP amendment to the SRNF's Forest Plan. Riparian reserve standards and guidelines are in the Forest Plan on pages IV-46 to IV-50. This project is designed to restore and protect riparian reserves, decommission identified roads, restore areas disturbed by UARs that pose a high risk to aquatic and riparian biota and habitats, and meet the intent of the riparian reserve component of the ACS.

Key Watersheds

The intent of this ACS component is to provide a system of key watersheds that serve as refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. These refugia include areas of high quality habitat as well as areas of degraded habitat. Key watersheds with high quality conditions intended to serve as anchors for the potential recovery of depressed stocks. The entire Smith River basin is a high quality key watershed. Actions within key watersheds would be implemented in a manner consistent with guidance for management within these areas. The intent of activities in these areas would be focused on recovery of Pacific salmonids. Actions designed to reduce the negative effects of the existing road-related infrastructure on aquatic habitats and habitat restoration is emphasized within key watersheds.

The proposed restoration and road decommissioning actions, as well as other route treatments, would result in watershed-scale improvements in the Smith River basin and meet the intent of the key watershed component of the ACS.

Watershed Analysis

As one of the principal analyses that is used in making decisions on implementation of the ACS, watershed analysis is required in key watersheds, for roadless areas in non-key watersheds and riparian reserves prior to determining how proposed land management activities meet the ACS objectives. Watershed analyses have been completed for the entire Smith River basin (1995).

The proposed restoration and road management actions are based on findings of several watershed-scale analyses, including the Smith River basin assessment and sub-basin watershed analyses, and subsequent Smith River NRA road condition inventories and travel analyses, including the *Smith River NRA Roads Analysis Process/Off-Highway Vehicle Strategy* (*Smith River NRA RAP/OHV Strategy*). The *Smith River NRA RAP/OHV Strategy* identified all potential resources risks for every route on the Gasquet District, and developed management recommendations to address those risks. These analyses provide the initial recommendations for route treatments that would increase protections for aquatic and riparian habitats.

Watershed Restoration

Watershed restoration is designed to recover degraded habitat and to restore critical ecological processes that create and maintain favorable environmental conditions for aquatic and riparian-dependent biota. To address and reduce the potential effects and impacts to aquatic dependent species and habitat, concurrent decommissioning of a portion of a route system and restoration of disturbed landscapes can be an integral part of motorized travel management decisions.

Watershed restoration is an integral part of the Purpose and Need of this project and will be a primary emphasis during project implementation to aid recovery of fish habitat, riparian habitat, and water quality. The proposed restoration and road decommissioning actions, as well as other route treatments, would result in watershed-scale improvements in the Smith River basin and meet the intent of the watershed restoration component of the ACS.

Forest Service Manual and Handbooks (FSM/H 2670)

Forest Service Sensitive species are identified by the regional forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that rare plants and animals do not become threatened or endangered and ensure their continued viability on national forests. It is forest service policy to analyze impacts to Sensitive species to ensure management activities do not create a significant trend toward federal listing or loss of viability.

IV. DESCRIPTION OF THE PROPOSED ACTION

The Smith River NRA/Gasquet Ranger District, Six Rivers National Forest, is proposing to designate and manage roads and motorized trails within the Smith River National Recreation Area. The project would address a majority of the system roads and all of the unauthorized routes (UARs) currently existing on the District as identified in the RAP as needing potential actions. Roads and trails proposed for designation already exist on the ground, and no new construction or relocation would occur.

Purpose and Need for Action

Providing for the long-term protection of the Smith River National Recreation Area (NRA) and its resources is essential to maintaining the quality of the recreation experience. There is a need to provide for a system of designated routes for the Smith River NRA that:

- Is safe and responsive to public needs and desires
- Is more affordable and efficient to manage
- Has minimal negative ecological effects on the land
- Is in compliance with the Smith River NRA Act.

Descriptions of the Proposed Management Actions

For the purpose of this analysis, each road and UAR is identified by a unique number and individually listed addressed in the FEIS (*Appendix A. Alternative Tables).* The management actions considered within the alternatives are described as follows:

Changes to NFTS

Open For Vehicle Use

Designation of UARs on the NFTS. Designation of UARs on the NFTS includes identifying vehicle class and, if appropriate, season-of-use. Designations are considered in order to respond to the need for public and administrative motorized access. Mitigations identified in Appendix A would be implemented prior to addition to NFTS

- **Add UARs as Motorized Trails**
- **Add UARs as ML 2, ML 3 roads (ML 3 roads represents inadvertent errors in the transportation atlas)**

Upgrade to ML 2 (open). In some cases, a road is designated as ML 1 (closed to motorized use) but is currently drivable and identified as having a high recreation need. Upgrading these roads to ML 2 provides for access by high-clearance vehicles. Upgrading to ML 2 provides public access for street legal and non-street legal classes of vehicles and allows the SRNF to manage use to reduce resource risk. Upgrading may involve road surface improvements, such as installing, repairing or replacing culverts or waterbars where resource risks warrant (see Stormproof under Risk Mitigations).

Downgrading to ML 2 (street and non-street-legal vehicles allowed) (a more restrictive use). Downgrading a ML 3 road, which only allows for street legal, licensed vehicle use, to ML 2 would allow for use by street legal and non-street legal classes of vehicles. Because ML 2 roads allow for both licensed and unlicensed vehicle use, they are considered mixed-use roads.

Convert road to motorized trail. Roads not required for administrative access that provide for public access are converted to motorized trails, where resource risks can be mitigated.

Parking sites. All action alternatives include access to parking sites.

Change the ROS classification from Semiprimitive Non-motorized to Semiprimitive Motorized**:** Reclassification of **requires a project-specific amendment to the LRMP (see Appendix Forest Plan Amendment). The use levels and long-term general popularity of Blackhawk Bar warrant a special-case consideration of a non-significant forest plan amendment to the Recreation Opportunity Spectrum (ROS) designation, in order to provide public access to this area.**

Closed to Vehicle Use

Designation of UARs on the NFTS as ML 1 (closed). Some action alternatives include UARs proposed for designation on the NFTS as ML 1 for future administrative needs. The routes would be designated and put into road storage, which may include removing or repairing road drainage features (including any culverts), installing rolling dips or waterbars and barricading to prevent use.

Downgrading to ML 1 (closed). Downgrading ML 2 to ML 1 would close the road for motorized use (no vehicle class allowed) but would maintain the option of future administrative use. Downgrading to ML 1 is primarily aimed at the reduction of maintenance costs on low-use roads. Downgrading and managing as ML 1 may involve removing culverts and other drainage features to leave the road in a hydrologically maintenance-free condition (road storage) and barricaded to prevent use (see below).

Decommission. Decommissioned NFTS roads are left in a maintenance-free condition (i.e. remove drainage structures, re-establish natural drainage patterns). They are not drivable by motor vehicles and are not part of the NFTS. Decommissioning of roads is considered in order to respond to a variety of criteria, including responding to changes in administrative access needs, minimizing damage to forest resources; minimizing harassment to wildlife; and reducing maintenance costs. For roads that are currently non-drivable and present a low risk, removing the road from the NFTS may simply involve an amendment to the NFTS database; however, in other cases, when a road is still drivable and, or there is a moderate or high resource risk, actions associated with decommissioning listed below may be required.

Management Actions/Mitigations for decommissioning and putting UARs/road into ML1 status

Waterbar. Water dispersion treatments are designed to stop water from concentrating on the travelway surface, reduce the potential for stream diversions (i.e., prevent water from flowing down the road or trail), which reduces the potential for off-site sediment delivery to water resources.

Remove culvert and associated fill. This action is aimed at eliminating the need for road maintenance, re-establishing pre-road construction drainage patterns, and restoring the stream crossing road fill at stable locations, away from streams.

Barricade. This includes the placement of a barrier (gate, earthen mounds or large rock) at the entrance to a road or route. The objective is to prevent motorized use and promote passive restoration of the travelway.

Treat Weed sources. Weeds would be removed by hand and weed propagules (seeds) would be removed from the forest. Weed sources would be treated over multiple years to remove the seed bank

Restoration of Drainage Patterns on Inventoried Unauthorized Routes

The action alternatives include restoring drainage patterns that have been altered by routes. Restored routes are not part of the NFTS. The objective is to leave the route corridor in a natural slope condition that provides for natural slope surface drainage, promotes revegetation and minimizes surface flow and channel diversion, erosion, and sedimentation; and subsequent damage to soil and water resources during storm events (stormproofing). Restoration of drainage patterns is considered in order to respond to a variety of resource concerns, including reducing damage to forest resources. Depending on slope location, type of stream crossings, and surface flow and channel diversion potential of a road or route, restoring drainage patterns on UARs may require as little as a simple barricade or as much as the use of heavy equipment to correct drainage problems. The specific actions needed are based on the site-specific conditions and may include the following treatments:

Resource Protection: Add waterbars/rolling dips, remove culvert and associated fill, and address other resource issues (noxious weeds) prior to barricading.

Barricade. **To prevent unauthorized use, all UARs not added to the system would be barricaded under all action alternatives. UARs that come off of roads identified for decommissioning would not require separate barriers as the decommissioned road would require a barrier placed at the entrance of the road**

Resource Risk Mitigations/Maintaining NFTS roads and motorized trails

Mitigation measures are specific actions that are proposed to avoid, reduce, or eliminate route-related impacts on forest resources. In some cases, the following is both a management action and a mitigation. Appendix A identifies by road or trail mitigations necessary to reduce risk to public safety and impacts to botanical, wildlife, or aquatic species, and water quality. Mitigations

apply to NFTS current and proposed roads and motorized trails. Appropriate BMPs will be applied during implementation of mitigations to protect and maintain water quality. When resource risks are identified as high or moderate in the travel analysis process, mitigations are required to reduce the risk to comply with Forest Plan standards and guidelines (see *History of Alternative Development*). Mitigations are further detailed in *Appendix D. Mitigation Measures*. Within this appendix, mitigation measures for the following:

Seasonal Gate Closures **Changes to season-of-use designations on NFTS roads and motorized trails. Season of use can include adding seasonal gates to prevent spread of POC root disease or to temporarily restrict use of a road or trail to where damage to sensitive plants, soil, or water resources may otherwise occur.**

Stormproofing. **Stormproofing includes actions on open roads and trails that would reduce the risk of road failure in storm events. This includes adding waterbars/rolling dips and drainage improvement (culvert addition, repair or upgrade). In addition, ML 1 roads in "road storage" would be made hydrologically maintenance free by removing or repairing drainage features including activities such as water bars/rolling dips, culvert removal and gating as needed to prevent motorized use.**

Griffin Creek Bridge Repair. This is a phased bridge repair focused on removal and demolition. This phase includes removing the bridge railing for re-use when the deck and curbs are re-established in the second phase; removing and demolishing the concrete deck, glulam girders and steel diaphragm members; and removing and demolishing the offset pier down to the top of the pier footing at ground elevation. The bridge repair design is to be fully supported from abutment to abutment. The second phase entails excavating the base of the existing abutments to establish a new center footing to complement the two exterior footings for each abutment. The forms will be constructed for reinforced concrete columns to tie into footings, and three steel girders on abutment seats with new diaphragms between girders will be installed. The girders will be painted, the formwork for the deck constructed, the reinforced concrete deck poured and curb installed, and the bridge railing reinstalled.

Additional Resource Mitigations (as per Appendix A of FEIS):

- Route Delineation **would occur by placement of a physical barrier to travel, such as large boulders or other imported material, in close proximity to the motorized trail prism, designed to keep vehicular traffic on the designated road or motorized trail and prevent unlawful use.**

- Maintain Roads and Trails **as per the *Six Rivers Road Maintenance Project* and associated motorized trail maintenance analysis included in Appendix D.**

- Addition of Gravel for POC Mitigation: **Reinforce existing gravel on roads or add new gravel along sections of road and motorized trails near POC to reduce vehicle contact with mud and reduce the spread of PL root disease to uninfected POC populations.**

- Sensitive Plant Species: The Sensitive Plant Species Management Actions would be followed and would include route **delineation through use of boulders, logs etc to protect sensitive plant species.**

- **Naturally Occurring Asbestos. This is aimed at increasing public awareness about the potential exposure to naturally occurring asbestos while traveling on newly designated NFTS roads and, or motorized trails, and the risk associated with exposure. Information may be made available in maps and literature available at the Gasquet Ranger District office, or through signage.**

Resource Specific Design Criteria applicable to all Action Alternatives

Project implementation would be consistent with the activities described in the Watershed and Fisheries Restoration Program biological assessment (BA) (2015). Changes to the design features listed within the BA would be discussed with NMFS Level 1 to ensure variations to the following design features would not cause an effect that was not analyzed.

- Individual projects with the potential to generate sediment would typically be implemented annually during the Normal Operating Season (between June 15 and November 1) or first significant rainfall, whichever comes first. Actual project start and end dates are based on weather predictions and rainfall predictions. The work window can be extended to November 15 contingent on appropriate dry weather conditions and stream flows.
- Reduce delivery of sediment to stream network through upslope watershed restoration projects. Road and trail related actions fall into two main categories:
- First: maintaining and upgrading the identified minimum road (and trail) transportation system as determined through travel management plans and implemented through past and future decisions across the Forest to prevent existing road network from degrading

such water quality impacts occur, and programmatic/public notice road closures. This includes:

- Upgrading undersized or worn out pipes,
- Storm-proofing by adding rolling dips to prevent diversions at stream crossings,
- Changing Maintenance Level of road (either increase or decrease to meet management objective)
- Closing roads - make the road unavailable for vehicle use, make hydrologically maintenance free and could include:
- installation of gates (for Level 1 roads and or seasonally for POC concerns)
- placement of boulders or earth berm/vehicle trap to prevent traffic on UAR not added
- Maintaining and improving OHV and non-motorized trails to reduce sedimentation and could include:
- Sediment reduction work on routes not added to trail system as identified in Appendix A of the FEIS.
- Relocation of recreation sites/reducing impacts.

- Second: Implementing decisions to decommission system roads, trails and unauthorized routes to restore drainage patterns (i.e, removing culvert, re-establish vegetation, re-contour).
- Limitations on the amount of ground disturbing work in watersheds would occur to reduce the risk of multiple ground disturbing actions occurring that would lead to excess water quality concerns.
- Griffin Creek Bridge is a full spanning bridge and allows for full passage and will not affect habitat/flow conditions.
    - Site containment during demolition so concrete wash water or other concrete does not enter stream. When concrete is poured to construct bridge footings or other infrastructure in the vicinity of flowing water, work must be conducted to prevent contact of wet concrete with water (e.g., within a cofferdam). Concrete or concrete slurry will not come into direct contact with flowing water.
    - Falsework will be installed to keep bridge debris and construction, maintenance, and repair materials from falling into streams during demolition, construction, and substantial maintenance and repair activities.

Water Quality, Soils, Geology

To reduce the risk of sediment delivery to streams, all applicable best management practices (BMPs) will be implemented. Best management practices are located in *Appendix D. Mitigation Measures*.

Restoration, decommissioning, downgrading and upgrading work will occur when stream flow is at a minimum, typically during the dry season. Streams will be dewatered where necessary prior to any activity involving heavy equipment. Specific dewatering methods (pipe, pump, etc.) will be determined on a site-by-site basis.

Native or straw mulch will be applied to all disturbed ground prior to seasonal rain or summer thunderstorms to minimize surface erosion.

Decommissioned or restored stream channel side slopes and channel bottom gradients will be designed to blend with the natural channel above and below to minimize potential for unexpected channel adjustments.

Large rocks will be placed in the restored stream channels where needed to protect newly created side slopes and reduce the potential for post-treatment channel adjustments.

Replacement of stream crossings (upsizing) culverts will be designed to accommodate the 100-year flood event and have no diversion potential.

V. EXISTING ENVIRONMENT

A. Species Account

Federally Threatened, Endangered, or Proposed Species

Coho Salmon (*Oncorhynchus kisutch*): SONCC evolutionary significant unit (ESU), and designated Critical Habitat.

Status: Federally threatened

Both historical and recent abundance trends have been described by NMFS in their coast-wide status review (Weitkamp et al. 1995, pp. 110-111). Most of the information for the northern California region of this ESU was recently summarized by the California Department of Fish and Game. They concluded that "Coho salmon in California, including hatchery stock, could be less than 6 percent of their abundance during the 1940s, and have experienced at least a 70 percent decline in numbers since the 1960s." They also reported that coho salmon populations have been virtually eliminated in many streams and that adults are observed only every third year in some stream, suggesting that two or three brood cycles may already have been eliminated.

An *Updated Status of Federally listed ESUs of West Coast Salmon and Steelhead* (including coho salmon) was completed in June 2005 (Good et al. 2005). The status update included limited new information for coho salmon. In the status update, the BRT stated that, "None of these data contradict the conclusions the BRT reached previously, nor do any data (1995 to present) suggest any marked change, either positive or negative, in the abundance or distribution of coho salmon within the SONCC ESU."

The NMFS describes coho salmon within the Smith River basin as a functionally independent population (Williams et al. 2006). Functionally independent salmon populations can serve primary roles in salmon ESU recovery. Coho salmon in the Smith River basin primarily occur in tributaries of the lower mainstem, particularly Mill Creek and Rowdy Creek. The 2014 Recovery Plan identified the Smith River population as a core population necessary to the recovery of the ESA as a whole (NMFS 2014). Coho salmon occurrence in the Smith River NRA has been low over the past 30 years, as indicated by annual spawning and juvenile fish surveys since 1976. Adult and juvenile coho are not observed in survey reaches on the Smith River NRA every year, but rather sporadically. Spawning and juvenile coho have been observed sporadically in the low-gradient and gravel-rich reaches of large 6th-order tributaries of the North, South, and Middle Forks Smith River, including Hurdygurdy, Patrick, and upper North Fork Smith. Juvenile coho were observed in Hurdygurdy and Patrick Creeks in 1991, and recently in the upper South Fork Smith in 2012 and 2013, and North Fork Smith (outside the Smith River NRA) in 2012 and 2013.

Critical Habitat: The NMFS designated Critical Habitat for SONCC coho salmon, on May 5, 1999, that encompasses coho-accessible reaches of all rivers (including estuaries and tributaries) between Cape Blanco, Oregon and Punta Gorda, California. Analysis of SONCC coho Critical Habitat on the SRNF is based on known or suspected coho habitat found within a watershed. Critical habitat excludes reaches located above longstanding natural impassable barriers (i.e. natural waterfalls in existence for at least several hundred years). Southern Oregon/Northern

California Coast coho Critical Habitat is derived from available historical fish species inventories, and habitat assessments on record at the forest supervisor's office.

Essential Fish Habitat (EFH): The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) set forth a number of new mandates for NOAA Fisheries, regional fishery management councils, and federal action agencies to identify and protect important marine and anadromous fish habitat. Effects to EFH related to this project were analyzed using habitat defined by the SRNF as known or suspected coho and chinook habitat. Essential fish habitat for coho and chinook were derived from available historical fish species inventories, and habitat assessments on record at the forest supervisor's office.

Southern Oregon/Northern California Coast (SONCC) Coho Salmon Recovery Plan

Released in September 2014, the SONCC coho salmon recovery plan was developed to provide a roadmap to recovery of this species which conservation partners can follow together (NMFS 2014). Specifically, the Recovery Plan was designed to guide implementation of prioritized actions needed to conserve and recover the species by providing an informed, strategic, and voluntary approach to recovery that is based on the best available science. The Smith River was identified as a core population and essential to the recovery of the SONCC coho salmon. Impaired water quality (sediment, turbidity) was determined to be a limiting factor for the watershed as a whole. The recovery plan identified the need to reduce sediment from roads at the watershed level. Actions carried out under this FEIS implement this recovery plan action by decommissioning, stormproofing and upgrading roads as well as restoring drainage patterns of the UARs that were not proposed for designation to the motorized trail system. With the release of the 2014 SONCC recovery plan, SRNF began work on a Watershed and Fisheries Restoration Program (WFR Program) level consultation with NMFS to implement actions that are identified in that recovery plan and continue to implement watershed restoration actions under the ACS.

Forest Service Sensitive Species

The species below spend their entire life cycles in the stream environment.

Chinook salmon (*Oncorhynchus tshawytscha*): Southern Oregeon/California Coasts ESU; (see above for Essential Fish Habitat).

Chinook salmon require cool water, diverse and complex habitat and clean gravels to successfully reproduce. Habitat needs of Chinook salmon fry change rapidly from the time of emergence to time of smolting, but generally require cool water and instream cover. Chinook salmon spawn in the major tributaries of the Smith River. Annual surveys occur to identify locations and number of spawning Chinook.

Steelhead (*Oncorhynchus mykiss*): Klamath Mountain Province Distinct Population Segment (DPS)

Steelhead require cool water, diverse and complex habitat, and clean gravels to reproduce successfully. Spawning typically occurs in winter. Habitat needs of steelhead vary with season of year and life cycle stage. Substrate composition, water quality, and water quantity are important habitat elements for steelhead before and during spawning. First- and second-order streams, which generally include permanently flowing non-fish bearing streams and seasonally flowing or

intermittent streams, are sources of water, nutrients, wood, and other vegetative material. Both summer and winter runs of steelhead are found in the major Smith River tributaries.

Coastal cutthroat trout (*Oncorhynchus clarkii*):

Cutthroat require cool water, diverse and complex habitat, and clean gravels to reproduce successfully. Habitat needs of cutthroat are similar to coho. These streams are cool (18° C), well shaded, with abundant vegetative overhang. Fry require slower and shallower waters than older stages. Adults over wintering in streams, utilize pools with fallen logs or undercut banks, but will use pools with boulders if adequate (Gerstung 1993). Spawning habitat includes small to moderate-sized gravel substrates. Embryonic survival is inversely related to amount of fine sediment present (Moyle et al. 1995). Adults usually choose the tails of pools to spawn in, preferring the headwater tributaries of larger streams. Resident and anadromous cutthroat are found in the Smith River drainages. Jones Creek contains a population of resident cutthroat trout above a barrier near the confluence with the Middle Fork Smith.

Pacific lamprey (*Entosphenus tridentatus*)

Pacific lampreys apparently still occupy much of their native range, but existing evidence suggests that large declines in the past 25 to 50 years may be pervasive. We do know that they no longer have access to upstream habitats that are blocked by large dams. The large runs that once characterized coastal streams such as the Eel and Klamath rivers, based on anecdotal information, seem to be gone. Generally, lamprey redds are found in similar locations as salmonids and may be identified as round depressions in gravel or cobble substrates. Lamprey require slow backwater areas for rearing (up to seven years are spent filter feeding in these areas before migrating out to the ocean. Little information exists on the distribution of lamprey in the Smith River.

California Floater (*Anodonta californiensis*)

Anodonta californiensis occurs in *lakes and slow rivers* (Taylor 1981), “generally on soft substrates (mud-sand), in fairly large streams and lakes only, in relatively slow current; a low elevation species” (Frest and Johannes 1995). Howard and Cuffey (2003) found that *A. californiensis* was almost exclusively found in pools, with no occurrences in riffles and very few in runs in the South Fork of the Eel River. There is no known record of populations on the Smith River.

Chace juga (*Juga chacei*)

Juga chacei is limited to spring and stream habitats that are small and cool, with coarse substrates, tributary to the Smith River and adjacent Lake Earl in Del Norte County (Taylor 1981). Although specific information on Juga chacei is not available, studies on J. silicula, a closely related stream-dwelling species found in the Coast and low Cascade ranges of Oregon (Furnish 1990) and other members of the genus to which this species belongs indicate that individuals live for several (5 to 7) years. Dispersal of individuals is typically very low.

Pristine springsnail (*Pristrinicola hemphilli*)

According to Frest and Johannes (2000), *P. hemphilli* occurs mostly in very small springs and seeps, but sometimes in larger springs, spring runs or strongly spring-influenced small streams. Associated substrates are cobble to coarse gravel. Snails feed on periphyton algae attached to the

substrates where they occur. Springsnails have specific and highly localized (the extent of spring run and spring-influenced areas) habitat requirements and cannot easily disperse between springs. Frest and Johannes collected 16 specimens from Del Norte County, in California, but there is not enough data to evaluate the abundance of this species. There is no published information on the population trend of this species. One known population is located at a spring along Patrick Creek. This spring is not being affected by the proposed action.

B. Effects Analysis Methodology

The aquatic analysis methodology focuses on consistency with the Aquatic Conservation Strategy (ACS), addressing effects to aquatic biota and their habitat uses. The analysis is based on a standardized set of pathways and indicators organized into a matrix that was developed from the Northwest Forest Plan ACS and adopted by the USFS and NMFS. Indicators are those identified in the methodology *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). The matrix developed here reflects the information needed to implement the Aquatic Conservation Strategy (ACS) and to evaluate effects relative to the Northwest Forest Plan ACS Objectives.

The Matrix of Pathways and Indicators is designed to summarize important environmental parameters and levels of condition for each. This matrix is divided into six overall pathways (major rows in the matrix):Water Quality, Channel Condition and Dynamics, Habitat Access, Flow/Hydrology, Habitat Elements, and Watershed Conditions. Each of these represents a significant pathway by which actions can have potential effects on anadromous salmonids and their habitats. The pathways are further broken down into "indicators."

The columns in the matrix correspond to levels of condition of the indicator. There are three condition levels: "properly functioning," "at risk," and "not properly functioning." For each indicator, there is either a numeric value or range for a metric that describes the condition, a description of the condition, or both. When a numeric value and a description are combined in the same cell in the matrix, it is because accurate assessment of the indicator requires attention to both.

The indicators are used to determine consistency with the ACS by disclosing effects to aquatic biota, and if any of the action alternatives (or their components) “meets” or “does not prevent attainment” of the objectives of the ACS. This indicator analysis method describes the existing baseline condition (summarized by indicator in the matrix), including the properly functioning range of natural variability of each indicator that is necessary to meet the ACS objectives and benefit the relevant aquatic species, and how the project maintains the existing condition or moves it toward the properly functioning range of natural variability.

Process

Identify which of the proposed management activities have the potential to impact TE and FSS aquatic species with a focus on SONCC coho habitat and their designated critical habitat.

Describe the environmental baseline for the Smith River basin using the matrix pathways and indicators in order to frame the context of the proposed management activities on the baseline – both in terms of recovery actions and potential impacts.

By individual watersheds, identify which proposed management activities occur adjacent to SONCC coho listed habitat

Other indicators from the effects section: road density

Proposed Management Actions

Of the proposed management actions, only three have the potential to impact aquatic biota: Changes to NFTS and Restoration of Drainage Patterns on Inventoried Unauthorized Routes: These two actions include ground disturbance, they have the potential to effect aquatic species by introducing sediment (negative) as well as to reduce the risk of road failure (decommissioning, culvert removal), reduce the amount of sediment entering the channel and prevent impacts from occuring have to potential to effect (road upgrades, season of use)

The third management action, Mitigations, apply to NFTS current and proposed roads and motorized trails to reduce risk to water quality and aquatic species have the potential to reduce the risk of impacts.

Assumptions

- Not all of the ACS indicators under the pathways matrix would necessarily be changed or influenced by limited changes to the NFTS. Therefore, in many cases, the effect of individual changes to the NFTS and restoration would be a combination of improving and maintaining other indicator values.

- "Properly functioning" as the term relates to indicators, is an indication of benefits to the growth, survival, reproduction, and population persistence. Proper functioning watersheds would meet or not prevent attainment of ACS objectives.

- Habitats for the species being analyzed were assumed to be occupied if they contained the necessary life history elements and were located below longstanding natural barriers.

- Habitat is already impacted. In the long-term, available habitat would remain the same on routes designated to the NFTS, but would improve where UARs are decommissioned and restored.

- A thorough matrix analysis for project effects to aquatic species also yields an effective analysis of project effects to the features and functions of Primary Constituent Elements (PCEs) for Critical Habitat and Essential Fish Habitat (WFR Program BA, 2015).

- Aquatic species spend all or significant portions of their life cycles either in or moving through riparian habitats.

- All vehicle types result in the same amount of disturbance effect on aquatic dependent species. Therefore, proposals to reclassify existing system roads as motorized trails would have no effect on aquatic systems and would not be considered further in this analysis.

- Research has concluded that sediment from roads can result in adverse effects to streams and aquatic habitats (Dissmeyer, 2000; Gucinski et al., 2001; Meahan, 1991).

- The overall effect of roads to aquatic habitats is related to the amount of sediment movement from road surfaces and is highly variable within and among surface types and

is related to levels of maintenance and road drainage and type of use of the road (Clinton and Vose, 2003; Maholland, 2002; Maholland and Bullard, 2005).

- The elimination of vehicle traffic on a road near a stream during periods of wet road conditions would result in less sediment being delivered from the road to the stream to benefit aquatic habitats.
- Improving indicators would result in improved watershed conditions for all TE and FSS aquatic species residing within the Smith River.
- Direct Effects to TEP or FSS species wouild occur only where routes cross occupied habitat and the potential for harm could occur thorugh disturbance or crushing. None of the activites proposed cross occupied habitat (with the exception of Griffin Creek Bridge as discussed below), therefore direct effects to individuals would not occur.

Data Sources:

The latest federal species list for the project area was obtained from the U.S. Fish and Wildlife Service. Currently the Service is developing the IPAC website for agencies to obtain federal species lists, but the results of species lists are not yet reliable. In July 2015, the Level 1 team reviewed the January 14, 2014 species list obtained from the USFWS and determined it was still valid for this project area. The Region 5 Forest Service sensitive aquatic species list was identified from the US Forest Service, Pacific Southwest Region Sensitive Animal Species List, September 9, 2013.

Assessment of environmental baseline and use of indicators and pathways (groups of indicators) follows *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). Information regarding fish habitat baseline conditions of the Smith River is derived primarily from these sources: 1) SRNF fish surveys habitat inventories (including Level II surveys from Siskiyou Research Group and the Smith River Alliance) for Hurdygurdy, Craigs, Coon, Gordon, Rock, Boulder, Jones, Goose, Cant Hook, Patrick, Shelly, Monkey, Griffin, Siskiyou Fork, Myrtle, Hardscrabble, and Middle, South, and North Fork Smith, 2) stream survey reports from the California Department of Fish and Game, 3) the Fox Unit Monitoring Fishery Reports for upper South Fork Smith tributaries (USFS 1976 through 1985), and 4) the Smith River Ecosystem Analysis (McCain et al. 1995).

Analysis of watershed and road conditions (and effects) is based on *Road Assessment and Restoration Planning in the Smith River Basin* (Ledwith 2003a, Ledwith 2003b). These analyses address current and potential sediment sources, road density and location, drainage network increases, and effects from road drainage features such as stream crossings; and use methods outlined in the *Assessment and Implementation Techniques for Controlling Road-Related Sediment Sources* (Hagans and Weaver, 1997), *Methods for Inventory and Environmental Risk Assessment of Road Drainage Crossings* (Flanagan *et. al*, 1998)

Watershed condition data were also compiled from *Rating Watershed Condition: Reconnaissance Level Assessment for the National Forests of the Pacific Southwest Region* (USDA Forest Service, Draft 2.4, April 2000). This report was part of a regional USFS effort to evaluate watershed condition and identify effects. Watersheds were delineated at the 5th field scale for National Forest Lands, which includes all of the Smith River NRA and Gasquet District

lands. The following watershed information is general to the entire action area. More specific watershed data is included for project activities in close proximity to coho salmon CH.

Distribution and critical habitat information upon which the effects analysis was based on current known SONCC coho distribution based on historic and current surveys (SRNF surveys, CalFish database, NMFS etc). Critical Habitat for SONCC coho was not spatially identified but rather described in the Federal Register as all river reaches accessible to coho salmon.

FEIS sections for Watershed, Soils, POC and Geology provide analysis that supports the Aquatic Conservation Strategy consistency analysis.

Pathways Methodology

Aquatic Biota Habitat Indicators:

Indicators are those identified in the methodology *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). This indicators are grouped according to pathways as follows:

WATER QUALITY
- Temperature
- Sediment/Turbidity
- Chem. Contam/Nut

HABITAT ACCESS
- Physical Barriers

HABITAT ELEMENTS
- Substrate
- Large Woody Debris
- Pool Frequency
- Pool Quality
- Off-channel Habitat
- Refugia

CHANNEL CONDITION & DYNAMICS
- Width/Depth ratio
- Streambank Cond.
- Floodplain Connectivity

FLOW/HYRDOLOGY
- Peak/Base Flows
- Drainage Network Increase

WATERSHED CONDITIONS
- Road Density & Location
- Disturbance History
- Riparian Reserves

B. Environmental Baseline

Assessment of environmental baseline and use of indicators and pathways follows *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS 1996). Information regarding fish habitat baseline conditions of the

Smith River is derived primarily from these sources: 1) the Fox Unit Monitoring Fishery Reports for upper South Fork Smith tributaries (USFS 1976 through 1985), 2) SRNF fish habitat inventories and fisheries surveys for Hurdygurdy, Jones, Goose, Patrick, Shelly, Siskiyou Fork, Myrtle, Hardscrabble, and Middle, South, and North Fork Smith, 3) stream survey reports from the California Department of Fish and Game, 4) the Smith River Ecosystem Analysis (McCain et al. 1995), and 5) Level II stream habitat inventories for North Fork Smith tributaries (Siskiyou Research Group 2004).

Analysis of watershed and road conditions (and effects) is based on *Road Assessment and Restoration Planning in the Smith River Basin* (Ledwith 2003a, Ledwith 2003b). These analyses address current and potential sediment sources, road density and location, drainage network increases, and effects from road drainage features such as stream crossings; and use methods outlined in the *Assessment and Implementation Techniques for Controlling Road-Related Sediment Sources* (Hagans and Weaver, 1997), *Methods for Inventory and Environmental Risk Assessment of Road Drainage Crossings* (Flanagan *et. al*, 1998)

Watershed condition data were also compiled from *Rating Watershed Condition: Reconnaissance Level Assessment for the National Forests of the Pacific Southwest Region* (USDA Forest Service, Draft 2.4, April 2000). This report was part of a regional USFS effort to evaluate watershed condition and identify effects. Watersheds were delineated at the 5th field scale for National Forest Lands, which includes all of the Smith River NRA and Gasquet District lands. The following watershed information is general to the entire action area. More specific watershed data is included for project activities in close proximity to coho salmon CH.

Water Quality

Water Temperature: properly functioning

Water temperature in the project area ranges from 5 degrees C in winter (in tributaries) to 23 degrees C in late summer (in mainstems) (USFS 1976 to 1985). Due to the proximity to the coast and the maritime rain precipitation patterns, stream temperatures rarely approach the freezing piont. Shade is provided mainly by red alder, bigleaf maple, Douglas-fir, incense cedar, and Port-orford cedar. Some dense shading from redwood occurs in the western part of the project area. In the anadromous reaches of the Smith River, shade canopy ranges from 20 to 83 percent (USFS 1976 through 1985). The range in water temperature in the Smith River is properly functioning.

Turbidity: properly functioning

The Smith River is well known for its inherent clarity and low turbidity. Turbidity levels are very low and are reflective of the hard ultramafic rock and coarse parent material, and the subsequesnt coarse substrate that dominates streams of the Smith River basin. Information is available for sediment related turbidity during storms. For Hurdygurdy Creek, the highest turbidity recorded that is on record is 5.5 (Hach FTU) on 14 January 1980. This was at a flow of 1600 cubic feet per second (cfs) and a suspended sediment load of 157 milligrams per liter (USFS 1980).

Turbidity data has also been recorded during storms following wildfire - an indication of the expected level of ash delivered from hillslopes into channels during storms. One of the highest turbidity readings for the Smith basin was observed in November 16, 2002 during the first major storm that followed the Biscuit Fire of 2002, where turbidity (presumably from ash runoff)

peaked at 74 at 8:45 pm. The turbidity dropped back to 8 by 8:00 pm the following day. Since the stream maintains a low turbidity level during a very high storm flow (>100 year return interval) and recovers very quickly from a large pulse of wildfire ash, turbidity can therefore be assumed to be properly functioning.

Sediment: at risk

Management-related sources of sediment exist primarily in the form of road prisms and stream crossings. Crossings are predominantly corrugated metal culverts buried within channels with earthen fills. Stream crossing fills present the most concern since the fills are currently within channels, and in several cases have the potential for stream diversions or are beginning to cause impacts due to crossing failure. Nearly 50% of the stream crossings are in need of routine maintenance. Cross drains and erosional features on roads (gullies, rills, road prism and bank failures) are also sources of sediment.

Mass wasting can be a primary determinant of fine sediment sources. The sensitivity of an area to mass wasting depends on the interaction of the soils and underlying bedrock, slope steepness, and the subsurface hydrology. Much of the District is characterized as steep, mountainous terrain. Road-related mass wasting can be attributed to 1) improper placement and construction of road fills and stream crossings, 2) inadequate culvert sizes to accommodate the peak flows, sediment loads, and woody debris, 3) roads located on soils susceptible to mass wasting, and 4) water diversion onto unstable hillslopes. Road-related mass wasting potential is determined by examining the miles and density of roads located on unstable geologic rock units (Table 4a and b).

Table 4a. Smith River NRA and Gasquet District Mass Wasting

Analysis Watershed Name	Mass Wasting Potential
Blue Creek	Moderate Hazard
Lower North Fork Smith	Low Hazard
Middle Fork Smith	High Hazard
Myrtle-Hardscrabble	Moderate Hazard
South Fork Smith	Moderate Hazard

Table 4b. Criteria for Mass Wasting Ratings

Rating	Definition
High Hazard	Watersheds characterized by the presence of a large number of roads on unstable geologic types. This results in a situation where it is very likely that the timing, geographic distribution, and magnitude (total volume) of natural land sliding has been significantly altered.
Moderate Hazard	Watersheds characterized by the presence of a moderate number of roads on unstable geologic types. This results in a situation where there is a moderate risk that the timing, geographic distribution, and magnitude (total volume) of natural land sliding has been significantly altered.
Low Hazard	Watersheds characterized by the presence of very few, if any, roads on

Rating	Definition
	unstable geologic types. This results in a situation where the natural sediment regime is likely to be intact, and it is very unlikely that roads have, or will, significantly modify the timing, geographic distribution, and magnitude (total volume) of natural land sliding in the watershed.

North Fork Smith subbasin

The North Fork Smith subbasin extends northward in to Oregon and drains a large geologic formation known as the Jesephine Ophiolite, and is dominated by lateritic soils that are very old and deeply weathered. The California portion of the subbasin is approximately 40,000 acres, and the Oregon portion is approximately 60,000. The road network here is primarily related to mining activity from the late 1800s to the mid 1900s. A large portion (30,330 acres) of the subbasin is roadless. The North Fork Smith Roadless area includes the majority of the drainage of the North Fork of the Smith River. Approximately 9,000 acres of the western portion of the roadless area has been altered by roads and mining activities. The geologic character of the ophiolitic area is predominantly serpentine/ultramafic with very coarse parent material. Therefore, the potential for fine sediment to be produced is lower than that of the Middle and South Fork subbasins.

Nearly all of the stream crossings within the North Fork Smith subbasin are rocked fords containing very small fills. Potential road-related fine sediment sources in this subbasin are considerably fewer than in the Middle and South Fork subbasins. In the Bear Creek, High Plateau Creek, Peridotite Canyon Creek and Stony Creek watersheds, Forest Road 18N13 (8 miles), Road 18N09 (6 miles) and all of the spur roads (approximately 24 miles) are currently maintained at OML 1 and are in good hydrologic condition, with very little drainage diversions, erosion, and potential for sedimentation.

Middle Fork Smith sub basin (including Myrtle-Hardscrabble)

Within the Middle Fork Smith subbasin, 108 roads have either a stream crossing, cross drain, or erosional feature for a total of 829 features. Crossing types in the subbasin are diverse with 357 (82%) fitted with corrugated metal culverts, 44 (10%) fords, 21 (5%) Humboldt crossing and 13 (3%) bridges. Eighty four stream crossing sites (19%) were identified as high, 208 (48%) as medium, and 145 (33%) low priority. High and medium priority stream crossings could potentially be a source of approximately 231,866 cubic yards of sediment.

A total of 311 cross drains exist in the Middle Fork Smith subbasin. Of these, 37 (12%) were identified as high priority. These culverts commonly have plugged inlets and directly delivery sediment to the stream network through surface flow paths (i.e., rills and gullies). These flow paths are chronic contributors of fine (i.e., silt and clay) sediment from the road surface and inboard ditches. The main cause of these flow paths is long sections of uncontrolled flow along the road surface and inboard ditch.

120 (39%) cross drains are in need of routine maintenance. The most common problem (50% of sites) is sediment plugging of the culvert inlet. Plugged cross drains can divert water either onto the road surface or hillslope causing erosion, or into downroad cross drains or stream crossings possibly causing these sites to fail. Other maintenance needs include treating buried outlets, filled inboard ditches, and broken drop inlet covers.

A total of 81 road-related erosional features have been identified in the Middle Fork Smith watershed. Types of erosional features include: 31 cutslope failures, 28 fillslope failures, and 22 roadbed failures. These sites are the source of an estimated 99,030 cubic yards of sediment that is beginning to enter the stream network.

Within the Middle Fork Smith subbasin, 248 roads (132 system and 116 non-system) have been inventoried and evaluated. A total of 437 stream crossings exist in the Middle Fork Smith watershed giving a stream crossing density of 1.7 crossings per mile of road. Road density is approximately 0.003 miles/acre. Knopki, Little Jones, and Siskiyou Fork watersheds in the upper Middle Fork area have the majority of road-related impacts. In the Knopki watershed, 18N11D and complex of roads has 17 features in which 13 are high priority. Seven stream crossings have failed with an estimated 500-1000 cubic yards of sediment left to deliver to the stream network. In addition there are 7 erosional features in which 6 are considered high priority with potential delivery of 20,352 cubic yards of sediment to the stream network. Many of these sites have been identified as chronic sources of sediment to Knopki Creek.

18N05 is a ridge to valley road in which the lower 2 miles are in close proximity to a perennial tributary of Knopki Creek. The stream crossings (9) are old fords and Humboldt crossings that are failing and currently diverting. There are four erosional features that are in the process of recovering but still have the capacity to deliver 1,145 cubic yards of sediment to the stream network. The road has been abandoned for 20 plus years and is heavily vegetated. Treating this road would result in potential "sediment savings" of 2,150 cubic yards. Table 5a describes the potential sediment sources existing in the Middle Fork Smith sub basin.

Table 5a. Potential sediment yield from road-related sites in the Middle Fork Smith sub basin (from Ledwith 2003a).

Site Type	Total number of sites	Number of high priority sites	Number of medium priority sites	Future yield to streams (cy)	Number of sites that need maintenance	Number of sites currently diverting	Number of sites with diversion potential
Stream Crossings	437	84	205	231,866[1]	149	33	181
Cross Drains	311	37	64	N/A	120	N/A	302
Erosional Features	81	35	10	44,339[2]	N/A	N/A	N/A
Totals	829	156	279	276,205	269	33	483

[1] Includes stream crossings ranked high or medium priority. At stream crossings with diversion potential, future erosion is difficult to predict. A minimum estimate of the stream crossing fill volume was used as a predicted value for this table.
[2] Includes erosional features ranked high and medium priority.

South Fork Smith sub basin and Blue Creek

Within the South Fork Smith subbasin, 264 roads (164 system and 100 non-system) have been inventoried and evaluated. A majority of the roads pose little risk to the stream network, with only minor evidence of past sediment delivery to streams. Only 110 (45%) of the roads have either a stream crossing, cross drain, or erosional feature for a total of 1,059 features. Of these sites, 415 (39%) need treatment for a potential sediment savings of 287,013 cubic yards.

Twelve high priority roads are identified as sediment sources. 15N11A is an abandoned haul road to Canthook Creek. There are 12 high priority sites on the road including 8 stream crossings that have failed and are contributing sediment to the stream network. Some of these crossings are actively diverting causing roadbed and fillslope erosion. The road ends at Canthook Creek where the stream is eroding the road fill delivering sediment directly into the

stream. The area surrounding 15N11A has multiple crossings and landings along Canthook Creek. Treatment of these areas would result in "sediment savings" of 3,655 cubic yards.

There are 7 high priority sites between County Road 405 and road 16N03 with many sites delivering sediment to the stream system. The first half mile of 405.5 follows a perennial tributary of Hurdy Gurdy Creek. Within this section are two erosional features and two stream crossings that are chronic sources of sediment to the stream. The drainage system on 16N03.2 is not working adequately causing roadbed and fillslope erosion. The high priority stream crossing at mile post 0.69 is rapidly failing and may deliver the whole prism to the stream network. Treatment of these roads would result in "sediment savings" of 6,896 cubic yards.

16N33 used to connect 17N04 to 16N03 until a middle section was decommissioned. The upper section, beginning at 17N04, is two miles long and has two stream crossings and two cross drains which are plugged and diverting causing erosion. The last mile of this road, down to the decommisioned section, runs along a perennial tributary of Hurdy Gurdy Creek. The drainage is poor with long stretches of saturated roadbed. Runoff in this section is routed down the road causing gullying and erosion of the hillslope. There are also numerous fillslope failures. 16N33 Lower starts at 16N03. The first 0.6 miles (to intersection of 16N31, A & B) is fairly stable with 3 features. The second 0.6 miles is in poor condition with 9 fillslope failures and 4 road gullies. There is also a failed stream crossing (16N33-0.89) which is actively eroding the fillslope. Treatment of these roads would result in "sediment savings" of 40,101 cubic yards. Table 5b describes the potential sediment sources existing in the South Fork Smith subbasin.

Table 5b. Potential sediment yield from road-related sites in the South Fork Smith sub basin (Ledwith 2003b).

Site Type	Total number of sites	Number of high priority sites	Number of medium priority sites	Future yield to streams (cy)	Number of sites that need maintenance	Number of sites currently diverting	Number of sites with diversion potential
Stream Crossings	410	51	194	270,986[1]	175	14	146
Cross Drains	613	67	76	N/A	238	N/A	426
Erosional Features	36	17	10	16,027[2]	N/A	N/A	N/A
Totals	1,059	135	280	287,013	413	14	572

[1] Includes stream crossings ranked high or medium priority. At stream crossings with diversion potential, future erosion is difficult to predict. A minimum estimate of the stream crossing fill volume was used as a predicted value for this table.
[2] Includes erosional features ranked high and medium priority.

Chemical Contaminants and Nutrients: at risk

No known toxic chemical contaminants occur in the watershed. There is a risk of chemical contamination to streams from unrestricted motor vehicle traffic on stream banks and gravel bars at dispersed streamside recreation sites.

Recreational use of popular streamside recreation sites and the potential for water contamination from human waste has resulted in additional vault or portable toilets placed throughout the Smith River NRA in the last 5 years.

The Smith basin is at risk of not properly functioning with regard to this indicator.

Habitat Access

Physical Barriers: properly functioning

There are no known anadromous fish migrations barriers associated with any Forest Road (Six Rivers National Forest Fish Passage Survey, 2001). A few road-stream crossings have been identified as potential barriers to resident coastal cutthroat trout in the Middle Fork Smith River and Blue Creek. To what extent resident fish are affected by these possible barriers is unknown, and further analysis of these areas is a priority. In general, the location of the potential barrier is in the upper portions of the watershed and the extent to which resident fish are affected appears to be minimal.

The only artificial anadromous barrier on the Smith River was on Monkey Creek (which blocked approximately 3 miles of anadromous habitat) and was removed in 1995. No other artificial barriers exist and the stream system has approximately 300 miles of habitat accessible to anadromous fish. Therefore, the Smith basin is properly functioning with regard to habitat access.

Habitat Elements

Substrate: properly functioning

In the Smith River, sources of substrate mainly originate from natural debris, rotational, and translational landslides. Although channel aggradation is evident in some depositional reaches of the system, such as lower Hurdygurdy and Jones Creeks, substrate composition is very coarse and is dominated by cobble and gravel. The large 1964 "rain-on-snow" storm event de-stabilized logged areas and activated many landslides in the watershed, which delivered a very large pulse of hillslope debris and sediment to the channel, resulting in aggradation (Fox Unit Monitoring Fishery Reports, USFS 1976 through 1985). Smaller storms from the 1970s to the present periodically reactivated some landslides, but have also progressively downcut through the aggraded areas and have slowly routed, transported, and stored the channel sediment from the 1964 event to stable bar locations.

In depositional areas of lower Hurdygurdy, Patrick, Craigs, Monkey, and Coon Creeks, channel aggradation is influenced by the legacy of placer and hydraulic mining that occurred in the late 1800s, which washed out coarse material from lower hillslopes and delivered material to the lower reaches. The fine sediment component of substrate has been measured in the Smith basin. Fine sediment (<.85 millimeter particle size) in depositional reaches (including gravel bars) associated with salmon spawning habitat was measured from 1976 to 1984 in Hurdygurdy Creek (a primary salmon spawning area) and ranged from 3.5% to 5% (USFS 1976 to 1985). A fine sediment percentage of 20% has been documented as a threshold where salmon egg mortality begins to greatly increase (Reiser and Bjornn 1979, Bjornn and Reiser 1991). These data indicate that in depositional features such as gravel bars (i.e. spawning habitat) where fine sediment can accumulate and have a defined impact, the level of fine sediment is very low and the Smith basin is properly functioning with regard to substrate.

Large Woody Debris: at risk

Large wood availability in the Smith River have been at low levels for at least the past 4 decades (CDFG 1963, 1972, 1978; USFS 1991). Much of the large woody debris (LWD) is above the bank full channel and potentially functions during high flow periods. This distribution of LWD is characteristic of the Smith River basin and due in large part to the intensity of storm events and associated flow responses, and to the predominance of steep confined stream reaches that

prevent LWD from accumulating. A 1972 stream survey documented 10 LWD jams in the 12 mile anadromous reach of Hurdygurdy Creek, ranging from 67 to 13,000 cubic yards in size (CDFG 1972). In pools, LWD provides channel complexity and the habitat components of cover and bank stability, however these sites comprise a small proportion of the total stream area when compared to other habitat types and cover elements. Instream cover provided by LWD in pools averages is 6%, and for riffle and run habitats is 2% (USFS 1991). Habitat surveys throughout the basin have documented very low quantities of LWD. Therefore, the Smith River basin is at risk of propoerly functioning with regard to LWD.

Pool Frequency: properly functioning

Pool/riffle ratio (by occurrence) is approximately 1/3. Pools comprise approximately 18% of the total surface area, compared to riffles that comprise the remaining 82%. The predominate pools are bedrock-formed. Pools are more abundant in the mainstems of the North, Middle, and South Forks Smith, and in the lower reaches of primary tributaries including Diamond, Stony, Hardscrabble, Myrtle, Patrick, Monkey, Siskiyou Fork, Hurdygurdy, Craigs, Coon, Gordon, Jones, Goose, and Rock Creeks. Pools generally become smaller and/or less abundant progressively upstream in the steeper channel reaches, however they are common at natural falls barriers – which can provide important cool water refugia during low flows in summer. Stream habitat inventories of these major tributaries indicate that the predominant pool-forming elements are bedrock flow obstructions, and the most common cover element is interstitial space within the coarse substrate. Given that pool formation and frequency is controlled primarily by the natural processes of scour and fill around bedrock obstructions, and that those processes have not been altered, pool frequency is therefore properly functioning.

Pool Quality: properly functioning

Due to the lack of LWD cover, the complexity of pools (e.g. amount of cover, spatial partitions, and substrate diversity) is less than what would potentially exist with more abundant LWD. This lack of complexity directly relates to the quality of pool habitats for overwintering coho salmon (Meehan and Bjornn 1991). However, this low abundance of LWD is characteristic of the Smith River basin and due in large part to the predominance of steep confined stream reaches that prevent LWD from accumulating, and the intensity of storm events and associated flow responses. The amount of LWD jams present in the project area (middle and upper reaches of the Smith basin) prior to European settlement and subsequent LWD removal may have been low compared to other basins. For example, LWD jams are non-existent in the North Fork Smith mainstem, a reach that has had no intentional removal and very low amounts of direct channel disturbance (road crossings, streamside timber harvest, etc.) All other important attributes, such as depth, temperature refugia, interstitial cover space, bedrock cover ledges, and pool volume are at their potential. Therefore, given the overall condition of these important attributes, pool quality is best described as properly functioning.

Off-channel Habitat: properly functioning

Due to the predominant steep incised channel morphology of the stream system in the project area, abundance of off-channel habitat is low. In lower reaches of the main tributaries, backwater alcoves and edgewater type habitat comprise typically 2% of the total habitat surface

area, and are commonly associated with channel braids or overflow channels near gravel bars. However, in comparison to their availability, these isolated small habitats are highly utilized by newly emerged salmonids in early spring during high flows. Based on habitat inventories throughout the Smith River basin, the low amount of off-channel habitat is typical for the dominant B channel types and indicates that the stream system is controlled by rock type and channel gradient and is therefore within the expected range (Rosgen 1994). Therefore, off-channel habitat is properly functioning.

Refugia: properly functioning

The value of the Smith River as a fish habitat refuge is high and is reflective of the overall habitat conditions in the Smith River basin. The refugia values are highlighted by the fact that the entire basin is designated as a Key Watershed under the Northwest Forest Plan. The Smith River supports all freshwater life stages of Chinook salmon, coho salmon, steelhead, and coastal cutthroat, as well as Pacific lamprey, and several species of amphibians. Any given sub basin or watershed can be expected to provide sufficient refuge habitat in the event of a large catastrophic disturbance in a nearby watershed, such as a wildfire or debris landslide. Therefore, the Smith River is assumed to be properly functioning as a fish habitat refuge.

Channel Conditions and Dynamics

Width/depth Ratio: properly functioning

Although channel aggradation is evident in some reaches, the w/d ratio is within expected ranges for typical channels in the Smith River (Fox Unit Monitoring Fishery Reports, USFS 1976 through 1985; Siskiyou Research Group 2004). In depositional reaches, the average width/depth ratio of the wetted channel measured during summer flows is 6.55/1.0, and ranges from 3.18/1.0 in trench pools to 17.0/1.0 in high gradient riffles. In reaches of the Smith River system, bankfull width/depth ratio ranges from below 20 to over 50. Smith River channels are predominantly steep and relatively incised Rosgen B forms (Rosgen 1994), where the width/depth ratio is fairly resilient to changes from sediment input and flooding. Overall, the width/depth ratio is properly functioning.

Streambank Condition: properly functioning

Streambank condition can be described in terms of stability. Streambank stability data are available for upper South Fork and North Fork tributaries (measured as % reach length) and ranges from zero in steep narrow bedrock channels such as the North Fork Smith subbasin (Siskiyou Research Group 2004), to approximately 11% of the stream channel in lower Hurdygurdy Creek where mining has occurred (Fox Unit Monitoring Fishery Reports). Portions of the Middle Fork Smith River are influenced by extensive streambank alterations from Highway 199, but have maintained high stability due to the predominance of boulder and bedrock banks. Due to the predominance of bedrock streambanks in the Smith River system, streambank condition is properly functioning.

Floodplain Condition: properly functioning

Roads can directly affect physical channel dynamics when they encroach on floodplains or restrict channel migration. Floodplains help dissipate excess energy during high flows and recharge soil moisture and groundwater. Floodplain function is compromised when roads encroach on or isolate floodplains. This can increase peak flows. When peak flows increase, more water is available for in-channel erosion, which affects channel stability. Restricting channel migration can cause channel straightening which increases the stream energy available for channel erosion. This can also result in channel instability. Altering channel pattern affects a stream's ability to transport materials, including wood and sediment.

The project area is predominantly comprised of steep narrow canyons and valley floors, where floodplains within the bankfull level are small and localized as to their influence. However, in lower gradient reaches throughout the Smith River system, small floodplains do exist, are well connected to the channel, and are properly functioning.

Flow/Hydrology

Peak/Base Flow: properly functioning

Roads can divert surface flow, expand channel networks, convert subsurface flow to surface flow, and reduce infiltration. A channel network can be expanded by road ditches and road-related erosional features (e.g. gullies and rills), which intercept and concentrate runoff from their natural flow path. These factors may affect the overall hydrology in a watershed, particularly the quantity and timing of flow.

Reduced infiltration contributes to additional surface flow since water does not infiltrate for storage in the soil profile, but rather runs off as overland or surface flow. Storage and movement of water through the soil profile as subsurface flow regulates and sustains base flows in stream channels. When infiltration during storms is reduced, more water becomes available as surface runoff, and less water is available as subsurface. This can result in quicker, higher, and sharper stream peak flow responses to storms ("flashiness"), and lower less sustained base flows during dry periods.

Road Hazard Potential can be used to represent the potential for altered hydrologic regime (changes in runoff response) and stream diversions associated with roads. The overall condition class is determined by examining the slope position, slope gradient, proximity to stream channels, number of stream crossings, and density of the road system for each watershed (Table 6a and b).

Table 6a. Smith River NRA and Gasquet District Road Hazard Potential

Analysis Watershed Name	Road Hazard Potential
Blue Creek	Low Hazard
Lower North Fork Smith	Low Hazard
Middle Fork Smith	Moderate Hazard
Myrtle-Hardscrabble	Moderate Hazard
South Fork Smith	Low Hazard

Table 6b. Criteria for Road Hazard Potential Ratings

Rating	Definition
High Hazard	The density and distribution of roads within the watershed indicate there is a high probability that the hydrologic regime (ie., timing, magnitude, duration, and spatial distribution of runoff flows) is substantially altered. Roads within the watershed exhibit at least 3 of the following characteristics: (a) densities >0.25 miles/square mile on slope classes >45%, (b) densities >0.5 miles/square mile in middle and lower slope positions, (c) densities > 0.25 mile/square mile within 100 meters of stream channel (hydrologically connected), (d) > 1 stream crossing/mile of road.
Moderate Hazard	The density and distribution of roads within the watershed indicate there is a moderate probability that the hydrologic regime is substantially altered. Roads within the watershed exhibit 1 - 2 of the following characteristics: (a) densities >0.25 miles/square mile on slope classes >45%, (b) densities >0.5 miles/square mile in middle and lower slope positions, (c) densities > 0.25 mile/square mile within 100 meters of stream channel (hydrologically connected), (d) > 1 stream crossing/mile of road.
Low Hazard	The density and distribution of roads within the watershed indicate the hydrologic regime is substantially intact and unaltered. Roads within the watershed exhibit the following characteristics: (a) densities <0.25 miles/square mile on slope classes >45%, (b) densities <0.5 miles/square mile in middle and lower slope positions, (c) densities < 0.25 mile/square mile within 100 meters of stream channel (hydrologically connected), (d) (watershed average) < 1 stream crossing/mile of road.

Definitions:

Hydrologically Connected: Any road segment that, during a 'design' runoff event, has a continuous surface flowpath between any part of the road prism and a natural stream channel (any declivity in the land that exhibits a defined channel and evidence of scour and deposition) is a hydrologically connected road segment. This process uses proximity of roads to streams as a surrogate for identifying hydrologically connected roads to streams.

Hydrologic Regime: The timing, magnitude, duration, and spatial distribution of peak , high, and low flow runoff within a watershed.

Regardless of the land use history and the associated disturbance in the watershed, a significant portion of the land area is undisturbed to the point where the peak/base flow has not been measurably altered. As hillslopes, old landslide scars, and decommisioned roads continue to stabilize, it is expected that the peak/base flow response will continue to function properly.

Increase in Drainage Network: at risk

All road-stream crossings provide a point of hydrologic connectivity, but the lengths of connectivity differ at each site. Cross-drains, water bars, drainage dips, and other road drainage structures may be hydrologically connected to a channel if the diverted flow is sufficient to create a gully that leads to a stream channel. Connectivity also occurs when ditches or the road surface deliver directly to the stream at road-stream crossings. Roads cuts with long, continuous ditch lengths can intercept ground water, route it as surface water and may locally increase peak flows during storm events. Drainage ditches that are connected to road-stream crossings provide a conduit for road-related sediment to enter stream channels.

Road-stream proximity (roads within 105 meters of stream) and road-stream density are displayed in Table 7 to indicate the extent of hydrologic connectivity within a watershed.

Table 7. Hydrologic Connectivity on the Smith River NRA and Gasquet District

Analysis Watershed Name	Road-Stream Proximity (mi/sq mi)	Crossing Density (#/sq mi)
Blue Creek	0.21	0.54
North Fork Smith	0.27	0.39
Middle Fork Smith	0.63	1.17
Myrtle-Hardscrabble	0.60	1.04
South Fork Smith	0.32	0.56

North Fork Smith subbasin

A large portion (30,330 acres) of the subbasin is roadless, The North Fork Smith Roadless area includes the majority of the drainage of the North Fork of the Smith River. Approximately 9,000 acres of the western portion of the roadless area has been altered by roads and mining activities. The geologic character of the ophiolitic area is predominantly serpentine/ultramafic with very coarse parent material. Nearly all of the stream crossings within the North Fork Smith subbasin are rocked fords containing very small fills. Potential road-related fine sediment sources in this subbasin are considerably fewer than in the Middle and South Fork subbasins. In the Bear Creek, High Plateau Creek, Peridotite Canyon Creek and Stony Creek watersheds, Forest Road 18N13 (8 miles), Road 18N09 (6 miles) and all of the spur roads (approximately 24 miles) are currently maintained at OML 1 and are in good hydrologic condition, with very little drainage diversions, erosion, and potential for sedimentation. Therefore, the increase in drainage network indicator is properly functioning.

Middle Fork Smith subbasin (including Myrtle-Hardscrabble)

Within the Middle Fork Smith subbasin, roads 17N08, 18N07, and 18N11 experience high traffic loads and have a combined 29 high priority sites between them which accounts for 28% of all high priority sites. These roads are chronic contributors of sediment to nearby streams with 17N08 contributing directly to Little Jones Creek and 18N07 contributing directly to Knopki Creek. Common problems on these roads include undersized culverts, plugged culverts, and roadbed gullies. The drainage pattern on these roads is mostly insloped with 92% of the steam crossings under-sized for the 100-year storm event, and 77% having the potential to divert if

overtopped. The roads also have some of the longest inboard ditches in the watershed. The average inboard ditch, without a break in slope, for 18N07 was 1,102 feet and 641 feet for 17N08. Beyond addressing the specific problems at each high priority site, these roads would benefit from culvert upgrades, installation of diversion prevention dips, and breaks in slope to reduce length of inboard ditches. Treatment of these roads would result in potential "sediment savings" of 97,969 cubic yards. Due to the current condition of roads and length of hydrologically connected road drainage features, the increase in drainage network indicator is at risk of not properly functioning.

South Fork Smith subbasin

A total of 613 cross drains have been identified in the South Fork Smith subbasin. Of these, 67 (11%) were identified as needing immediate treatment. The most common problems at these pipes were plugged inlets and direct delivery of sediment to the stream network through surface flow paths (i.e., rills and gullies). These flow paths can be chronic contributors of fine (i.e., silt and clay) sediment from the road surface and inboard ditches. The main cause of these flow paths is long sections of uncontrolled flow along the road surface and inboard ditch. In these situations, the most effective treatment is the installation of additional drainage features to reduce the road-related drainage density.

238 (39%) cross drain sites were identified as needing simple routine maintenance. The most common problem (60% of the sites) is sediment plugging the culvert inlet. Sites that plug can divert water either onto the road surface or hillslope causing erosion, or into downroad cross drains or stream crossings, expanding the drainage network and eventually causing the downstream sites to fail. Due to the current condition of roads and length of hydrologically connected road drainage features, the increase in drainage network indicator is at risk of not properly functioning.

Watershed Conditions

Road Density and Location: at risk

Road networks can impact watershed processes through surface erosion and the generation and transport of increased loads fine sediment. Surface erosion is highly dependant on soils, road surfacing, road grade, age of the road, traffic volumes, and the effectiveness and spacing of drainage structures. Studies have indicated that sediment delivery to stream systems is highest in the initial years after road construction, although unlined ditches and road surfaces with little armor can remain chronic sources of sediment.

Surface erosion condition is determined by examining the density of roads on erodible soils (Table 8a and b). This indicator addresses the potential for altered sediment regime associated with surface erosion accelerated by road construction and road maintenance.

Table 8a. Smith River and Gasquet District Surface Erosion

Analysis Watershed Name	Road Hazard Potential
Blue Creek	Low Hazard
Lower North Fork Smith	Low Hazard

Analysis Watershed Name	Road Hazard Potential
Middle Fork Smith	Moderate Hazard
Myrtle-Hardscrabble	Moderate Hazard
South Fork Smith	Low Hazard

Table 8b. Criteria for Surface Erosion Ratings

Rating	Definition
High Hazard	Significant alteration of the natural sediment regime associated with surface erosion is likely or evident. Conditions are characterized by the presence of higher road densities and associated disturbance to soil and vegetation on soils highly sensitive to accelerated erosion (high - very high Erosion Hazard Ratings).
Moderate Hazard	Moderate alteration of the natural sediment regime associated with surface erosion is likely or evident. Overall disturbance is variable, with low to moderate road densities and associated disturbance to soil and vegetation on soils highly sensitive to accelerated erosion (high - very high Erosion Hazard Ratings).
Low Hazard	Minor or no alteration of the natural sediment regime associated with surface erosion is likely or evident. Overall disturbance is low and are characterized by the presence of low road densities and associated disturbance to soil and vegetation on soils highly sensitive to accelerated erosion (high - very high Erosion Hazard Ratings).

Drainage structure, function, and spacing are key to minimizing the amount of surface flow, which directly affects surface erosion. Subsequent project level Roads Analysis may consider new cross drain spacing guidelines using the Water Erosion Prediction Program (WEPP) to model surface erosion from roads have been derived (Morfin et al., 1996). The WEPP model provides for input ranges of local climatic conditions, surfacing material characteristics, maintenance frequency, distance between cross drains, and road grade typical for National Forests. (USDA Forest Service, Water/Road Interaction Series, 1998).

Stream crossing density reflects the extent to which roads have modified the channel network and is an indicator of the potential for culvert failures. The relatively low density of road-stream crossings across the Smith River NRA is attributable to the high proportion of roads on or near ridgelines and not in frequent proximity to channels. The consequences of culvert failures can range from minor to substantial. Minor failures introduce culvert fill material that exceeds the transport capacity of the channel, causing it to become aggraded and widened. It can take several years for the channel to adjust and move the sediment downstream, but generally the effects are localized and remain within a relative short distance downstream of the crossing. Substantial failures can generate debris flows and entrain additional sediment as they progress downhill and downstream. The impacts from debris flows can extend far from the culvert failure site and take many years for the channel to adjust and riparian vegetation to reestablish. Stream

crossings on steep terrain, with a lot of woody debris upstream, have the greatest potential for debris flows. Adequate road maintenance is critical in these areas.

Culvert diversions also pose significant risks in terms of off-site sedimentation. Diversions occur when a culvert plugs and the stream flow follows the roadbed instead of crossing the road and returning to the original channel. When the diverted stream flow accumulates enough water and sediment, it can create a gully and eventually cross the road and scour a new channel on the hillslope. Upgrading culvert size, increasing the number of cross drain culverts, water bars, or larger drivable surface drains (rolling dips) can minimize diversion potential.

Table 9 describes estimated road-crossing density for the District. Estimates may be actually higher or lower than predicted depending on accuracy of the stream or road coverage. The relatively low crossing density throughout the project area is attributed to the majority of roads located in the upper third of the watershed where stream density is lower. During the Smith River RAP, data on road-stream crossing density was field verified to identify specific sites and areas of concern. This included and extensive road and culvert inventory in the South and Middle Fork Smith River sub-basins (Ledwith 2003).

Table 9. Smith River NRA and Gasquet District Road-Stream Crossing Density

Analysis Watershed Name	Crossing Density (#/sq mi)
Blue Creek	0.54
Lower North Fork Smith	0.39
Middle Fork Smith	1.17
Myrtle-Hardscrabble	1.04
South Fork Smith	0.56

Portions of roads in the Smith River basin are near streams and affect flow hydrology (within 105 meters of a channel). A smaller portion of these are also within valley bottoms of stream systems. Overall road density across the Smith River basin is relatively low at approximately 1.6 mile per square mile. Therefore, the low road density that includes a portion near channels (location indicator) best describes this indicator as at risk of not properly functioning.

Disturbance History: at risk

Human disturbance history in the Smith River basin includes timber harvest and mining. Approximately 58,000 acres (FS and private) in the project are have had some form of timber management. Most of the private lands are located in the upper Hurdygurdy, Goose, and Little Jones Creek watersheds. Approximately 15% of the watershed has had some form of human disturbance, and the forest age for much of this disturbed area is less than 50 years old (early mature).

Past hydraulic mining, primarily for gold, altered certain streamchannels, including Hurdygurdy, Craigs, Coon, Patrick, and Myrtle Creeks. For example, the lower 4 miles of Hurdygurdy Creek were at the heart of the Big Flat Mining District, that was most active from 1878 to 1889 and again between 1932 and 1939. This mining district encompassed approximately 1,500 acres, and contained two major ditch systems, ten hydraulic pits, numerous placers, and smaller ditches and

penstock sections (USFS 1976 through 1985). Hydraulic mining altered channels and riparian areas significantly. Huge volumes of hillslope sediment were washed down to riparian and streamside areas, and LWD was removed from the channel to facilitate the mining of alluvial gold placer deposits within the substrate and near the channel. The removal of LWD reduced habitat complexity, LWD recruitment potential, and the ability of the channel to store and route the introduced sediment. Much of the landscape where hydraulic mining occurred is recovering, and previously altered riparian stands in areas like lower Hurdygurdy Creek are approaching 70 to 80 years and are beginning to provide RR functions.

This amount of disturbance history from timber harvest and mining results in the watershed to be at risk of not properly functioning.

Riparian Reserves: properly functioning

The road system directly affects riparian communities where it impinges on riparian areas. Roads can indirectly affect riparian communities by intercepting surface and subsurface flows and routing these flows so that riparian areas dry up and the riparian vegetation is replaced with upland vegetation. Riparian plant communities play a vital role in providing shade. Removal or degradation of these communities can affect stream stability and water temperatures, which in turn, affects aquatic habitat.

The condition and function of the riparian reserves varies throughout the project area. Functions provided by the riparian reserves that are important for aquatic TES species include shade canopy and thermal buffering, LWD production from the mortality and recruitment of mature trees, protection of small floodplains important for overwintering habitat, and production of nutrient and food sources. As described above, the shade canopy is currently adequate to maintain stream temperatures within the range necessary for productive salmonid habitat.

Due to the timber harvest history (described above), approximately 10% of the RRs in the project area are in an early to early mature seral stage (approximately 15,000 acres of private land are included in this estimate). These RRs are predominantly within plantations or thinning areas comprised of the Douglas-fir plant series and typically range from 25 to 60 years old. Over the next 100 years, LWD recruitment potential will likely be low in these areas until they mature and develop the potential for LWD recruitment. The remaining majority (90%) of the RRs have not been managed, and range from early mature to old growth. Variation in seral stage is due to mainly to fire, windthrow, and landslides. These RRs function properly and will continue to provide shade, food, nutrients, and LWD. Therefore, the overall current RR baseline condition at the Smith River basin scale, is that RRs are properly functioning.

Table 10. Pathways and indicators for the Smith River Basin

Smith River

	ENVIRONMENTAL BASELINE		
	Properly Functioning	At Risk	Not Properly Functioning
WATER QUALITY			
Temperature			
Sediment/Turbidity	turbidity	sediment	
Chem. Contam/Nut			
HABITAT ACCESS			
Physical Barriers			
HABITAT ELEMENTS			
Substrate			
Large Woody Debris			
Pool Frequency			
Pool Quality			
Off-channel Habitat			
Refugia			
CHANNEL CONDITION & DYNAMICS			
Width/Depth ratio			
Streambank Cond.			
Floodplain Connectivity			
FLOW/HYRDOLOGY			
Peak/Base Flows			
Drainage Network Increase			
WATERSHED CONDITIONS			
Road Density & Location			
Disturbance History			
Riparian Reserves			

Middle Fork of Smith River

Most activities planned are too far away to effect coho salmon and their CH, therefore, road work activities that are in close proximity to coho salmon and their CH will be focused on for this analysis. To assess impacts from the proposed action, a more specific set of data are used to analyze impacts from activities within close proximity to coho salmon CH.

The following information was stated above to show habitat indicators for the entire Smith River basin. However this information is again shown to analyze effects of the project within the

Upper Middle Fork of the Smith River. Habitat indicators discussed below are only for sediment and turbidity because those habitat indicators are the only ones that have the potential to be affected.

Sediment and Turbidity – At Risk

Within the Middle Fork Smith subbasin, 108 roads have either a stream crossing, cross drain, or erosional feature for a total of 829 features. Crossing types in the subbasin are diverse with 357 (82%) fitted with corrugated metal culverts, 44 (10%) fords, 21 (5%) Humboldt crossing and 13 (3%) bridges. Eighty four stream crossing sites (19%) were identified as high, 208 (48%) as medium, and 145 (33%) low priority. High and medium priority stream crossings could potentially be a source of approximately 231,866 cubic yards of sediment.

A total of 311 cross drains exist in the Middle Fork Smith subbasin. Of these, 37 (12%) were identified as high priority. These culverts commonly have plugged inlets and directly delivery sediment to the stream network through surface flow paths (i.e., rills and gullies). These flow paths are chronic contributors of fine (i.e., silt and clay) sediment from the road surface and inboard ditches. The main cause of these flow paths is long sections of uncontrolled flow along the road surface and inboard ditch.

120 (39%) cross drains are in need of routine maintenance. The most common problem (50% of sites) is sediment plugging of the culvert inlet. Plugged cross drains can divert water either onto the road surface or hillslope causing erosion, or into downroad cross drains or stream crossings possibly causing these sites to fail. Other maintenance needs include treating buried outlets, filled inboard ditches, and broken drop inlet covers.

A total of 81 road-related erosional features have been identified in the Middle Fork Smith watershed. Types of erosional features include: 31 cutslope failures, 28 fillslope failures, and 22 roadbed failures. These sites are the source of an estimated 99,030 cubic yards of sediment that is beginning to enter the stream network.

Within the Middle Fork Smith subbasin, 248 roads (132 system and 116 non-system) have been inventoried and evaluated. A total of 437 stream crossings exist in the Middle Fork Smith watershed giving a stream crossing density of 1.7 crossings per mile of road. Road density is approximately 0.003 miles/acre. Knopki, Little Jones, and Siskiyou Fork watersheds in the upper Middle Fork area have the majority of road-related impacts. In the Knopki watershed, 18N11D and complex of roads has 17 features in which 13 are high priority. Seven stream crossings have failed with an estimated 500-1000 cubic yards of sediment left to deliver to the stream network. In addition there are 7 erosional features in which 6 are considered high priority with potential delivery of 20,352 cubic yards of sediment to the stream network. Many of these sites have been identified as chronic sources of sediment to Knopki Creek.

18N05 is a ridge to valley road in which the lower 2 miles are in close proximity to a perennial tributary of Knopki Creek. The stream crossings (9) are old fords and Humboldt crossings that are failing and currently diverting. There are four erosional features that are in the process of recovering but still have the capacity to deliver 1,145 cubic yards of sediment to the stream network. The road has been abandoned for 20 plus years and is heavily vegetated. Treating this road would result in potential “sediment savings” of 2,150 cubic yards. Table 11 describes the potential sediment sources existing in the Middle Fork Smith sub basin.

Table 11. Potential sediment yield from road-related sites in the Middle Fork Smith sub basin (from Ledwith 2003a).

Site Type	Total number of sites	Number of high priority sites	Number of medium priority sites	Future yield to streams (cy)	Number of sites that need maintenance	Number of sites currently diverting	Number of sites with diversion potential
Stream Crossings	437	84	205	231,866[1]	149	33	181
Cross Drains	311	37	64	N/A	120	N/A	302
Erosional Features	81	35	10	44,339[2]	N/A	N/A	N/A
Totals	829	156	279	276,205	269	33	483

[1] Includes stream crossings ranked high or medium priority. At stream crossings with diversion potential, future erosion is difficult to predict. A minimum estimate of the stream crossing fill volume was used as a predicted value for this table.

[2] Includes erosional features ranked high and medium priority.

Table 12. Pathways and indicators for Knopki Creek and the Upper Middle Fork Smith River

Knopki and Upper Middle Fork Smith River

	ENVIRONMENTAL BASELINE		
	Properly Functioning	At Risk	Not Properly Functioning
WATER QUALITY			
Temperature			
Sediment/Turbidity	turbidity	sediment	
Chem. Contam/Nut			
HABITAT ACCESS			
Physical Barriers			
HABITAT ELEMENTS			
Substrate			
Large Woody Debris			
Pool Frequency			
Pool Quality			
Off-channel Habitat			
Refugia			
CHANNEL CONDITION & DYNAMICS			
Width/Depth ratio			
Streambank Cond.			
Floodplain Connectivity			
FLOW/HYRDOLOGY			
Peak/Base Flows			
Drainage Network Increase			
WATERSHED CONDITIONS			
Road Density & Location			
Disturbance History			
Riparian Reserves			

Diamond Creek

Sediment and Turbidity - Properly Functioning.

The aquatic habitats of Diamond Creek consist of cobble / boulder dominated rapids, riffles, and non-turbulent riffles and cobble / boulder dominated mid-channel pools, lateral scour pools, trench pools, and plunge pools. Gravel is the sub-dominant substrate component in both fast water and slow water habitat trending toward co-dominance with larger substrate in the upper reaches. Gravel is present either as interstitial fill between larger substrate, in eddy deposits, in occasional large patches in pooltails, and along stream margins. Bedrock outcrop is common throughout the surveyed section and is often a contributor to pool formation and maintenance. Sand is a minor substrate component in Diamond Creek. The substrate of Diamond Creek is not embedded. Several side channels occur in Diamond Creek of which some offer rearing and refuge habitat opportunities that differ from the main channel. Water quality and clarity is excellent. Water temperature was cool throughout the surveyed section ranging from 16^0 C to 10^0 C, well below lethal levels.

Although Diamond Creek is designated as CH, recent stream surveys in Diamond Creek (Siskiyou Research Group 2004) did not detect presence of juvenile coho.

Table 13. Pathways and indicators for Diamond Creek

Diamond Creek	**ENVIRONMENTAL BASELINE**		
SUMMARY of SURVEYED HABITAT PARAMETERS	**Properly Functioning**	**At Risk**	**Not Properly Functioning**
WATER QUALITY Temperature range is 16C to 10C, below lethal levels for fish. Riparian provided shade is dependent on geology. Shade is less common in peridotite/serpentine dominated areas. Best riparian shade in upper watershed. No suspended sediment detected. Negligible turbidity. Water is clear.			
HABITAT ACCESS No barriers to migration observed. A bedrock waterfall and a bedrock chute may inhibit migration in upper watershed during low flow.			
HABITAT ELEMENTS Fast water dominated expressed mainly as rapids and riffles. Boulder/cobble dominated substrate. Gravel is found more often as interstitial fill rather than in patches suitable for spawning. The streambed is not embedded. Large woody debris density is naturally low. Though recently burned, the riparian zone appears intact and unmanaged. Pool density is naturally low. Pools formed by boulders and bedrock. Average pool depth is 4.4 feet. Side channels offer some rearing and refuge habitat that differs from main channel. Anadromy likely extends 8.15 miles up from mouth.			
CHANNEL CONDITION Stable with evidence of active bank instability observed. Bank instability is naturally occurring. With localized exceptions at landslides, the channel is not aggraded.			
HYDROLOGY Measured discharge within expected range. Currently used roads in the watershed have either had stream crossings converted to rolling dips or have had culverts replaced. Stream is fed by numerous tributaries, seeps, and springs.			
WATERSHED CONDITIONS Road density is approximately 0.96 miles per square mile. Most sub-watersheds have a higher road density. Most roads are high in subwatersheds, or along drainage divides, or decommissioned. Road 18N09 parallels the stream in reaches two and three, currently shows signs of erosion, and may be a future sediment source.			

VI. EFFECTS OF THE PROPOSED ACTION

Effects on Aquatic Habitat Indicators

Water Quality

Water Temperature: Maintained

Riparian vegetation could potentially be disturbed during road decommissioning, culvert/bridge removal or replacement and upgrade, or stormproofing activities. Riparian trees may be cut and excavated to access each site and restore proper channel dimensions. This type of activity is likely to have no or only localized effects on stream shade and water temperature because of the small amount of vegetation being removed at any site. See the *Port-Orford-Cedar* section of this chapter for mitigations to reduce risk to this important riparian species.

Turbidity: Short-term pulses from actions, but risk reduction from restoration actions and overall reduction in turbidity.

Fine sediment introduced into a waterway can cause turbidity. An increase in turbidity can affect fish and filter-feeding macro-invertebrates downstream of the work site. At moderate levels, turbidity has the potential to adversely affect primary and secondary productivity; at higher levels, turbidity may interfere with feeding and may injure and even kill both juvenile and adult fish (Spence et al. 1996, Berg and Northcote 1985).

The proposed road decommissioning actions would generally help to limit sediment input and turbidity from road systems over time. However, activities themselves could potentially contribute some short-term sediment to streams. Fine sediment could be generated from decommissioning or culvert removal. The amount of fine sediment that could potentially enter a stream because of these activities would be minimized through the implementation of best management practices (BMPs). Where sediment does enter a stream, it is anticipated to be diluted and reduced to a discountable level that would not adversely affect listed fish and their critical habitat. This is primarily due to small intermittent streams (where activities would take place, outside of critical habitat) that are hydrologically connected to larger streams where coho salmon Critical Habitat exists. Disturbed soil will most likely be transported during the first heavy rains of winter after work has been completed. As sediment moves down these smaller streams, the amount of sediment is diluted from settling and dilution from other tributaries entering the transport stream.

When sediment finally gets into coho salmon Critical Habitat the small amount of sediment and flow from the transport tributary stream is even further diluted by entering larger streams where coho salmon may be present. Therefore, the proposed action would not result in adverse effects. Pulses of sediment and increases in turbidity would be short term and at negligible levels that would not harm or kill threatened, endangered and Sensitive fish, or adversely affect critical habitat or essential fish habitat.

As discussed in the baseline channel conditions section, the overall potential for increased turbidity levels from the action alternatives is very low and is reflective of the hard basalt geology and subsequent coarse substrate that dominates streams of the Smith River basin. The Smith River will maintain a low turbidity range that allows for a high rate of success in salmonid

incubation, rearing, feeding, and spawning. Turbidity is expected to not change from the proposed action and will remain properly functioning.

Sediment: Short pulses of sediment entering stream channels, however overall sediment reduction with risk reduction from upgrades, culvert removal and decommissioning.

Increases in sediment supply beyond the transport capability of a critical habitat or essential fish habitat stream can cause stream channel instability, aggradation (sometimes to the extent that perennial streams become intermittent; Cederholm and Reid 1987), widening, loss of pools, and a reduction in gravel quality (Sullivan et al. 1987, Furniss 1991, Swanston 1991). For salmon, these changes can mean reduced spawning and rearing success when spawning areas are covered, eggs and fry suffocate or are trapped in redds, food abundance is reduced, and over-wintering habitat is reduced (Cederholm and Reid 1987, Hicks et al. 1991).

The proposed action alternatives would reduce sediment input and turbidity from road systems over time. However, the work activities themselves can contribute some short-term increases in sediment to streams. Fine sediment can be generated from culvert replacement, stabilization of storm-damaged roads, road repairs and stabilization, and removal of material from small landslides. The amount of fine sediment which could potentially enter a stream as a result of these activities will depend on the road surface type, proximity of the road to the stream, whether road ditches are connected to streams, and the density and type of vegetation and other materials between the road and the stream. The inherent standards, guidelines, and BMPs will limit the amount of fine sediment entering stream channels. Where sediment does enter a stream, it is anticipated to be diluted and reduced to a discountable level that would not adversely affect listed fish and their critical habitat. This is primarily due to small intermittent streams (where activities would take place) that are hydrologically connected to larger streams where coho salmon Critical Habitat exists. As sediment moves down these smaller streams, the amount of sediment is diluted from settling out and dilution from other tributaries. When sediment finally gets into coho salmon Critical Habitat the small amount of sediment and flow from the tributary stream is even further diluted by entering larger streams where coho salmon may be present. Therefore, the proposed action would not result in adverse effects. Pulses of sediment would be short term and would be at negligible levels that would not harm, or kill threatened, endangered and Sensitive fish, or adversely affect critical habitat or essential fish habitat.

The proposed action would address the current potential sediment yield described in the baseline discussion through road decommissioning, culvert removal/replacement, and stormproofing. Table 3-1 summarizes the net reduction of the proposed action over the project area. The amount of road-related sediment from NFS roads is expected to greatly decrease because of the proposed decommissioning (culvert removals), culvert replacements, stormproofing, and road upgrading/downgrading. All roadwork activities entailing machinery and/or ground disturbance will occur when conditions are dry; minimizing the potential for mobilized or transported sediment, and subsequent turbidity increases. These activities will disperse precipitation runoff evenly from roads and prevent runoff concentration and subsequent rills and gullies from forming.

Table 3-1. Number and type of sites treated and amount of fine sediment reduced.

Site Type	Total number of sites	Number of high priority sites	Number of medium priority sites	Fine sediment reduced (cubic yd.)
Stream Crossings (culverts and Humboldt crossings)	847	135	399	502,852

Site Type	Total number of sites	Number of high priority sites	Number of medium priority sites	Fine sediment reduced (cubic yd.)
Cross Drains	924	104	140	N/A
Erosional Features	117	52	20	60,366
Totals	1,888	291	559	563,218

Restriction of motor vehicles to designated and improved NFS routes will eliminate cross-country motorized vehicle traffic, including on streambanks and gravel bars, and reduce the direct contact of vehicle tires to soil and further reduce the likelihood of any mobilization and transport of fine sediment into channels.

The proposed action alternatives would be beneficial to the sediment processes in the project area, and sediment is expected to decrease from NFS roads. National Forest System road-related sediment sources will be reduced, and the percentage of fine sediment in the substrate will remain low (less than 12 percent) and will not impede spawning success, egg incubation, and fry emergence. The proposed action would have long-term benefits to general water quality within the Smith River. However, due to the location of county and state roads along valley floors and in close proximity to the Middle and South Forks Smith River, road-related sediment will continue to be delivered to channels and the Smith River basin will continue to be at risk regarding this indicator.

Chemical Contaminants and Nutrients: Maintain

Contamination to the stream channel from the proposed activities could occur from equipment leaks (e.g., diesel fuel, oil, hydraulic fluids, and antifreezes) or spills from refueling during project implementation. However, following the inherent standards and guidelines and BMPs will reduce the risk of these hazards. Overall risk to water quality should be negligible.

Closing roads in riparian reserves that access streambanks and bars, and restricting vehicles to designated routes and parking areas, will reduce the potential for oil and gasoline (petrochemical) contamination. Upon completion of any of the proposed action alternatives, risk of contamination will decrease from NFS roads. The actions would have long-term benefits by permanently reducing the risk of water contamination and related impacts to threatened, endangered and Sensitive fish, critical habitat, and essential fish habitat. However, due to the location and extent of county and state highways adjacent to streams, this indicator will continue to be at risk.

Habitat Access

Physical Barriers: Maintain

The project will not create any new barriers to fish migration. Therefore, the watershed will continue to properly function with regard to habitat access. Anadromous salmonids will continue to be able to access the anadromous reaches of the Smith River.

Habitat Elements

Substrate: Maintain

Some sediment may enter stream channels because of heavy equipment use and disturbance of soils, particularly during road decommissioning, restoration, and culvert removal/replacements. Short-term sediment pulses in certain stream reaches may occur. However, effects are unlikely to

result in decrease growth or survival of freshwater life stages of threatened, endangered and Sensitive fish. Due to the distance sediment would have to travel downstream in hydrologically connected streams; it is unlikely that enough sediment would reach coho salmon and their critical habitat to cause adverse effects.

The project will reduce fine sediment, and substrate composition will be maintained at high quality for spawning, rearing, and for benthic fauna. Therefore, the Smith River will remain properly functioning with regard to substrate.

Large Woody Debris: Maintain

Large woody debris is an important component of threatened, endangered and Sensitive fish habitat, particularly coho salmon. Large woody debris regulates sediment and flow routing, influences stream channel complexity and stability, and provides hydraulic refugia and cover within stream systems (Bisson et al. 1987, Gregory et al. 1987, Hicks et al. 1991, Sedell and Beschta 1991, Bilby and Bisson 1998). Large woody debris also plays a key role in retaining salmon carcasses (Cederholm and Peterson 1985), a major source of nitrogen and carbon in stream ecosystems (Bilby et al. 1996).

In the mainstems and lower reaches of major tributaries of the Smith River basin, large woody debris has been reduced through a variety of human activities that include past timber harvest practices and associated activities, placer and hydraulic mining activities, as well as the mandated cleanup activities that removed wood from streams throughout the region from the 1950s through the 1970s (FEMAT 1993, Bilby and Bisson 1998). The removal of trees within a distance equal to one site-potential tree height of streams (approximately 170 to 240 feet for mature conifer trees west of the Cascades, FEMAT 1993) have the potential to change the distribution, size, and abundance of large wood available for recruitment from streamside stands (Hicks et al. 1991, Ralph et al. 1994, Murphy 1995, Spence et al. 1996).

Headwater streams in the Smith River basin play an important role in watershed function. Large woody debris in headwater streams increases sediment retention by forming depositional areas and dissipating energy; retains non-woody organic matter, allowing it to be biologically processed prior to downstream export as dissolved and particulate nutrients; and delays surface water passage, allowing it to be cooled by mixing with ground water (Sullivan et al. 1987, Murphy 1995, Spence et al. 1996, Bisson and Bilby 1998). Additional wood can be recruited to fish-bearing streams from upslope and upstream areas through landslides and debris flows (McGarry 1994, Reeves et al. 1995). In some areas, wood transported in this manner may constitute up to 50 percent of the wood recruited to downstream reaches (McGarry 1994). McDade et al. (1990) could not account for 48 percent of the existing large woody debris pieces in a study of recruitment from streamside areas.

Large woody debris availability will not be altered by this project. Large woody debris will remain at risk in the Smith River. Until amounts of large woody debris sufficient to improve pool quality start to accumulate, much of the large woody debris will continue to occur above the bank full channel and potentially function during high flow periods. Juvenile and adult salmonids will continue to utilize these ephemeral habitats during winter storms as velocity refugia from potentially flushing flows. The proposed action alternatives would not affect how fish and other aquatic biota utilize large woody debris-associated habitats.

Pool Frequency: Maintain

Pool/riffle ratio (by occurrence) will not be impacted by any of the proposed action alternatives and will remain at one-third. Pool frequency will therefore continue to properly function. Pools at the current frequency and availability will continue to provide deep-water juvenile salmonid rearing habitats, feeding areas, and adult salmonid resting and holding areas.

Pool Quality: Maintain

The proposed action alternatives would not result in a change in pool quality; therefore pool quality in will remain properly functioning. As described in the previous large woody debris section, the quality of pools (e.g., amount of cover, spatial partitions, and substrate diversity) for overwintering coho salmon will likely remain as less than optimal (Meehan and Bjornn 1991).

Off-channel Habitat: Maintain

Off-channel habitat will continue to properly function and will not be impacted by this project. This type of habitat will provide early rearing areas for newly emerged juvenile salmonids as they feed, avoid predation, and grow.

Refugia: Maintain long-term improvement with overall improvement of watershed functions

The proposed action alternatives would not impact or reduce the amount or quality of properly functioning fish habitat refugia, especially in relation to critical habitat and essential fish habitat. Watersheds will function to provide habitats and resources (food, water, dissolved oxygen) for salmonids in all freshwater life stages in the event of a catastrophic habitat loss in an adjacent stream, and serve as a refugia network of critical habitat and essential fish habitat for coho and Chinook salmon throughout the Smith River basin.

Channel Conditions and Dynamics

Width to depth Ratio: Maintain

The proposed action alternatives would not impact the width/depth ratio and it will remain as properly functioning.

Streambank Condition: Maintain

Streambanks may be disturbed when culverts are removed or replaced. Streambank vegetation may be potentially removed from a site causing streambanks to be temporarily exposed to streamflow until new vegetation is reestablished. Maintenance activities may result in a loss of riparian vegetation if the road is close to the channel, which could cause some localized streambank instability. However, any resulting reduction of stability from these activities would be minor, and the effects to downstream threatened, endangered and Sensitive fish and critical habitat and essential fish habitat would be negligible.

Streambank condition will be protected from the restriction of motor vehicles to designated routes and parking areas. Therefore, streambank condition will continue to properly function.

Floodplain Condition: Maintain

The proposed action alternatives would not impact floodplain conditions. Floodplains will continue to properly function.

Flow and Hydrology

Peak and Base Flow: Maintain

The proposed action alternatives would further protect watershed processes related to natural peak/base flow (described in the baseline section), and it is expected that the peak/base flow response will continue to function properly.

Increase in Drainage Network: Improvement

The proposed action alternatives would reduce hydrologic connectivity from the road system and improve the drainage network from roads. A significant amount of routes will be decommissioned or restored and the amount of connected ditches and road related gullies will be reduced. Drainage network processes will be improved and the landscape will have a more natural drainage pattern that is closer to what existed prior to route construction.

Watershed Conditions

Road Density and Location: Improvement in sub watersheds; however, maintain at risk rating

Location of routes in relation to streams, specifically hillslope position, strongly influences how much surface and subsurface water flow a road intercepts. Mid-slope and lower slope roads in the Smith River basin can potentially intercept and re-rout flows. The proposed action would decrease runoff from maintained roads and therefore protect processes that maintain natural sediment transport efficiency and peak stream flow hydrology, and in turn protect stream channel stability. The removal of culverts, stormproofing, and improving surface drainage would restore natural hillslope drainage patterns.

The proposed action alternatives would reduce route density throughout the basin, with a portion of the reduction being near stream channels. This reduction is expected to be beneficial for downstream threatened, endangered and sensitive fish and critical habitat and essential fish habitat by reducing the potential for road-related sediment delivery to the channel. However, due to the location of county and state roads along valley floors and in close proximity to the Middle and South Forks Smith River, road location will continue to be at risk.

Disturbance History: Improvement in sub watersheds; however, maintain at risk rating

Restoration of disturbed landscapes through NFS road decommissioning, and routes restoration, will help facilitate and augment the natural rate of watershed recovery. As route miles are reduced, forests in harvested areas mature, and mined and logged areas continue to stabilize over the long term, this indicator will begin to approach a properly functioning condition. However, due to the location of county and state roads along valley floors and in close proximity to the Middle and South Forks Smith River, road-related disturbance will continue in close proximity to channels and the Smith River basin will continue to be at risk regarding this indicator.

Riparian Reserves: Maintain

Because of their proximity and connections to streams, ecological conditions and processes in riparian areas can strongly influence threatened, endangered and sensitive fish critical habitat and essential fish habitat. Riparian areas function to provide shade, cover, and channel structural elements; supply and process nutrients; support food webs; supply substrate materials; stabilize

streambanks; filter upland sediments; and provide linkages to side channels, floodplains, and groundwater (Sullivan et al. 1987, Gregory et al. 1991, FEMAT 1993, Spence et al. 1996).

Most riparian area functions affecting streams and anadromous fish (including bank stability, shade, litterfall, large wood recruitment) occur within a distance equal to the height of a site potential tree from the edge of the streambank (FEMAT 1993, p. V-27; Spence et al. 1996, pp. 216-220) for streams without a floodplain, and decline rapidly beyond that distance. Where there is a floodplain, riparian area functions may extend for a distance equal to the height of a site-potential tree from the edge of the floodplain, since during a flood the entire floodplain can function as the stream channel (Rhodes et al. 1994).

The proposed action alternatives, including design features to reduce the risk of spread of Port-Orford-cedar root rot disease, would further protect the processes that maintain the condition and function of riparian reserves, therefore riparian reserves will be maintained as properly functioning.

Summary of Effects of All Action Alternatives

As a result of any action alternative, some sediment may enter stream channels because of heavy equipment use and disturbance of soils during road upgrading or decommissioning. Short-term effects such as localized increases in fine sediment in certain stream reaches may occur. Fine sediment introduced into a waterway can cause turbidity. An increase in turbidity can affect fish and filter-feeding macro-invertebrates downstream of the work site. At moderate levels, turbidity has the potential to adversely affect primary and secondary productivity; at higher levels, turbidity may interfere with feeding and may injure and even kill both juvenile and adult fish (Spence et al. 1996, Berg and Northcote 1985).

Increases in sediment supply beyond the transport capability of the stream can cause stream channel instability, aggradation (where the channel can become wider and shallower and sometimes to the extent that perennial streams become intermittent) (Cederholm and Reid 1987), loss of pools, and a reduction in gravel quality (Sullivan et al. 1987, Furniss 1991, Swanston 1991). For salmon, these changes can mean reduced spawning and rearing success when spawning areas are covered, eggs and fry suffocate or are trapped in redds (*nests*), food abundance is reduced, and over-wintering habitat is reduced (Cederholm and Reid 1987, Hicks et al. 1991).

Under all alternatives, road density does not exceed three miles per square mile in any of the 5th-field watersheds, and only the Middle Fork Smith, which contains US Highway 199 and multiple Del Norte County roads, exceed two miles per square mile (2.07 miles per square mile).

Contamination to the stream channel from any of the action alternatives could occur from equipment leaks (e.g., diesel fuel, oil, hydraulic fluids, and antifreezes). However, following the Forest Plan standards of refueling at least 150 feet from a stream and having spill containment equipment on hand would reduce the risk of these hazards. Contamination may also occur from wet concrete or wastewater when bridges or culverts are repaired. Spilled wet concrete and wastewater runoff from concrete curing can cause rapid pH swings, which has the potential to kill or stress fish. However, the use of concrete would be very infrequent and be applied during low flows when many channels are dry. Therefore, any subsequent risk to water quality would be negligible. Closing roads in riparian reserves that access streambanks and bars, and restricting vehicles to designated routes, will reduce the potential for oil and gasoline (petrochemical)

contamination. Upon completion of any action alternative, risk of contamination will decrease from NFS roads.

Streambanks may be disturbed when culverts are upgraded or replaced. Streambank vegetation may need to be removed from the work site causing streambanks to be temporarily exposed to streamflow until new vegetation is reestablished, which could cause some localized streambank instability. Riparian canopy vegetation would potentially be disturbed when culverts are removed and when roads are decommissioned. When culverts are removed, riparian shrubs and trees may be cut and excavated to access each site and restore proper channel dimensions. This type of activity is likely to have no or localized effects on stream shade and water temperature because of the small amount of vegetation being removed. The removal of roads adjacent to streams would have a positive effect on stream temperature and streambank stability in the long term. Trees and other riparian vegetation would re-colonize a decommissioned roadbed and, in time, help shade the adjacent stream and re-stabilize the streambanks to their natural slope.

The effects to threatened, endangered and Sensitive fish and stream habitat from any of the action alternatives is linked to degree of hydrologic connectivity—the proximity of roads to streams, specifically hillslope position, and strongly influences how much surface and subsurface water flow a road would intercept and deliver re-routed water and added road sediment to different stream segment or channel (also called a diversion). Mid-slope and lower slope roads would have the greatest potential of intercepting and re-routing flows. Increased runoff from improperly maintained roads can increase sediment transport efficiency and peak stream flows that may destabilize stream channels and reduce habitat quality. The implementation of Alternatives 5 or 6 would reduce the hydrologic connectivity of the NFS road system, and restore hillslope drainage to natural patterns.

The Griffin Creek Bridge is located in Southern Oregon/Northern California coho salmon critical habitat. The project is consistent with the Watershed and Fisheries Restoration Program Biological Assessment (2015) with the application of best management practices and design features to prevent material from entering the channel. Contamination may also occur from wet concrete or wastewater when the bridge is repaired. Spilled wet concrete and wastewater runoff from concrete curing can cause rapid pH swings, which has the potential to kill or stress fish. However, the use of concrete be applied during low flows when many channels are dry and would employ design features to prevent the concrete from entering the channel. The work itself would not occur within the wetted width.

Motorized routes may have unavoidable effects on streams, no matter how well they are located, designed or maintained (FEMAT 1993). Routes can affect streams directly by accelerating erosion and sediment loadings, by altering channel morphology, and by changing the runoff characteristics of watersheds (Furniss et al. 1991). Hauge et al. (1979) discussed several ways that roads can affect hillslope drainage, including changes in infiltration rates, interception and diversion of subsurface flow, changes in the watershed area of small streams, changes in the time distribution of water yield to channels, and changes in fine (micro) details of drainage. Gibbons and Salo (1973 op. cit. Furniss 1991) found that sediment contributions per unit area from roads is much greater than that from all other land management activities combined, including log skidding and yarding. In general, motorized routes have been a primary source of sediment impacts in developed watersheds (Everett et al. 1994; Rhodes et al. 1994; Wissmar et al. 1994).

The effects of any of the action alternatives are **expected to not adversely affect threatened coho salmon** or sensitive aquatic biota, critical habitat, and essential fish habitat and would be beneficial to threatened, endangered and sensitive fish, critical habitat, and essential fish habitat. Individual Forest Service Sensitive species may be temporarily effected by influxes of sediment; however, it is unlikely to lead to federal listing of any of the aquatic Forest Service Sensitive species.

Effects of Decommissioning and Restoration on Sediment and Turbidity Indicators in Areas of Close Proximity to Coho Salmon Critical Habitat within the Middle Fork Smith River

The roads in closest proximity to critical habitat and essential fish habitat proposed for decommissioning or restoration are 18N03 and 18N09.102 and are within 500 feet of critical habitat and essential fish habitat. 18N03 is approximately 400 feet from the upper Middle Fork Smith River and has six intermittent culverts that would be removed. 18N03 has a stable roadbed and is currently outsloped with no inboard ditches. This project would be done during the summer with no flow in any of the six intermittent streams. Disturbed soils would most likely have time to settle (over summer), erosion control efforts (standards and guidelines and BMPs) would limit the amount of material that could be potentially washed into the intermittent streams that are hydrological connected. Material (sediment) that does end up in these intermittent streams would be transported downstream towards coho salmon Critical Habitat. While this material is being transported downstream, some of the material (larger size particles) will settle out in slower reaches of these streams. In addition, as streams move downhill other springs, seeps and tributaries that increase the amount of flow in them will dilute the level of sediment. When this transported material finally reaches the Middle Fork Smith River (much larger channel), the small amount of sediment and flow that would reach the river, would be quickly diluted even more from the large amount of water that it would be flowing into the Middle Fork Smith River.

Effects of Restoration on Sediment and Turbidity Indicators in Areas of Close Proximity to Coho Salmon Critical Habitat within Diamond Creek

Road 18N09.102 is approximately 300 feet from Diamond Creek and has only intermittent low water crossings and would only require approximately 1 mile of outsloping and waterbarring. Since this road already has low water crossings, little work or soil disturbance would take place in channel crossing areas. Outsloping of the road would create natural hydrological drainage and water would not get concentrated. Therefore, very little material is expected to be transported out of this area. All other roads proposed for decommissioning are more than 0.25 miles from critical habitat and essential fish habitat and would have discountable levels of turbidity and sediment reaching coho salmon and their Critical Habitat for the same reasons listed above (dilution of small amounts of sediment).

Aggregated Effects

The proposed action comprises of a suite of activities that would be implemented on roads throughout the project area. Concurrent activities (road decommissioning, road stormproofing, road upgrading/downgrading, and road maintenance) could occur within a single 5th field watershed, and in all 5th fields in compliance with the Watershed and Fisheries Restoration Program BA and BO (2015). These concurrent activities are in total expected to result in net

combined overall (5th field and project area scale) beneficial effects to coho salmon, CH and EFH. For reasons described above throughout the effects discussion, and most notably related to: 1) proximity of CH and EFH, and 2) the very small likelihood of coho salmon occurrence in the project area, the net combined disturbance (primarily sediment delivery) levels at the 5th field and project area scales are expected to be discountable and would not have adverse effects to coho salmon and their CH.

Cumulative Effects under ESA

Cumulative effects are those effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur within the action area of the Federal action subject to consultation. Future private or state activities that are reasonably certain to occur within the project area include:

1. County road maintenance on roads 305, 314, 315, 316, 324, 405, 411, and 427 (approximately 75 miles)
2. California state highway 199 road maintenance (approximately 31 miles)

The amount of road-related sediment from FS roads is expected to greatly decrease as a result of any of the proposed action. FS road-related sediment sources will be reduced, and percentage of fine sediment in the substrate will remain low (<12%) and will not impede spawning success, egg incubation, and fry emergence. However, due to the location of county and state roads along valley floors and in close proximity to the Middle and South Forks Smith river, road-related sediment will continue to be delivered to channels in areas of the Smith River basin.

Closing roads in riparian reserves that access streambanks and bars and restricting vehicles to designated routes will reduce the potential for oil and gasoline (petrochemical) contamination. Upon completion of this proposed action, risk of contaminantion will decrease from FS roads. However, due to the location and extent of county and state highways adjacent to streams, contamination will continue to be a risk.

Restoration of disturbed landscapes through FS road decommissioning will help facilitate and augment the natural rate of watershed recovery. As road miles are reduced, forests in harvested areas mature, and mined and logged areas continue to stabilize over the long term, the legacy of effects from past activities will begin to recede. However, due to the location of county and state roads along valley floors and in close proximity to the Middle and South Forks Smith river, road-related disturbance will continue in close proximity to channels in the Smith River basin, but would not cause cumulative impacts due to the proposed action.

VII. DETERMINATION

Based upon the beneficial nature of this proposed action, it is the determination of the fisheries biologist that this project may affect, and is not likely to adversely affect Southern Oregon/Northern California Coastal coho salmon and its designated critical habitat.

This project would not adversely affect coho salmon and Chinook salmon EFH. Effects to CH and EFH are expected to be beneficial and the project as a whole would reduce the risk of road or trail failure in storm events.

The proposed action would not impact Forest Service Sensitive Chinook salmon, steelhead, coastal cutthroat trout, pacific lamprey, and the three identified invertebrates, nor lead to a trend

toward listing of these species. The proposed action would have long term beneficial effects to all aquatic species are their habitats.

IX. REFERENCES

Anderson, H.W. 1971. Relative contributions of sediment for source areas, and transport processes. Pages 55-63 in Krygier and Hall (1971).

Belt, G.H., J. O'Laughlin and T. Merrill. 1992. Design of forest riparian buffer strips for the protection of water quality: Analysis of scientific literature. Report Number 8, Idaho Forest, Wildlife and Range Policy Analysis Group. 35 p. Avail. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, Idaho.

Berg, L, and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (Oncorhynchus kisutch) following short-term pulses of suspended sediment. Can. J. Fish. Aquat. Sci., 42:1410-1417.

Beschta, R.L., R.E. Bilby, G.W. Brown, L.B. Holtby, and T.D. Hofstra. 1987. Stream temperatures and aquatic habitat: fisheries and forestry interactions. *In*: Salo, E.O. and T.W. Cundy (Eds) Streamside Management: forestry and fishery interactions. University of Washington. Seattle. Contribution 57. p. 191-232

Bilby, R.E. and P.A. Bisson. 1998. Function and distribution of large woody debris. P. 324-346 *in*: *River ecology and management: Lessons from the Pacific Coastal Ecoregion*. Edited by R.J. Naiman and R.E. Bilby. Springer, New York.

Bilby, R.E., B.R. Franson, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Can. J. Fish. Aquat. Sci. 50:164-173.

Bisson, P.A., R.E. Bilby, M.D. Bryant, C.A. Dolloff, G. B. Grette, R.A. House, M.L. Murphy, K.V. Koski, and J.R. Sedell. 1987. Large woody debris in forested streams in the Pacific Northwest: past, present, and future. Pages 143-190 *in* E.O. Salo and T.W. Cundy, editors. Streamside management: forestry and fishery interactions. Contribution No. 57. Institute of Forest Resources, University of Washington, Seattle.

Bjornn, T.C. and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19: 83-138.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Staus review of west coast steelhead from Washington, Idaho, Oregon, and California. USDC NOAA Tech. Memo. NMFS-NWFSC-27, 261 p.

California Department of Fish and Game. 1960 – 2000. Stream survey reports for several Smith River tributaries. Unpublished reports on file at the USFS Smith River NRA fisheries office.

Cederholm, C.J., and N.P. Peterson. 1985. The retention of coho salmon (*Oncorhynchus kisutch*) carcasses by organic debris in small streams. Can. J. Fish. Aquat. Sci. 42:1222-

1225.

Cederholm, C.J., and M. Reid. 1987. Impact of forest management on coho salmon (*Onchorhynchus kisutch*) populations of the Clearwater River, Washington: A project summary. In *Streamside Management: Forestry and Fishery Interactions*; E. Salo and T. Cundy Eds. Proceedings of a Symposium held at University of Washington, 12-14 February 1986. Contribution no. 57, Institute of Forest Resources, Seattle, Washington. pp. 373-398.

Copstead et al., 1998. Water/Road Interaction: Introduction to surface cross drains. Report 9877-1806, SDTDC. San Dimas, CA: U. S. Department of Agriculture, Forest Service, Technology and Development Program.

Everest, F. H., R. L. Beschta, J.C. Scrivener, K. B. Koski, J. R. Sedell, and C.J. Cederholm. 1987. Fine sediment and salmonid production: a paradox. Pages 98-142 *in* Salo and Cundy (1987).

Everett, R.L., P.F. Hessburg, and T.R. Lillybridge. 1994. Emphasis areas as an alternative to buffer zones and reserved areas in the conservation of biodiversity and ecosystem processes. Proceedings, American Forests Scientific Workshop, Assessing forest health in the inland West, November 14-19, 1993.

Flanagan, Sam A., Michael J. Furniss, Tyler S. Ledwith, Stan Thiesen, Michael A. Love, Kemset Moore, and Jill Ory. 1998. Methods for Inventory and Environmental Risk Assessment of Road Drainage Crossings. In: Water/Road Interaction Technology Series. San Dimas Technology and Development Center, U.S. Forest Service.

Fuller, D.D. 1995. Emigration and stream residency of juvenile steelhead in Hurdygurdy Creek, California. M.S. Thesis. Humboldt State University, Arcata, California.

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. Pages 297-323 in W.R. Meehan (ed.), Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Technical Memo NMFS-NWFSC-66.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An ecosystem perspective of riparian zones. BioScience Vol. 41, No. 8, pp 540-551.
Healey, M.C. 1991. Life history of chinook salmon (*Oncorhynchus tshwytscha*). *In*: C. Groot and L. Margolis, editors. *Pacific Salmon Life Histories*. University of British Columbia Press, Vancouver

Hagans, Danny K. and William E. Weaver. 1997. Assessment and Implementation Techniques for Controlling Road-Related Sediment Sources.

Harr, R.D., W.C. Harper, J.T. Krygier, and F.S. Hsieh. 1975. Changes in storm hydrographs after roadbuilding and clearcutting in the Oregon Coast Range. Water Resources Research 11:436-444.

Harr, R.D., J. Rothacher, and R.L. Fredriksen. 1979. Changes in streamflow following timber harvest in southwestern Oregon. USDA Forest Service Research Paper PNW-249. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Hauge, C.J., M.J. Furniss, and F.D. Euphrat. 1979. Soil erosion in California's Coast Forest District. California Geology (June):120-129.

Hibbs, D.E., P. Giordano and S. Chan. 1992. Vegetation dynamics in managed coastal riparian areas. P. 39-41. In: 1992 Annual Report of the Adaptive Coastal Oregon Productivity Enhancement Program. Adaptive COPE Program, Hatfield Marine Science Center, Oregon State University, Newport.

Hicks, B.J., J.D. Hall, P.A. Bisson, and J.R. Sedell. 1991. Responses of salmonids to habitat changes. In *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*; W.R. Meehan, ed. Pgs. 297-324. American Fisheries Society Special Pub. 19. Bethesda, MD.

Johnson, O.W., M.H. Ruckelshaus, W.S. Grant, F.W. Waknitz, A.M. Garrett, G.J. Bryant, K. Neely, and J.J. Hard. 1999. Status review of coastal cutthroat trout from Washington, Oregon, and California. USDC NOAA Tech. Memo. NMFS-NWFSC-37, 292 p.

Jones, J.A. and G.E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. Water Resources Research 32:959-974.

Ledwith, Tyler S. 2003a. Road assessment and restoration planning in the South Fork Smith watershed of the Smith River basin – Final Report. Funded by California Department of Fish and Game SB 271 contract# P0010306.

Ledwith, Tyler S. 2003b. Road assessment and restoration planning in the Middle Fork Smith watershed of the Smith River basin – Final Report. Funded by California Department of Fish and Game SB 271 contract# P0010306.

McCain, M.E. 1994. Habitat utilization by the 1987 and 1988 cohorts of Chinook salmon from emergence to outmigration in Hurdygurdy Creek, California. M.S. Thesis. Humboldt State University, Arcata, California.

McCain, M., B. Devlin-Craig, C. Black (editors). 1995. Smith river ecosystem analysis: basin and subbasin analyses, ands late-successional reserve assessment, version 1.0 (McCain et al. 1995). USDA Forest Service, Six Rivers National Forest, Eureka, California, 213 pp.

McDade, M.H., F.J. Swanson, W.A. McKee [and others]. 1990. Source distances for coarse woody debris entering small stream in western Oregon and Washington. Canadian

Journal of Forest Research 20:326-330.

McGarry, E.V. 1994. A quantitative analysis and description of the delivery and distribution of large woody debris in Cummins Creek, Oregon. Oregon State University, Corvallis Oregon. M.S. Thesis.

Meehan , W.R. and T.C. Bjornn. 1991. Salmonid distributions and life histories. American Fisheries Society Special Publication 19: 47-82.

Meyers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R. S. Waples. 1998. Status review of Chinook salmon from Washington, Idaho, Oregon, and California. USDC NOAA Tech. Memo. NMFS-NWFSC-35, 443 p.

Morfin et al., 1996. Predicting Effects of Climate, Soil, and Topography on Road Erosion with the WEPP Model. Presented at 1996 ASAE Annual International Meeting. St. Joseph, Missouri.

Murphy, M.L. 1995. Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska -- requirements for protection and restoration. NOAA Coastal Ocean Program Decision Analysis Series No. 7. NOAA Coastal Ocean Office, Silver Spring, MD. 156 pp.

National Marine Fisheries Service (NMFS). 1996. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. NMFS Northwest Region Environmental and Technical Services Division Habitat Conservation Branch. Pportland, Oregon.

NMFS 1997. Biological Opinion and Conference Opinion. Routine and Non-routine Road Maintenance and Flood Response Actions. NMFS Southwest Region, Arcata, California. SWR-Arcata,CA-1997/1302

NMFS. 2003. Biological Opinion. 10 Categories of Forest Service and Bureau of Land Management Programmatic Activities in Northwestern Oregon. NMFS Northwest Region, Portland, Oregon. NWR-2002/01254.

NMFS. 2004. Biological and Conference Opinion. USDA Forest Service and USDI Bureau of Land Management Land and/or Resource Management Plans in the Northwest Forest Plan Area. NMFS Northwest Region, Portland, Oregon. NWR-2003/01457

Ralph, S.C., G.C. Poole, L.L. Conquest, R.J. Naiman. 1994. Stream channel morphology and woody debris in logged and unlogged basins of western Washington. Can. J. Fish. Aquat. Sci. 51:37-51.

Reeves, G.H., F.H. Everest, and J.D. Hall. 1987. Interactions between the redside shiner (Richardsonius balteatus) and the steelhead trout (Salmo gairdneri) in western Oregon:

the influence of water temperature. Can. J. Fish. Aquat. Sci. 44:1603-1613.

Reeves, G.H., L.E. Benda, K.M. Burnett, [and others]. 1995. A disturbance-based approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Reid, L.M., and S. Hilton. 1998. Buffering the buffer. USDA Forest Service Gen. Tech. Rep. PSW-GTR-168. 10 pp.

Reiser, D.W. and T.C. Bjornn. 1979. Habitat requirements of anadromous salmonids. In: Influence of forest and rangeland management on anadromous fish habitat in the western U.S. and Canada. Gen. Tech. Rept. PNW-96. USDS Forest Service.

Rhodes, J.J., D.A. McCullough, and F.A. Espinosa, Jr. 1994. A coarse screening process for potential application in ESA consultations. Columbia River Intertribal Fish Commission. Prepared under NMFS/BIA Inter-Agency Agreement 40ABNF3. December.

Rosgen, D.L. 1994. A classification of natural rivers. Catena, vol. 22: 169-199. Elsevier Science, B.V. Amsterdam.

Sedell, J.R., and R.L. Beschta. 1991. Bringing back the "bio" in bioengineering. In *Fisheries Bioengineering: Proceedings of a Symposium, Bethesda, MD*; J. Colt and S. Dendall, eds. Pgs. 160-175. American Fisheries Society Publication 10. Bethesda, MD.

Siskiyou Research Group. 2004. Stony Creek, Diamond Creek, North Fork Diamond Creek, and Peridotite Canyon Level II stream surveys. Copy on file at USFS Smith River NRA fisheries office. Unpublished survey on file at the Smith River National Recreation Area.

Six Rivers National Forest. 1963 – 1995. Fish habitat inventories and fisheries surveys for Hurdygurdy, Jones, Goose, Patrick, Shelly, Siskiyou Fork, Myrtle, Hardscrabble, and Middle, South, and North Fork Smith.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, Oregon. (Available from the National Marine Fisheries Service, Portland, Oregon). 356 p.

Sullivan, K., T.E. Lisle, C.A. Dolloff, G.E. Grant, and L.M. Reid. 1987. Stream channels: the link between forests and fishes. In *Streamside Management: Forestry and Fishery Interactions*; E.O. Salo and T.W. Cundy, eds. Pgs. 191-232. Contribution 57, University of Washington, Institute of Forest Resources. Seattle, WA.

Swanston, D.N. 1991. Natural processes. In *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*; W.R. Meehan, ed. Pgs. 139-179. American Fisheries Society Special Pub. 19. Bethesda, MD.

USDA Forest Service, Six Rivers National Forest. 1991. Hurdygurdy Creek fish habitat inventory (USFS 1991). Unpublished survey on file at the Smith River National Recreation Area.

USDA Forest Service. 2002. Road-Stream Crossing Survey at Perennial Streams to assess Fish Passage on National Forest Lands. Six Rivers National Forest. Data is on file at the Supervisor's Office, Eureka, CA.

USDA Forest Service, Draft 2.4, 2000. Rating Watershed Condition: Reconnaissance Level Assessment for the National Forests of the Pacific Southwest Region. USDA Forest Service, Pacific Southwest Region.

USDA Forest Service 2000. Water Quality Management for Forest System Lands in California; Best Management Practices. USDA Forest Service, Pacific Southwest Region. 186 p.

USDA Forest Service, Six Rivers National Forest. 1995. Six Rivers National Forest Land and Resource Management Plan (Six Rivers LRMP). Pacific Southwest Region. Vallejo, CA.

USDA Forest Service. 1998. Six Rivers National Forest Wet Weather/Winter Operations Standards. Eureka, CA.

USFS. 1979. Water Resources Inventory for USDA Forest Service Six Rivers National Forest, Eureka, California. Prepared by Ott Water Engineers, Redding, California under contract no. 53-9A47-9-28.

USFS. 1976 through 1985. Fox Unit Monitoring Fishery Reports (USFS 1976 through 1985). Unpublished reports on file at the Smith River National Recreation Area.

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. USDC NOAA Tech Memo. NMFS-NWFSC-24, 258 p.

Wemple, B. 1994. Hydrologic integration of forest roads with stream networks in two basins, western Cascades, Oregon. MS Thesis. Oregon State University, Corvallis, OR.

Wissmar, R.C., J.E. Smith, B.A. McIntosh, H.W. Li, G.H. Reeves, and J.R. Sedell. 1994. Ecological health of river basins in forested regions of eastern Oregon and Washington. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-326.

Williams, T.H., E. P. Bjorkstedt, W.G. Duffy, D. Hillemeier, G. Kautsky, T.E. Lisle, M. McCain, M. Rode, R.G. Szerlong, R.S. Schick, M.N. Goslin, and A. Agrawal. 2006. Historical population structure of coho salmon in the southern Oregon/northern California coasts evolutionarily significant unit. USDC NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-390. 71 p.

Ziemer, R.R. 1981. Storm flow response to road building and partial cutting in small streams of northern California. Water Resources Research 17(4):907-917.

Appendix

Aquatic Conservation Strategy Consistency

Projects must be consistent with the Aquatic Conservation Strategy Objectivizes. Key to meeting ACS Objectives is to ensure that the riparian reserves network would be maintained and restored including:

- **maintaining riparian structures and functions of intermittent streams;**
- **benefits are conferred to riparian-dependent and associated species other than fish;**
- **habitat conservation is enhanced for organisms that are dependent on the transition zone between upslope and riparian areas; and**
- **travel and dispersal corridors for many terrestrial animals and plants is improved. The riparian reserves also serve as connectivity corridors among the LSRs (Forest Plan p. IV-45).**

In the case of this project, no new road or motorized trail construction is proposed. Impacts to the riparian areas have occurred either through old timber sale abandoned roads, dozer lines from firefighting efforts and user created routes. All proposed action alternatives reduce or minimize the adverse effects to aquatic systems, including the prohibition of cross-country travel. For the entire project area, ACS objectives were met by minimizing motorized route additions in riparian reserves including minimizing the number of routes with stream crossings. Comparison of water quality indicators in the *Water Quality* section reveals that there is not a significant difference concerning impacts to water quality in all of the action alternatives. However, because all of the roads and routes analyzed already exist on the ground, some effects to water quality have already occurred. The main difference between all the action alternatives is the amount of UAR restoration and road decommissioning proposed. While these activities (restoration, decommissioning or designating as a ML 1 road) generally produce the same results on the ground, they are differentiated based on whether or not the travel route is already a designated system road or is currently an UAR. It is important to understand that all of these actions would prohibit motorized vehicle use.

Alternative 5 predicts the least impacts and greatest potential for water quality protection because it proposes more road decommissioning and restoration of UARs. Alternative 6 also provides for greater protection of water quality as compared to Alternatives 1 and 4. Alternative 1 (No Action) would have the most impact to water quality because it maintains the status quo and does not provide for active road restoration, decommissioning or stormproofing.

Each route proposed for addition was evaluated to ensure these routes do not prevent, and to the extent practicable contribute to, attainment of ACS objectives (Forest Plan p. IV-48). Mitigations, such as water bars, were incorporated to reduce erosion. Seasonal restrictions were also applied to address potential water quality concerns (Forest Plan p. IV-49).

Aquatic Conservation Strategy Objectives

Objective 1: Maintain and restore 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.

Alternatives 4, 5 and 6 contribute to a restorative effect on Objective 1 by reducing road-related impacts to the individual watersheds, by decommissioning roads, upgrading and stormproofing as well as prohibiting travel on identified UARs across the Smith River basin. Road density would be reduced in each watershed and routes not added would have drainage patterns restored and natural revegetation. The routes added to the NFTS as motorized trails would be subject to mitigations including stormproofing to reduce impacts to water quality. Seasonal gate closures reduce impacts while also protecting POC stands that have not been infected.

Objective 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.

None of the alternatives change aquatic access, as there would be no significant change in flow nor are barriers created. Prohibiting cross-country travel (off road use) may prevent some further impacts to spatial and temporal connectivity caused by unauthorized travel through wetted stream channels. The majority of stream crossings are in headwater areas in ephemeral channels.

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

Alternatives 4, 5 and 6 will contribute to a restorative effect on Objective 3 by restoring the physical integrity of stream channels by eliminating illegal OHV use on routes not designated. Although an exact percentage is unknown for all UARs, many of the crossings in the upper third hill slope position that were visited had no evidence of scour. Most of the route-stream crossings are characterized as ephemeral headwater order 1 and 2 streams. Of the 519 stream crossings, only 47 would be added of which 85 percent are in the 1st and 2nd order streams. Routes not added would be barricaded and allowed to recover. The remaining route-stream crossings are characterized as intermittent orders 3 to 6 (these are typically dry in the summer months).

Objective 4: Maintain and restore 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.

Water quality is expected to improve from pre-project conditions in all action alternatives. Maintenance of water quality would be achieved by minimizing sediment delivery to stream courses through mitigations, stormproofing to reduce diversion potential NFTS roads, restoring drainage patterns on UARs not designated and prohibiting cross-country travel. The project will contribute to maintaining the current high water quality conditions in the project area by reducing the miles of routes within riparian areas and by implementing BMPs and required mitigation measures to protect and improve water quality.

Any short-term increases in sediment production or turbidity are expected to be well within the range of what would typically occur during high winter flows or because of natural streambank erosion. At the watershed scale, changes in the overall sediment rates will not be detectable. After the completion of the proposed project, there would be a reduction in the overall road network within the drainages from current conditions. These actions would contribute to the health of the riparian, aquatic, and upland ecosystems.

Objective 5: 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.

With cross-country travel prohibited from 133 miles (Alternative 5) to 71 (Alternative 4) out of a total of 156 miles of UARs and reducing the number of stream crossings with vehicle traffic, some improvement is expected forest-wide on the load of fine sediments reaching streams. For routes designated on the NFTS, mitigations, such as waterbars, were incorporated to reduce erosion on routes identified. Seasonal restrictions were also applied where necessary to address potential water quality concerns.

The action alternatives contributes to maintaining Objective 5 at the project scale, and improving conditions at the watershed scale by helping to restore the natural sediment regime by improving road drainage on routes to be added to the NFTS and by a total decrease in road stream interactions as well as road density.

At the watershed scale, changes in the overall sediment rates will not be detectable given the high variability in natural rates of sediment input. Implementation of the mitigations would reduce high-risk routes to low risk routes in terms of water quality.

Objective 6: Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

In many 6th-field watersheds, reduction of route density in Alternatives 4, 5 and 6 may also result in changes in peak flow timing and volume, however this is likely to be undetectable as density changes are small. The action alternatives would maintain the current instream flow conditions described in Objective 6 at both the project and the watershed scales due to the age of the vegetation, the low elevation of the project area, and the small portions of the watersheds that would be affected.

Objective 7: Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

The project area is predominately comprised of steep narrow canyons and valley floors, where floodplains within the bankfull level are small and localized as to their influence. In the lower gradient reaches throughout the Smith River system, there is existing access to some of these small floodplains, however as part of all action alternatives, stormproofing (NFTS roads) and restoring drainage patterns (UARs) were identified on a route by route basis as needed such that the timing and variability of flows would be maintained. Duration of floodplain inundation would not be affected.

Objective 8: 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.

Objective 9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Alternatives 4, 5 and 6 all reduced the amount of routes located in riparian areas. Prohibiting use of these routes may prevent further impacts to animal and plant communities and lead to improved conditions over time as re-vegetation occurs on routes not authorized. Species composition of plant communities in riparian areas would be maintained since construction of new roads is not proposed. Mitigations for noxious weeds would reduce impacts to native plant communities.

There are a number of roads with existing weed infestations that are proposed for addition to the NFTS. Prior to be put on the MVUM and therefore available for use, treatment would be occur so these species will not continue to spread creating new infestations into riparian areas.