Appendix A

Implementing Agreement

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A. IMPLEMENTING AGREEMENT

A.1 Introduction

Following is the draft of an Implementing Agreement for our HCP/NCCP.

A.2 Implementing Agreement

IMPLEMENTING AGREEMENT
FOR THE
THE MENDOCINO REDWOOD COMPANY HABITAT CONSERVATION PLAN AND
NATURAL COMMUNITY CONSERVATION PLAN

DRAFT
AUGUST 31, 2011

DRAFT

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This agreement ("Agreement") is entered into as of the Effective Date with regard to the Mendocino Redwood Company Habitat Conservation Plan and Natural Community Conservation Plan ("HCP/NCCP") by and among: the United States Fish and Wildlife Service ("USFWS") of the United States Department of the Interior; the National Oceanic and Atmospheric Administration National Marine Fisheries Service ("NMFS") of the United States Department of Commerce; the California Department of Fish and Game ("CDFG") and the California Department of Forestry and Fire Protection ("CAL FIRE") of the State of California Natural Resources Agency; and the Mendocino Redwood Company, LLC ("MRC").
These entities may be referred to collectively as the "Parties" and individually as a "Party." USFWS and NMFS may be referred to collectively as the "Services" and individually as a "Service." USFWS, NMFS and CDFG may be referred to collectively as the "Wildlife Agencies."

RECITALS

As of the Effective Date, MRC owns approximately 228,000 acres within several major watersheds in Mendocino County that MRC has managed since 1998 for commercial timber harvesting pursuant to the California Forest Practice Act ("**CFPA**") and the California Forest Practice Rules ("**CFPR**"). In addition, MRC's timber harvest operations have been certified as meeting the principles and conditions of the Forest Stewardship Council by two independent accredited certifying bodies: Scientific Certification Systems and SmartWood. MRC wishes to conduct profitable timber harvest operations while protecting and rebuilding the important ecological attributes of its lands.

A portion of MRC's ownership, comprising approximately 213,000 acres, constitutes the initial "**Plan Area**," the area initially covered by the HCP/NCCP. Over the next eighty (80) years, MRC may acquire land near the Plan Area. **Exhibit A** depicts the general location of the Plan Area, as well as the area outside the Plan Area where additional lands may be acquired and included in the HCP/NCCP subject to certain conditions in the HCP/NCCP (the "**Adjustment Area**"). The total geographic area analyzed by the HCP/NCCP, as well as the EIS/PTEIR (see below for explanation of the EIS/PTEIR), includes both the Plan Area, Adjustment Area, and additional lands assessed but excluded from the Adjustment Area. The size of the Plan Area may be increased, if MRC acquires land within the Adjustment Area, or decreased, if MRC removes current land holdings from the HCP/NCCP pursuant to the terms and conditions of this Agreement.

The lands within the Plan Area will be managed according to MRC's HCP/NCCP. The Plan Area contains habitats and natural communities that are important to the conservation and recovery of various species classified as endangered, threatened, rare, or of special concern by the Wildlife Agencies. MRC's timber operations will impact such species by affecting these habitats and natural communities. The HCP/NCCP describes the measures MRC will implement over the next eighty (80) years, which are intended to provide for the conservation and management of certain "**Covered Species**" and to minimize

and mitigate to the maximum extent practicable the effects of "Authorized Take" of Covered Species, while carrying out certain "**Covered Activities**" in the Plan Area. The Covered Species and Covered Activities are described in Chapter 1 of the HCP/NCCP. The Mendocino Redwood Company Timber Management Plan (the "**TMP**") describes how MRC will achieve the maximum sustained production of high quality timber projects within the Plan Area, taking into account biologic and economic factors. The TMP specifically takes into account the forest growth and the harvest constraints needed to achieve the goals and objectives of the HCP/NCCP.

USFWS and NMFS have jurisdiction over the conservation, protection, restoration, enhancement and management of fish, wildlife, native plants and their habitats under various federal laws, including the federal Endangered Species Act ("**ESA**"), the Migratory Bird Treaty Act, the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq.), the Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-666(c)), and the Fish and Wildlife Act of 1956 (16 U.S.C. §§ 742(a) et seq.).

CDFG has jurisdiction over the conservation, protection, restoration, enhancement and management of fish, wildlife, native plants and habitat necessary for sustainable populations of those species under various state laws, including but not limited to the California Endangered Species Act ("**CESA**"), the Natural Community Conservation Planning Act ("**NCCPA**"), the Native Plant Protection Act (Cal. Fish & G. Code §§ 1900 et seq.), fully protected species statutes (Cal. Fish & G. Code §§3511, 4700, 5050, and 5515) and California Fish and Game Code sections 1600 et seq., 1802, and 3500.

CAL FIRE has jurisdiction over commercial timber harvest on non-federal lands in the State of California as set forth in the CFPA, the California Land Productivity Act of 1982, and the CFPR.

The CFPR allows for the preparation of a program timberland environmental impact report ("**PTEIR**") that assesses impacts and provides mitigation for impacts resulting from timber operations involved with an ownership, portion of an ownership, or multiple ownerships. If the Director of CAL FIRE certifies that the PTEIR meets the requirements of the California Environmental Quality Act (Cal. Pub. Resources Code §§ 21000 et seq.) ("**CEQA**") and certain requirements of the CFPR, timber operations covered in the PTEIR may be carried out using a "programmatic timber harvesting plan" ("**PTHP**"). The contents of the PTHP must meet specified requirements in the CFPR but will be tailored to reflect the approach to timber management analyzed in the PTEIR. In addition, where the PTEIR has adequately addressed and mitigated an environmental impact, the PTHP may refer to the PTEIR's analysis and apply the PTEIR's mitigation measures, rather than conducting a new analysis and developing new or different measures. If new standards or prescriptions are added to the CFPR, MRC may continue to use the standards and prescriptions analyzed in the PTEIR if MRC shows that the PTEIR's standards and prescriptions are at least as protective as those added to the CFPR. The PTEIR approach allows for large-scale, long-term timber management planning, and

provides flexibility and efficiency in the development and review of individual PTHPs and related mitigation measures. The TMP explains MRC's ownership-wide, long-term approach to timber management, describes alternate operational standards to be applied in PTHPs, and provides the basis for a PTEIR that analyzes and mitigates the potential environmental impacts of that approach and provides for the use of PTHPs. The HCP/NCCP prescribes standards, guidelines and measures to be included in MRC's PTHPs to protect Covered Species and to fulfill the requirements of ESA and the NCCPA.

ESA prohibits the "take" of wildlife and fish species listed as endangered or threatened under ESA. Under Section 10(a)(1)(B) of ESA (16 USC § 1539(a)), the Services may issue permits authorizing the take of endangered or threatened species incidental to otherwise lawful activities if certain statutory requirements are met by the applicant and the incidental take will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. To obtain a federal incidental take permit, the applicant must submit a habitat conservation plan describing, among other things, the steps the applicant will take to minimize and mitigate to the maximum extent practicable the impact of such taking. MRC submitted its HCP/NCCP to USFWS and NMFS, and applied for federal permits for incidental Take of Covered Species within the Plan Area.

CESA prohibits the take of species listed as endangered, threatened or candidate species under CESA. Section 2835 of the NCCPA allows CDFG to authorize by permit the take of species during otherwise lawful activities, whether or not they are listed as endangered or threatened under CESA, where the conservation and management of the species are provided for at a landscape level in a natural community conservation plan approved by CDFG. MRC submitted its HCP/NCCP to CDFG for approval and issuance of a state permit authorizing take of Covered Species within the Plan Area.

The HCP/NCCP was developed through an iterative process of: analysis of the Covered Species, the Covered Activities, the Plan Area and the Adjustment Area; discussions between MRC and the Wildlife Agencies; input from independent science advisors and the public; and environmental review under the National Environmental Policy Act ("**NEPA**") and CEQA. A planning agreement between MRC and CDFG (dated June 23, 2003 and amended July 1, 2009) guided preparation of the HCP/NCCP, and a memorandum of understanding between MRC, the Wildlife Agencies, CAL FIRE and Stillwater Sciences, Inc. ("**MOU**")(dated July 28, 2005) guided the development of the EIS/PTEIR.

After the Effective Date, to the extent that Section 898.2(d) of Title 14 of the California Code of Regulations or a successor provision requires CAL FIRE to disapprove THPs that would result in the take of species listed as endangered, threatened or rare under ESA or CESA unless the take is authorized by the appropriate Wildlife Agency, MRC intends that the Federal and State Permits issued with this Agreement will satisfy that regulation with regard to each of the Covered

Species for PTHPs submitted by MRC for Covered Activities within the Plan Area.

MRC is making substantial commitments of land, natural resources, financial resources, and human resources to provide for the conservation and management of the Covered Species, their habitats and other natural communities, and substantial restrictions on its use of Covered Lands, to obtain the take authorization and regulatory assurances provided pursuant to state and federal law by the Wildlife Agencies.

DEFINITIONS

Terms used in this Agreement shall be interpreted as defined in the ESA and its implementing regulations for purposes of applying the ESA, interpreted as defined in CESA and its implementing regulations for purposes of applying CESA, and interpreted as defined in the NCCPA for purposes of applying the NCCPA; provided, however, that the following terms, when capitalized, shall be interpreted as defined in this Section.

"Adaptive Management" means the collective use by the Parties of new information gathered through the monitoring program of the HCP/NCCP and from other reliable and relevant sources to adapt management strategies and practices to better provide for the conservation of Covered Species, as further described in Chapter 13.

"Additional Covered Lands" means land within the Adjustment Area in which MRC acquires sufficient legal control after the Effective Date to harvest timber and to implement the HCP/NCCP in accordance with this Agreement and the Federal and State Permits, and which MRC designates as part of the Plan Area through written notice to the Wildlife Agencies accompanied by adequate supporting documentation evidencing legal control, as further described in Section 9.

"Adjustment Area" means the area depicted in Exhibit A. Lands within the Adjustment Area are eligible to become Additional Covered Lands in accordance with Section 9.

"Agreement" means this document.

"Alternate Standard" means operational (specific prescriptive) standards for timber operations that have been accepted by the CAL FIRE Director and that provide equal or better resource protection as afforded by the default standard in the CFPR at the time a PTHP is submitted. The CAL FIRE Director will not accept an alternate standard unless it has been analyzed in the PTEIR and the Director concludes based on that analysis that the alternate standard is not likely to result in a significant adverse environmental impact.

"Amendment" means an amendment of the HCP/NCCP or the Federal and State Permits, as described in Section 9.4.

"Authorized Take" means the extent of incidental take of Covered Species authorized by the USFWS and NMFS in the Federal Permits issued to MRC pursuant to Section 10(a)(1)(B) of ESA, and the extent of take of Covered Species authorized by CDFG in the State Permit issued to MRC pursuant to section 2835 of the Fish and Game Code.

"CAL FIRE" means the California Department of Forestry and Fire Protection, a Department within the California Natural Resources Agency charged with implementing the California Forest Practice Act.

"CDFG" means the California Department of Fish and Game, a subdivision of the California Natural Resources Agency charged with administering several wildlife protection laws, including but not limited to CESA and the NCCPA.

"CEQA" means the California Environmental Quality Act (Cal. Pub. Resources Code §§ 21000 et seq.), including all regulations promulgated pursuant to that Act.

"CESA" means the California Endangered Species Act (Cal. Fish & G. Code §§ 2050 et seq.), including all regulations promulgated pursuant to that Act.

"CFPA" or **"California Forest Practice Act"** means the California Z'berg-Nejedly Forest Practice Act of 1973 (Cal. Pub. Resources Code §§ 4511 et seq.)

"CFPR" means the "California Forest Practice Rules," regulations implemented by CAL FIRE (Cal. Code Regs, tit. 14, Chapters 4, 5, & 10) to carry out the California Forest Practice Act.

"Changed Circumstances" means for purposes of the Federal Permits, pursuant to 50 CFR 17.3, changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement that can reasonably be anticipated by plan or agreement developers and the USFWS and NMFS and that can be planned for (e.g., the listing of new species, or a fire or other natural catastrophic event in areas prone to such events). "Changed Circumstances" for purposes of the State Permit, pursuant to NCCPA, are reasonably foreseeable circumstances that could affect a covered species or geographic area covered by the plan.

"Chapter" means a chapter of the HCP/NCCP. A Chapter may be divided into subchapters.

"Controllable Erosion" means a condition created by and controllable by human action that could deliver more than ten (10) cubic yards of soil to a watercourse within a forty (40) year period.

"Covered Activities" means the land uses and conservation and management

activities identified in Chapter 1 to be carried out by MRC and its agents in the Plan Area that may in some cases result in Authorized Take of Covered Species during the term of the HCP/NCCP.

"Covered Species" means the species whose conservation and management are expressly provided for by the HCP/NCCP and for which incidental take that is otherwise prohibited under the ESA or CESA is authorized by the Wildlife Agencies pursuant to the Federal and State Permits. The Covered Species are listed in Chapter 1**.**

"Days" means calendar days.

"Effective Date" means the calendar day after all of the following have occurred: this Agreement has been executed by all Parties and all of the Federal and State Permits have been issued.

"EIS/PTEIR" means the Joint Environmental Impact Statement and Program Timberland Environmental Impact Report prepared pursuant to NEPA, CEQA, the CFPA and the CFPR to analyze the potential environmental impacts of proposed timber harvest and conservation and management activities in the TMP, HCP/NCCP, and this Agreement.

"Federal Listed Species" means the Covered Species which are listed as threatened or endangered species under ESA as of the Effective Date.

"Federal Permits" means the federal incidental take permits issued by USFWS and NMFS to MRC pursuant to Section 10(a)(1)(B) of ESA.

"Federal and State Permits" means the Federal Permits and the State Permit.

"ESA" means the Federal Endangered Species Act of 1973, as amended (16 USC §§1531 et seq.), including all regulations promulgated pursuant to that Act.

"HCP/NCCP" means the Habitat Conservation Plan/Natural Community Conservation Plan prepared by MRC and approved by the USFWS and NMFS under Section 10(a)(1)(B) of ESA and by CDFG under Section 2820 and Section 2835 of the NCCPA.

"LWD" means large woody debris.

"Minor Modification" or **"Modification"** means a minor modification of the HCP/NCCP, as provided in Section 9.2 and Section 9.3.

"MRC" means the Mendocino Redwood Company, LLC.

"MRC Lands" means those lands in Mendocino County in which MRC has sufficient legal control to harvest timber and to implement the HCP/NCCP in

accordance with this Agreement and the Federal and State Permits.

"Migratory Bird Treaty Act" means the Federal Migratory Bird Treaty Act (16 USC § 701 et seq.), including all regulations promulgated pursuant to that Act.

"NCCPA" means the Natural Community Conservation Planning Act (Cal. Fish & G. Code §§ 2800 et seq.), as amended on January 1, 2003.

"NEPA" means the National Environmental Policy Act (42 U.S.C. §§ 4621 et seq.).

"NMFS" means the National Oceanic and Atmospheric Administration's National Marine Fisheries Service, a subdivision of the United States Department of Commerce.

"Operating Conservation Program" means, consistent with 50 CFR §17.3, the body of conservation and management measures provided in the HCP/NCCP intended to avoid, minimize, mitigate and monitor the Covered Activities' impacts on Covered Species, and to provide for the conservation and management of the Covered Species and natural communities within the Plan Area, as described at Chapters 7, 8, 9, 10 and 11. The Operating Conservation Program also includes the Monitoring and Adaptive Management processes in Chapter 13, the measures described at Chapter 14 to respond to Changed Circumstances, and the Roads, Landings, and Skid Trails Management Plan in Exhibit E.

"Party" or **"Parties"** means any or all of the signatories to this Agreement**.**

"Plan Area" means the area covered by the HCP/NCCP, as it may from time to time be modified by the acquisition of Additional Covered Lands within the Adjustment Area and inclusion in the HCP/NCCP, or by the removal of MRC Lands, pursuant to this Agreement. The Plan Area as of the Effective Date is depicted in Exhibit A and is described in Chapter 1 of the HCP/NCCP.

"PTHP" means a Program Timber Harvesting Plan prepared by a registered professional forester for commercial timber harvesting on forest stands in the Plan Area under California Code of Regulations, title 14, chapter 4, subchapter 7, article 6.8. Under the CFPA and the CFPR, MRC must file a PTHP, or any successor or alternative document that may apply to commercial timber harvesting under future amendments or revisions to the CFPA or CFPR, prior to a commercial timber harvest.

"Removed Lands" means lands removed from the Plan Area by a transfer of ownership or by other means, as provided in Section 9.7.

"Section" means a section or subsection of this Agreement, except where the specific context makes it clear that it refers to something else (e.g., "Section 7 of the ESA").

"Services" means the USFWS and NMFS.

"State Permit" means the Take permit issued by CDFG to MRC pursuant to Section 2835 of the Fish and Game Code.

"Take" means, for purposes of the Federal Permits, "take" as defined in Section 3 of FESA ("to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct") and, for purposes of the State Permit, "take" as defined in section 86 of the Fish & Game Code ("to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill").

"TMP" and **"Timber Management Plan"** mean the Timber Management Plan prepared by MRC that is incorporated into the EIS/PTEIR.

"USFWS" means the United States Fish and Wildlife Service, a constituent agency of the United States Department of the Interior.

"Wildlife Agencies" means the USFWS, NMFS and CDFG.

PURPOSE AND EFFECT OF THIS IMPLEMENTATION AGREEMENT

The purposes of this Agreement are to clarify the provisions of the HCP/NCCP and the processes the Parties intend to follow to ensure the successful implementation of the HCP/NCCP in accordance with the Federal and State Permits and applicable Federal and State law, including but not limited to section 2820(b) of the Fish and Game Code, and to explain how CAL FIRE will collaborate with the other Parties regarding implementation of the HCP/NCCP through the PTHP process and in accordance with the FPR and FPA.

The HCP/NCCP and each of its provisions is intended to be, and by this reference are, incorporated herein.

The provisions of the HCP/NCCP and this Agreement are intended to be consistent with and to complement each other and shall be interpreted accordingly. However, to the extent that this Agreement contradicts or conflicts with the HCP/NCCP, the terms of this Agreement shall control.

The provisions of the Federal and State Permits and this Agreement are intended to be consistent with and to complement each other and shall be interpreted accordingly. To the extent that one of the Federal Permits or State Permit contradicts or conflicts with this Agreement, the terms of the Federal Permit or State Permit shall control with regard to that Permit only. Each Wildlife Agency has reviewed the Federal or State Permit that it issued and has concluded that it is consistent with this Agreement and does not contradict or conflict with any term or condition of this Agreement. Similarly, MRC has reviewed the Federal and State Permits and has concluded that they are consistent with this Agreement and do not contradict or conflict with any term or condition of this Agreement.

FINDINGS AND OBLIGATIONS OF THE WILDLIFE AGENCIES

USFWS

USFWS Findings

As further described in the findings issued by USFWS, USFWS has found that the HCP/NCCP satisfies the permit issuance criteria under Section 10(a)(2)(B) of the ESA for each Covered Species that is a Federal Listed Species within the jurisdiction of USFWS. For each Covered Species that is not a Federal Listed Species as of the Effective Date, USFWS has found that the HCP/NCCP satisfies the permit issuance criteria under section 10(a)(2)(B) of the ESA that would otherwise apply if such Covered Species were a Federal Listed Species.

USFWS Obligations

Concurrent with its execution of this Agreement, and on satisfaction of all other requirements, USFWS issued to MRC a Federal Permit under Section 10(a)(l)(B) of the ESA authorizing the incidental Take by MRC of each Covered Species that is a wildlife species within the jurisdiction of USFWS resulting from Covered Activities in the Plan Area. The Federal Permit is conditioned on compliance with the terms and conditions of the USFWS Federal Permit, the HCP/NCCP, and this Agreement.

An ESA Take authorization for plants is not required because the ESA does not prohibit Take of federally listed plants. Plant species included on the list of Covered Species are listed on the Federal Permits in recognition of the conservation measures and benefits provided for those plants under the HCP/NCCP. MRC receives assurances pursuant to the Federal "No Surprises" rule for such plant species. For the purpose of the USFWS Federal Permit, reference in this Agreement or in the HCP/NCCP to "Authorized Take" does not include Take of any Covered Species that are plants.

Subject to Section 12.7 of this Agreement, USFWS shall provide technical assistance and timely collaboration and consultation to MRC regarding implementation of the HCP/NCCP, in accordance with the HCP/NCCP and this Agreement, throughout the duration of the USFWS Federal Permit.

NMFS

NMFS Findings

As further described in the findings issued by the NMFS, the NMFS has found that the HCP/NCCP satisfies the permit issuance criteria under Section 10(a)(2)(B) of ESA for each Covered Species that is a Federal Listed Species within the jurisdiction of the NMFS. For each Covered Species that is not a Federal Listed Species as of the Effective Date, NMFS has found that the HCP/NCCP satisfies the permit issuance criteria under section 10(a)(2)(B) of the ESA that would otherwise apply if such Covered Species were a Federal Listed Species.

NMFS Obligations

Concurrent with the execution of this Agreement by all Parties, and on satisfaction of all other requirements, NMFS issued to MRC a Federal Permit under Section 10(a)(l)(B) of the ESA, authorizing the incidental Take by MRC of each Covered Species within the jurisdiction of NMFS resulting from Covered Activities in the Plan Area. The Federal Permit is conditioned on compliance with the terms and conditions of the Federal Permit, the HCP/NCCP, and this Agreement.

Subject to Section 12.7 of this Agreement, NMFS shall provide technical assistance and timely collaboration and consultation to MRC regarding implementation of the HCP/NCCP, in accordance with the HCP/NCCP and this Agreement, throughout the duration of the Federal Permit.

CDFG

CDFG Findings

As further described in the State Permit and the findings issued by CDFG, CDFG has found that the HCP/NCCP satisfies the permit issuance criteria listed in Sections 2820, 2821 and 2835 of the California Fish and Game Code for each Covered Species within the jurisdiction of CDFG.

CDFG Obligations

Concurrent with the execution of this Agreement by all Parties, and on satisfaction of all other requirements, CDFG issued to MRC the State Permit authorizing the Take by MRC of each Covered Species within the jurisdiction of CDFG resulting from Covered Activities in the Plan Area. The State Permit is conditioned on compliance with the terms and conditions of the State Permit, the HCP/NCCP, and this Agreement.

CDFG shall monitor MRC's implementation of the HCP/NCCP and compliance with the State Permit, provide technical assistance and timely collaboration and consultation to MRC regarding implementation of the HCP/NCCP, attend meetings, and participate, as available, in inspections and effectiveness and validation monitoring activities, in accordance with the HCP/NCCP and this Agreement, throughout the duration of the State Permit.

CDFG shall seek to acquire, or to fund the acquisition of, the additional marbled murrelet stands, as further described in Chapter 10.3.2.3.2.

CAL FIRE

CAL FIRE Findings

As further described in the PTEIR Certification and CEQA Findings issued by CAL FIRE, CAL FIRE has found that the PTEIR will achieve the resources protection goals in sections 4513, 4551, 4561, and 4581 of the CFPA.

CAL FIRE Obligations

CAL FIRE shall fully and faithfully perform all obligations assigned to it under this Agreement. CAL FIRE shall also provide technical assistance and timely collaboration and consultation to MRC regarding implementation of PTHPs under the PTEIR, as provided in the PTEIR and this Agreement.

Environmental Review

Federal Law – National Environmental Policy Act

Issuance of the Federal Permits under Section 10(a)(1)(B) of ESA to MRC by USFWS and NMFS are actions subject to review under NEPA. USFWS and NMFS are co-lead agencies under NEPA. Prior to the Effective Date, the Services evaluated the HCP/NCCP pursuant to NEPA in the Mendocino Redwood Company HCP/NCCP Final EIS/PTEIR.

State Law – California Environmental Quality Act

CAL FIRE's approval of the PTEIR, and CDFG's approval of the HCP/NCCP and issuance of the State Permit, are actions subject to review under CEQA. CAL FIRE is the lead agency for the PTEIR. CDFG is a responsible agency under CEQA for purposes of the HCP/NCCP and the State Permit. Prior to the Effective Date, CAL FIRE evaluated the potential environmental effects of proposed timber harvest activities described in the TMP pursuant to CEQA based on the EIS/PTEIR and issued findings addressing whether the implementation of the proposed timber harvest activities would cause significant adverse impacts to the environment. CAL FIRE agrees that, unless it determines that new information or a change in circumstances warrants supplemental review pursuant to CEQA, to the extent that issues are addressed in the PTEIR, and taking into consideration site-specific conditions, the conclusions of significance in these CEQA findings shall apply to CAL FIRE's review of PTHPs prepared under the EIS/PTEIR. Where a PTHP is found by the CAL FIRE Director not to be within the scope of the PTEIR, MRC may modify the PTHP to be within the scope of the PTEIR, submit a THP according to standard CFPR rules and procedures, or prepare for CAL FIRE's review and certification an addendum, supplement or subsequent PTEIR that addresses any remaining impacts identified in the PTHP.

As a CEQA responsible agency, CDFG independently reviewed the EIS/PTEIR and evaluated the HCP/NCCP pursuant to CEQA. Based on its review, CDFG issued findings addressing whether the implementation of the HCP/NCCP, including the Covered Activities, would cause significant adverse impacts to the Covered Species. CDFG agrees that, unless new information or a change in circumstances necessitates supplemental review pursuant to CEQA, CDFG's conclusions of significance in these CEQA findings as they pertain to Covered Activities' impacts on Covered Species shall apply to CDFG's subsequent review of individual Covered Activities.

RIGHTS AND OBLIGATIONS OF MENDOCINO REDWOOD COMPANY

MRC shall fully and faithfully perform all obligations assigned to it under this Agreement, the HCP/NCCP, and the Federal and State

Permits.

In addition, MRC shall adhere to the PTEIR, CFPA and CFPR provisions regarding PTEIRs and PTHPs for all of its commercial timber harvest and timber management activities in the Plan Area, subject to approval by CAL FIRE of PTHPs. As of the Effective Date, MRC may conduct its commercial timber operations in accordance with the PTEIR as a means of complying with the CFPA and CFPR. MRC may prepare PTHP's in accordance with the PTEIR, incorporate relevant environmental analyses from the PTEIR and any other required analyses, and submit the PTHP's to CAL FIRE in lieu of conventional THPs.

Implementation in Rough Proportion to Timber Harvest

MRC shall implement the Operating Conservation Program primarily through PTHPs, each of which will include mitigation, conservation and monitoring measures as described in the HCP/NCCP. These measures will be implemented at the pace and scale that timber harvest occurs, as all timber harvest covered by the Federal and State Permits will occur within the context of PTHPs.

Other components of the HCP/NCCP will be implemented, at least in part, independent of PTHPs, according to separate schedules or standards specific to each component. The components of the Operating Conservation Program that will at least in part be implemented independent of PTHPs are:

- road maintenance, construction and reconstruction, and restoration;
- vegetation management;
- LACMA establishment and management;
- AMZ establishment;
- Type 1 reserves;
- Wildlife Agency purchase of conservation easements;
- instream habitat improvement, including structure replacement, channel re-alignment, and bedload reduction (See Chapter 8);
- terrestrial habitat improvement, including control of invasive plants that threaten rare plants, creation and enhancement of amphibian haibat, and creation of habitat for the Point Arena mountain beaver (see Chapter 8); and
- monitoring and adaptive management.

MRC shall implement each of these components as described in the HCP/NCCP.

As further described in Chapter 7.10.1, MRC will ensure that the Operating Conservation Program is implemented, at a minimum, at the same pace and scale, on an acre-for-acre basis, as Covered Activities. This will ensure that implementation of the Operating Conservation Program will be roughly proportional in time and extent to the impact on habitat and Covered Species authorized under the Federal and State Permits.

Monitoring by Wildlife Agencies

MRC acknowledges that the rights to entry and inspection by the USFWS and NFMS are specific requirements for issuance of federal permits and, by accepting the Federal Permits, consents to entry to the Covered Lands in accordance with 50 CFR 13.21(e)(2), 13.47 and 222.302(j) accordingly. In addition, MRC shall allow entry to the Covered Lands by authorized agents and employees of the Wildlife Agencies engaged in and for the purpose of ensuring compliance with the Federal and State Permits and as otherwise described in the HCP/NCCP. In all cases, each Wildlife Agency shall ensure that its agents and employees that enter Covered Lands act in a reasonable, safe and professional manner, and in compliance with all laws and regulations that apply to the Wildlife Agencies, and that the entry occurs in a manner that minimizes any disruption to the Covered Activities or any other operation of MRC to the extent consistent with the purpose of the entry.

To the maximum extent practicable, entry by a Wildlife Agency shall occur only at reasonable hours and after provision of reasonable advance notice to MRC, so as to provide MRC's representatives the opportunity to accompany the authorized agency or employee; provided, however, that the Wildlife Agencies may enter the Covered Lands without notice at any time if the entry is for law enforcement purposes and complies with the Fourth Amendment to the Constitution.

IMPLEMENTATION OF OPERATING CONSERVATION PROGRAM

MRC shall ensure implementation of the Operating Conservation Program, which is a condition for Authorized Take of the Covered Species in the Permits. For purposes of the NCCPA, the Operating Conservation Program comprises the conditions for Authorized Take of Covered Species, and the conservation measures for Covered Species, as provided in section 2820(b)(2) of the Fish and Game Code. The Operating Conservation Program is informed by the habitat and species information and the conservation planning approach explained in Chapters 3 through 7.

Preparation and Implementation of PTHPs

The Operating Conservation Program is designed primarily to provide guidelines, standards and measures for, and to be implemented in conjunction with, MRC's ongoing timber operations, which will be implemented in accordance with the CFPA and CFPR and the HCP/NCCP, primarily through PTHPs. Timber operations under MRC's PTHPs may also include other Covered Activities that will be implemented within a PTHP area, such as vegetation management, road and landing construction, reconstruction and maintenance, use of rockpits and quarries, and instream habitat improvement. MRC shall include and implement all applicable measures and adhere to all applicable standards of the Operating Conservation Program in each PTHP within the Plan Area as of the Effective Date.

PTHP Review

CAL FIRE shall review MRC's PTHPs as set forth in CFPA, CFPR, section 1092, et seq., or successor regulations, and applicable policies of the Board of Forestry, to confirm that the PTHPs are consistent with the PTEIR.

The Wildlife Agencies may at their discretion review some or all of MRC's PTHPs to confirm that they are consistent with and will properly implement the Operating Conservation Program. The Wildlife Agencies acknowledge that one of MRC's main reasons for developing and implementing the HCP/NCCP is to integrate state and federal environmental review and permitting requirements for Covered Species into one concurrent review that follows CFPR procedures for PTHPs. Wherever reasonably possible, the Wildlife Agencies shall review PTHPs during and in accordance with such procedures. However, a Wildlife Agency's failure to review individual PTHPs during and in accordance with PTHP procedures shall not affect its permit enforcement authority. If, at any time, one or more of the Wildlife Agencies conclude that a PTHP is not consistent with the Operating Conservation Program, it shall promptly notify MRC in writing. If such notice is provided to CAL FIRE before it approves the PTHP, CAL FIRE shall not approve the PTHP until such time as the inconsistency is resolved. The Wildlife Agencies and MRC shall use reasonable efforts to resolve the inconsistency with sixty (60) days of the applicable Wildlife Agencies' written notice.

Alternative Fish, Plant and Wildlife Protection Measures

The HCP/NCCP envisions that under limited circumstances MRC may depart from the specific prescriptive measures in the HCP/NCCP and propose, analyze and use alternative site-specific measures in PTHPs or amendments to PTHPs to implement the Operating Conservation Program. Except where an alternative measure is specifically allowed in the HCP/NCCP without consultation with the Wildlife Agencies, MRC shall obtain the Wildlife Agencies approval before submitting the PTHP or PTHP amendment with the alternative measure to CAL FIRE, as described in this Section. To obtain the Wildlife Agencies' approval, MRC shall notify them in writing, explaining the alternative measure and the rationale for using it, and why the measure will not result in an impact to the environment that is greater than or different from the impacts in the HCP/NCCP and the EIS/PTEIR. Within thirty (30) days of receiving MRC's written notice, each Wildlife Agency shall either approve or deny the alternative measure or shall notify MRC when such determination will be made. A Wildlife Agency shall deny an alternative measure if it concludes the measure would not be as effective as the measure it would replace or would result in an impact to the environment that is greater than or different from the impacts analyzed by the Wildlife Agencies for purposes of the HCP/NCCP and the EIS/PTEIR. If the Wildlife Agency does not approve the alternative measure, MRC shall not include the measure in the PTHP. The Wildlife Agency shall be reasonably available to meet and confer with MRC regarding any proposed alternative measure within thirty (30) days of a meeting request by MRC.

Extension of PTHP Review Period

If requested by one or more of the Wildlife Agencies, MRC shall request the Director of CAL FIRE to extend the PTHP review period by two weeks, or such longer period of time as MRC may request, to enable the Wildlife Agencies to confer directly with MRC to resolve concerns about the PTHP's consistency with the HCP/NCCP or proper implementation of the Operating Conservation Program. CAL FIRE shall extend the PTHP review period in accordance with any such request. CDFG shall not file a non-concurrence with CAL FIRE (see section 1037.5(e) of the CFPR) regarding any PTHP without first requesting MRC to seek an extension of the PTHP review period.

CAL FIRE Enforcement of PTHPs

CAL FIRE will coordinate with the Wildlife Agencies regarding the enforcement of all terms of the HCP/NCCP that are included in each approved PTHP through CAL FIRE's enforcement authority under the FPA.

Additional Measures Voluntary

For each PTHP that incorporates all measures of the Operating Conservation Program that apply to the particular area covered by the PTHP, and so long as MRC is fully and faithfully implementing the Operating Conservation Program according to the HCP/NCCP and this Agreement, neither CAL FIRE nor the Wildlife Agencies shall require additional monitoring, avoidance, minimization or mitigation measures for any of the Covered Species that might be affected by such PTHP, except as provided in Section 10. Any Wildlife Agency may recommend or request additional conservation measures for Covered Species, but in making any such recommendation or request shall state explicitly that the measure is in addition to the requirements of this Agreement, the HCP/NCCP and the Federal and State Permits, and implementation of the additional measures by MRC is voluntary. This section does not pertain to requirements under the CFPR, CFPA or CEQA regarding other types of environmental impacts (i.e., impacts other than impacts to Covered Species).

Previously Approved THPs

After the planning agreement (see Section 1.10) was executed, and before the Effective Date, MRC prepared and CAL FIRE approved THPs for commercial timber harvest activities and operations on certain lands within the Plan Area. These "previously approved THPs" were prepared in accordance with interim guidelines established in the planning agreement, as well as the CFPR. Previously approved THPs may be implemented, or continue to be implemented, after the Effective Date according to their previously approved terms and applicable State and Federal law; provided, however, that such THPs shall not be Covered Activities, shall not be subject to the HCP/NCCP requirements, and shall not receive Authorized Take coverage. Any amendment to a previously approved THP after the Effective Date shall comply with the HCP/NCCP, this Agreement and the Permits, and the specific action included in the amendment shall be a Covered Activity.

Road Maintenance, Reconstruction and Restoration

The HCP/NCCP includes measures for constructing new roads and landings, as well as assessing, upgrading and repairing existing roads, landings and skid trails to reduce and prevent sedimentation, improve habitat for aquatic species, protect beneficial uses of water, provide efficient infrastructure for forest operations, extend protections to terrestrial wildlife species, and limit the introduction of invasive species and pathogens, as further described in

Chapter 8. MRC will implement these measures primarily through PTHPs, which will address roads, landings and skid trails within each PTHP area. However, MRC will implement some sediment reduction measures independent of PTHPs, targeting the highest priority roads and Controllable Erosion sites, as further described in Chapter 8.3. MRC will implement all sediment reduction measures as set forth in this Section and further described in Chapter 8.3.

Eligibility for Grant Funding

Nothing in the HCP/NCCP, this Agreement or the State and Federal Permits shall render any grant proposal to treat Controllable Erosion ineligible for public grant funds if the proposal is for a project that would treat Controllable Erosion sites beyond the rate or amounts provided in Chapter 8.3. Specifically, the Wildlife Agencies shall not deem any grant proposal for a project that would treat Controllable Erosion in excess of, or in addition to, the Controllable Erosion requirements summarized in Table 8-16 and Table 8-17 to be ineligible for state or federal grant funds on the basis that the project is required mitigation under the HCP/NCCP. Any treatment of Controllable Erosion funded with public grant funds shall not be credited toward Controllable Erosion mitigation requirements in the HCP/NCCP, this Agreement or the State and Federal Permits.

Vegetation Management

Vegetation management is the non-commercial alteration of a forest or plant community's composition and structure to promote conifer growth, health, and vigor, control exotic species, and promote riparian function. It includes planting desirable plant species, removing undesirable plant species, prescribed burning, and burning slash piles. Vegetation management will occur within the context of PTHPs (e.g., site preparation), but much will occur independent of PTHPs because it will not be linked to a specific commercial timber operation. MRC shall adhere to the HCP/NCCP and incorporate applicable measures of the Operating Conservation Program in all of its vegetation management activities as described in Chapters 8, 9, 10 and 11, whether or not they are included in a PTHP. Where measures or standards of the Operating Conservation Program apply to "harvest" or "PTHPs", MRC shall where applicable incorporate the measure or adhere to the standard for vegetation management. By way of example, and without limitation:

MRC shall not carry out a prescribed burn where timber harvest would not be allowed under the HCP/NCCP, except as described in Chapter 1, or for conservation purposes with the concurrence of the Wildlife Agencies;

In cases where MRC uses heavy equipment for vegetation management, it shall where applicable adhere to Equipment Exclusion Zones and other guidelines for heavy equipment in the HCP/NCCP; and

In cases where MRC must upgrade or repair a road to carry out vegetation management, it shall adhere to and implement applicable standards in Appendix E of the HCP/NCCP.

Habitat Improvement

Improvement of terrestrial habitat includes control of invasive plants that threaten rare plants (Chapter 11), creation and enhancement of amphibian habitat (Chapter 8), and creation or enhancement of habitat for marbled murrelet and Point Arena mountain beaver (Chapter 10). Instream habitat improvement includes structure

placement and reestablishing natural channel alignment (Chapter 8). MRC's removal of culverts, natural alignment of stream channels, and prevention and reduction of sedimentation (Chapter 8) will improve instream habitat. In addition, MRC shall improve instream habitat by placing LWD in Class 1 Watercourses as described in this Section and further described in Chapter 8.2.3.

High Priority Watercourses

Based on its watershed analyses (see Chapter 7.6) and CDFG's and NMFS' coho recovery planning analyses, MRC shall, as further described in Chapter 8, identify Class 1 watercourses with high demand for LWD and a high degree of channel responsiveness. MRC shall identify such high priority watercourses, as they are updated from year to year, in each Annual Report.

Site-Specific Plans

Before placing more than individual pieces of LWD in a watercourse, MRC shall prepare and submit to the Wildlife Agencies a site-specific LWD plan that shows where and how the LWD will be placed, as further described in Chapter 8.2.3.

Individual Trees

MRC may place individual trees felled for a cable corridor or safety hazard in watercourses without a site-specific plan, as further described in Chapter 8.2.3. MRC shall describe any such individual tree placement in the Annual Report, identifying the location and describing the manner of placement.

Monitoring

MRC shall implement each of the compliance, effectiveness and validation monitoring programs described in Chapter 13 according to the time schedules and harvest levels set forth within Chapter 13.2.2.7. Any Party may propose changes to any HCP/NCCP monitoring program, as described in Chapter 13.2, and MRC will incorporate any such changes that are mutually agreeable to MRC and the Wildlife Agencies. MRC and the Wildlife Agencies shall convene regularly as described in Chapter 13 to review and discuss potential Modifications to the monitoring programs.

Reporting

Appendix D of the HCP/NCCP summarizes the reporting requirements for scientific data and analysis described throughout the HCP/NCCP, including an annual HCP/NCCP implementation budget, and all periodic data, survey and monitoring reports, and inventories that MRC is to provide the Wildlife Agencies, and the interval in which each type of report or information shall be given. Following the timelines set forth in Appendix D of the HCP/NCCP, MRC shall provide Annual Reports to the Wildlife Agencies containing all scientific reports and other scientific information and data described in the HCP/NCCP, including information that is reported less frequently than on an annual basis. The form, frequency, scope and substance of the various reports and other information shall be substantially as presented in Appendix D. However, MRC and the Wildlife Agencies may modify the form, frequency, scope and substance of the reports and other information from time to time without the need for an Amendment of Appendix D of the HCP/NCCP or this Agreement. MRC shall summarize any such Modifications in its Annual Report. MRC and the Wildlife Agencies shall cooperate to identify a format for the Annual Report, including all information and data contained therein, that is economical to

compile and accessible to use.

Public Review of Annual Report

The Annual Report shall be made available to the public, and MRC shall conduct annual public workshops to provide information and evaluate progress toward attaining the conservation objectives of the HCP/NCCP. MRC shall invite the Wildlife Agencies to the public workshops and shall take meeting notes at each workshop. MRC shall provide a copy of its meeting notes to the Wildlife Agencies.

Certification of Annual Report

Each Annual Report shall include the following certification from a duly authorized MRC representative who supervised or directed preparation of the Report:

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries by myself, or persons under my control, of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.

Additional Information

MRC shall provide any additional pertinent information in its possession or control related to implementation or monitoring of the HCP/NCCP that the Wildlife Agencies request on the basis that it is reasonably necessary for the purpose of assessing whether the terms and conditions of the HCP/NCCP are being implemented. MRC shall use reasonable efforts to provide such additional information within thirty (30) days of the request.

The Wildlife Agency requesting the additional information shall provide a reasonable basis for the request in writing, make the request as specific and focused as possible consistent with the Wildlife Agency's oversight responsibilities and, to the extent feasible, coordinate the request with the other Wildlife Agencies. MRC shall not be required to prepare any additional reports; instead, MRC shall be required only to provide information in its possession or control and in its current state. Nothing in this Agreement shall compel MRC to disclose communications that are subject to the attorney work product or attorney-client privilege, or any other evidentiary privilege applicable at the time the information request is made. MRC may designate, by notifying the Wildlife Agencies in writing, any trade secrets or commercial, proprietary, or financial information ("Sensitive Information") requested by the Wildlife Agencies as exempt from disclosure by the Wildlife Agencies pursuant to a request made under the federal Freedom of Information Act ("FOIA") and/or the California Public Records Act ("PRA"), because such trade secret and/or information so designated (1) is Confidential Information, (2) has not been disclosed to the public by MRC, and (3) to MRC's knowledge is not routinely available to the public from other sources. Should Sensitive Information be requested pursuant to FOIA or the PRA, the Wildlife Agencies will contact MRC sufficiently prior to releasing any such information so as to allow MRC a reasonable opportunity to protect the Sensitive Information from release. This provision shall not limit the applicability of, or to require any Wildlife Agency to violate, FOIA or the PRA. Biological data pertaining directly to HCP/NCCP implementation shall not be regarded as Sensitive Information.

Training

For any of its employees, representatives, and contractors that will participate in the implementation of a Covered Activity, MRC shall provide appropriate training regarding the applicable requirements of the HCP/NCCP. In particular, MRC shall provide mass wasting hazard training as described in Chapter 8.3.1.1.4, controllable erosion repair training as described in Chapter 8.3.1.2.2, marbled murrelet tree assessment training, as described within Chapter 10.3.2.3.7, Point Arena mountain beaver survey training, as described in Appendix M of the HCP/NCCP, and training for plant identification, as described in Chapter 9.6.3.3. MRC shall include the Wildlife Agencies and CAL FIRE in such training, as further described in Chapter 8.3. MRC shall ensure that its employees comply with applicable Federal and State laws and regulations regarding scientific permits.

Activities Not Covered by and not Subject to the HCP/NCCP

Activities that are not Covered Activities shall not be governed by or subject to the HCP/NCCP and shall not be covered by the State Permit or the Federal Permits. Activities not governed by or subject to the HCP/NCCP include, without limitation, pesticide and herbicide applications; removal of trees that are utility hazards; use of roads or lands within the Plan Area for purposes other than Covered Activities, subject to the requirement in Chapter 10.3.2.1 that MRC will restrict public entry into the Lower Alder Creek; fire suppression actions; hunting or other recreational activities; placement of cell towers; commercial gravel extraction; and activities outside of the Plan Area.

ONGOING CONSULTATION AND ADAPTATION OF THE OPEERATING CONSERVATION PROGRAM

The HCP/NCCP's Operating Conservation Program is intended to be dynamic and adaptable, incorporating relevant new information and scientific analysis and becoming more effective and efficient over time. However, the Operating Conservation Program is also intended to provide a firm basis for MRC's long-term land management planning, and a consistent regulatory framework within which MRC may carry out Covered Activities. To adapt the Operating Conservation Program in a way that meets MRC's need for consistency and stability in its implementation of the HCP/NCCP and also better achieves the HCP/NCCP's goals and objectives, the Parties will meet for the purpose of identifying, refining and reaching agreement about appropriate adaptations to the Program and to a set of parameters to define the scope of potential future adaptations, as further described in Chapter 13.12.

For some conservation measures, the HCP/NCCP specifies actions to be taken if monitoring reveals that HCP/NCCP goals or objectives are not being achieved. For example, Chapter 13.8.1 specifies actions to be taken if objectives for wildlife trees, hard snags and downed wood are not met. Where this is the case, MRC shall implement the specified adaptations independently, notifying the Wildlife Agencies where required in the HCP/NCCP. However, the HCP/NCCP envisions that some adaptations will be developed when monitoring data or watershed analyses reveal a specific need and will be tailored to address the need and its circumstances. These adaptations will occur within the set limits of allowable change described in Chapter 13 and will be identified and developed at an annual meeting of the Parties following review of the Annual Reports, as provided in Section 7.1. The Parties may elect to meet more frequently by mutual agreement.

Ongoing Consultations and Review of Annual Report

Except where specific adaptations are identified in the HCP/NCCP or are

specifically left to MRC's discretion, the need for adaptations of the Operating Conservation Program and the specific adaptations needed shall be determined at an annual meeting of the Parties that shall commence within sixty (60) days after MRC's delivery of the Annual Report to each of the Wildlife Agencies and CAL FIRE (the "**Annual Meeting**"). The Annual Meeting may consist of a series of meetings and may by conducted by telephone, as necessary to accommodate conflicting schedules or ongoing discussions. However, the Parties shall use all reasonable efforts to conclude the Annual Meeting within a two (2) week period. The purpose of each Annual Meeting will be to address all issues arising from or pertaining to information in the Annual Report, including all monitoring and evaluation for the prior year, and to identify mutually agreeable responsive actions, if necessary, to address the issues. By way of example, and without limitation, the Annual Meeting shall be the forum in which the Parties address or resolve the following issues or occurrences:

- Modifications to conservation measures that do not achieve their objectives;

- Modifications to conservation measures that could achieve their objectives in a different manner and would be less restrictive or equally restrictive of Covered Activities;

- Modifications to monitoring and evaluation methodologies, studies, and programs that do not serve their purpose;

- Changed circumstances, if not already addressed as described in Section 7.3;

- Modifications to the Operating Conservation Program based on Watershed Analyses, Focus Watershed Studies, and Long-Term Channel Monitoring; and

- Addendums to the PTEIR.

At the Annual Meeting, any Party may propose Modifications to the Operating Conservation Program in accordance with Chapter 13.3. The Parties will consider in good faith any proposed Modification from any Party. To be accepted and incorporated into the Operating Conservation Program, a proposed Modification must be agreed to by all Parties. If the Parties cannot reach agreement regarding a proposed Modification, they may use the issue resolution process, as provided in Section 7.3.2.

If the Wildlife Agencies determine that a Modification agreed to by the Parties will require an Amendment, the Modification shall not be implemented until the Amendment is approved, as described in Section 9.

Initial HCP/NCCP Implementation Meetings

The Parties shall meet quarterly during the first year of HCP/NCCP implementation to help ensure a successful initiation of the Operating Conservation Program.

Changed Circumstances

Changed Circumstances and planned responses to those circumstances are described in Chapter 14. In the event that any Party believes that a changed circumstance as defined in Chapter 14 may exist, it shall so notify the other Parties. In the event that any Party concludes that a changed circumstance in fact exists, it shall explain the basis of its conclusion and propose appropriate responsive action(s) in accordance with Chapter 14. The Parties shall meet within twenty-one (21) days of receiving the written request to discuss the response to the changed circumstance provided for in the HCP/NCCP. If the Parties cannot reach agreement on a response, the Wildlife Agencies shall identify, and MRC shall implement, a response from the alternatives specified in the HCP/NCCP. The Wildlife Agencies and MRC agree that Chapter 14 identifies all the Changed Circumstances and all required responses to Changed Circumstances for purposes of the HCP/NCCP.

Scope of Adaptive Management Changes and Changed Circumstances Responses

The Operating Conservation Program includes both adaptive management changes provided in Chapter 13 and planned responses to Changed Circumstances provided in Chapter 14, and MRC shall implement adaptive management changes and planned responses to Changed Circumstances as described therein. The Operating Conservation Program does not require MRC to implement, and the Wildlife Agencies shall not require MRC to accept or implement, any Modifications to the Operating Conservation Program that are beyond the scope of adaptive management changes described in Chapter 13 or planned responses to changed circumstances described in Chapter 14 or are inconsistent with the regulatory assurances provided under federal and state law and described in Section 10. In addition, any proposed Modification by the Wildlife Agencies that would require an Amendment of the HCP/NCCP under Section 9.4, below, is beyond the scope of the Operating Conservation Program's adaptive management program, and MRC may, in its sole discretion, reject any such proposed Modification.

No Increase in Authorized Take

Nothing in this Section or the Adaptive Management provisions of the HCP/NCCP, nor any other provision that provides for a Modification of any measure included in the Operating Conservation Program, authorizes an increase in Authorized Take. Any Modification that would result in an increase in Authorized Take must be approved as an Amendment under Section 9.4. Take that occurs on Additional Lands that is included in the Authorized Take is not an increase in Authorized Take. For purposes of this Section only, Authorized Take includes impacts to Covered Species that are plants under the USFWS Federal permit.

Plan Interpretation and Implementation

The Parties recognize that disagreements concerning implementation or interpretation of this Agreement, the HCP/NCCP, and the Permits may arise from time to time. The Parties will work together in good faith to resolve such disputes using the informal dispute resolution procedure set forth in this Section 7.4 or such other procedures which the Parties may later adopt. Any Party may seek any available remedy without regard to this section if the Party concludes that circumstances so warrant. Nothing in this Section shall be construed to limit authority of the Wildlife Agencies or CAL FIRE to enforce State or Federal law, or to limit any Party's ability to suspend, revoke, or relinquish the State and Federal Permits. However, unless the Parties agree

upon another issue resolution process, or unless a Party has initiated administrative proceedings or litigation related to the subject of the disagreement in federal or state court, the Parties will use the following procedures to attempt to resolve disagreements.

Meet and Confer

If any Party ("the Objecting Party") objects to any action or inaction by any other Party on the basis that the action or inaction is inconsistent with the HCP/NCCP, the Permits, or this Agreement, it shall so notify the other Parties in writing, explaining the basis of such objection. The Party whose action or inaction is addressed in the notice ("the Responding Party") shall respond to the notice within thirty (30) days of receiving it, stating what actions the Responding Party proposes to take to resolve the objection or, alternatively, explaining why the Responding Party thinks the objection is unfounded. If the response resolves the objection to the satisfaction of the Objecting Party, the Objecting Party shall so notify the Responding Party, and the Responding Party shall implement the actions, if any, proposed in the response to the Objecting Party. If the response does not resolve the objection to the Objecting Party's satisfaction, the Objecting Party shall notify the Responding Party accordingly, and they shall meet and confer to attempt to resolve the disagreement. To the maximum extent practicable, the meeting shall occur within 30 (days) after the Objecting Party receives the Responding Party's response, or at such later time as they may agree upon. MRC shall participate in the meeting and shall take notes, summarize the outcome, and distribute meeting notes to each Party for its review. All Parties shall receive the initial notification from the Objecting Party, the response from the Responding Party provided during the resolution procedure, and the final meeting notes.

Elevation of Disagreement

If the Parties do not resolve a disagreement after completing the resolution procedure in Section 7.4.1, any one of the Parties may elevate the dispute to a meeting of executives and managers of the involved Parties. For purposes of this provision, "executives and managers" shall mean the CDFG Regional Manager, the CAL FIRE Deputy Director for Resource Management, the USFWS Field Supervisor, the NMFS assistant Regional Administrator for Protected Resources, and MRC's President. Each Party shall be represented in person by its executive or manager at the meeting, but each executive or manager may bring whomever he or she chooses. To the maximum extent practicable, the meeting shall occur within forty-five (45) days of a request by any Party following completion of the procedure described in Section 7.4.1, or as soon thereafter as practicable. At the meeting, the executive or manager for each Party shall render that Party's final decision regarding the disputed matter for purposes of this dispute resolution procedure, and the procedure shall conclude, unless the Parties extend the procedure by mutual agreement. MRC shall participate in the meeting and shall take notes, summarize the outcome, and distribute meeting notes to all Parties.

Science Review Panel

The HCP/NCCP and this Agreement contemplate that the Parties will reach mutual agreement regarding certain scientific and technical issues. In the event that such mutual agreement cannot be reached, MRC may elect to refer the issue to a Science Review Panel for review and recommendations. The members of the Science Review Panel shall be selected by mutual agreement. All members of the Science Review Panel shall have expertise relevant to the issue submitted

to the Panel for advice. MRC shall pay for the cost of convening the Panel.

The Science Review Panel members shall review the issues presented in accordance with the terms, conditions and other criteria contained in this Agreement, the HCP/NCCP, and the Federal and State Permits, and shall make their recommendations based on the best science available at the time. The Science Review Panel shall deliver a written report reflecting the opinions of its members to MRC and the Wildlife Agencies. If recommendations of individual members of the Panel differ, the Panel shall reflect the individual views of each member in its report. The conclusions or recommendations of the Panel members shall not bind any Party.

FUNDING

Primary Funding and Demonstration of Availability

MRC warrants that it has, and shall expend, such funds as may be necessary to fulfill all of its obligations under the Federal and State Permits, as described in the HCP/NCCP and this Agreement. Before February 28 of each year, MRC shall submit to the Wildlife Agencies an annual budget approved by its Board of Directors that authorizes sufficient funds for expenditure for that year to carry out MRC's commitments under the Federal and State Permits and the HCP/NCCP. In addition, the President of MRC shall deliver to the Wildlife Agencies a letter verifying that an accounting reserve has been established or maintained in an amount adequate to implement measures included in the Operating Conservation Program that will impose costs beyond MRC's normal operating costs for that year, as further described in Chapter 7.13, together with a written confirmation from an independent auditor that MRC has established or maintained such reserve. The amount of the accounting reserve shall reflect the amount shown in the annual budget, but in no event shall the amount be less than two-million dollars ($2,000,000) in 2012 dollars. The accounting reserve amount shall be adjusted April 15 each year based on the Consumer Price Index published by the Bureau of Labor Statistics of the United States Department of Labor, San Francisco-Oakland-San Jose, California, All Items and Major Group Figures For Urban Wage Earners and Clerical Workers, and shall be increased or decreased in proportion to the extent of lands added to or removed in accordance with Section 9 and Chapter 1.12.

Material Change in Resources

MRC shall promptly notify the Wildlife Agencies of any material change in MRC's funding resources, including any decision to use the accounting reserve created in accordance with Section 8.1. A material change in MRC's funding resources is any change in the financial condition of MRC that could impair MRC's ability to manage MRC Lands, including any additional lands, in the Plan Area according to the terms of the Federal and State Permits, this Agreement and the HCP/NCCP. In the event MRC is unable to fully implement the Operating Conservation Program using budgeted funds, MRC shall draw from the accounting reserve as necessary to ensure full implementation of the Operating Conservation Program; provided, however, that MRC shall remain obligated under Section 8.1 to replenish and establish an adequate accounting reserve by January 30 of the following year.

State and Federal Funding

The Wildlife Agencies will cooperate with MRC to identify and secure, where appropriate, federal and state funds available for implementation of habitat conservation plans and natural community conservation plans, planning and

implementation of stream restoration, water quality improvement, or other activities that would complement the HCP/NCCP, such as the acquisition of lands within the HCP/NCCP's Marbled Murrelet Habitat Recruitment Stands. MRC's commitment to expend its own funds to fulfill its obligations under the HCP/NCCP and this Agreement will not preclude MRC's eligibility, or the eligibility of any organization, to receive any federal and state funds it would otherwise be eligible to obtain to plan or implement additional conservation measures referenced in the HCP/NCCP that are not required to fulfill MRC's mitigation obligations under the HCP/NCCP. The Wildlife Agencies acknowledge that such Federal and State funds may enable MRC to accelerate the implementation of portions of the Operating Conservation Program beyond the commitments in the HCP/NCCP and this Agreement. MRC acknowledges that additional conservation measures, to the extent that they are funded by State or Federal grant funds, cannot be used to fulfill, and will not be credited toward, MRC's mitigation obligations under the HCP/NCCP, this Agreement or the Permits.

MODIFICATION AND AMENDMENT

Modification and Amendment of this Agreement and the HCP/NCCP

This Agreement may be amended only by written agreement of the Parties. The HCP/NCCP may only be modified or amended with the written consent of MRC and the Wildlife Agencies following compliance with applicable Federal and State laws and regulations. Planned responses to Changed Circumstances and adaptive management changes provided for in the HCP/NCCP are part of the Operating Conservation Program and shall not require Modifications or Amendments of the HCP/NCCP.

Minor Modifications to the HCP/NCCP

Minor Modifications are revisions to the HCP/NCCP that do not substantially modify Covered Activities or the Operating Conservation Program. Minor Modifications to the HCP/NCCP must be agreed to by MRC and the Wildlife Agencies in writing, but they do not require an amendment the Federal or State Permits. Such Modifications may include, but are not limited to, the following:

- Corrections of typographical, grammatical, and similar editing errors in the HCP/NCCP that do not change the intended meaning;
- Correction of any maps or exhibits to correct errors in mapping;
- Minor changes to survey, monitoring or reporting protocols;
- Adding or deleting land, as further described in Chapter 1 and Section 9.6;
- Correction of any maps or appendices to reflect previously approved Modifications to the HCP/NCCP or Amendments to the Federal or State Permits; and
- Any change to the HCP/NCCP that does not require supplemental environmental review under NEPA, CEQA, or Section 7 of ESA, as determined by the applicable Wildlife Agency.

Procedure for Making Minor Modifications the HCP/NCCP

Any Wildlife Agency or MRC may propose Minor Modifications to the HCP/NCCP by providing written notice to all other Parties. Such notice shall include a statement of the reason for the proposed Modification, and explanation of why the Modification is minor, and a concise analysis of its environmental effects, if any, including any effects on the Operating Conservation Program and Covered Species. For proposed additions or removals of land by MRC, this information shall be included in the Proposal for the Addition of Lands by a Minor Modification required by Section 9.6.1 or the Proposal for the Removal of Lands required by Section 9.7.4. The Parties shall use reasonable efforts to respond in writing to the proposed Minor Modification within sixty (60) days after receipt of such notice. In its written response, a Party may request additional information about the proposed Modification.

Proposed Minor Modifications to the HCP/NCCP shall become effective on the calendar day after MRC and all of the Wildlife Agencies have provided their written approval (i.e., after the last of them has provided its written approval). If MRC or any Wildlife Agency objects to a proposed Minor Modification, it shall provide a reasonable opportunity to consult with the Party(ies) proposing the Modification. If the objection is not resolved, the proposed Minor Modification must be pursued, if at all, as an Amendment of the Federal Permits or State Permit as described in Section 9.4 of this Agreement. The Parties will use all reasonable efforts to approve or disapprove any proposed Minor Modification within ninety (90) days after receipt of the written notice proposing the Modification.

Amendment of the HCP/NCCP or the Federal and State Permits

MRC may propose any change to the HCP/NCCP and the Federal and State Permits as an Amendment. The Wildlife Agencies will review, and approve or disapprove, all proposed Amendments to the HCP/NCCP or the Federal and State Permits in accordance with applicable laws and regulations, including but not limited to ESA, NEPA, NCCPA and CEQA. Any Wildlife Agency may propose changes to the HCP/NCCP or the Federal and State Permits, and may request MRC to propose an Amendment to incorporate the changes, but it shall be within MRC's sole discretion whether to propose any such Amendment.

Acquisition of New Lands

Nothing in this Agreement, the HCP/NCCP, or the Federal and State Permits limits MRC's right to acquire new lands outside the Plan Area, or partial interests in such lands, for any purpose, including timber harvesting. Nothing in this Agreement, the HCP/NCCP, or the Federal and State Permits requires MRC to include in the Plan Area any such lands it acquires after the Effective Date. Unless such lands are added to the Plan Area by a Minor Modification to the HCP/NCCP or by Amendment to the HCP/NCCP and Permits, no such lands or activities thereon will be included in the PTEIR or be covered by Authorized Take.

Adding Lands to the Plan Area

MRC may propose to add land located in the Adjustment Area to the Plan Area, and to make such lands subject to the terms of this Agreement, the HCP/NCCP, and the Federal and State Permits, through a Minor Modification of the HCP/NCCP, if appropriate, or through an Amendment of the HCP/NCCP and the Federal and State Permits. MRC may propose to add to the Plan Area any land

within the Adjustment Area in which MRC obtains legal control sufficient to implement fully the terms and conditions of the PTEIR, HCP/NCCP and the Federal and State Permits.

Adding lands to the HCP/NCCP that are similar to lands in the Plan Area and managing them in accordance with the HCP/NCCP would likely complement the HCP/NCCP because it would increase the amount of habitat protected and managed for Covered Species. Based upon the analysis in the HCP/NCCP and the EIS/PTEIR, the timberlands within the Adjustment Area are largely similar in relevant characteristics to lands in the Plan Area.

Proposal to Add Lands with a Minor Modification

Provided that the total amount of land added over the 80 year permit term does not exceed fifty three thousand, three hundred and eleven (53,311) acres, up to ten-thousand (10,000) acres within the Adjustment Area may be added to the Plan Area in any calendar year through a Minor Modification of the HCP/NCCP, if the lands are determined by the Wildlife Agencies and CAL FIRE to be timberlands that are similar in relevant characteristics to lands in the Plan Area. Lands added and removed by any mechanism will be calculated independently and will not be aggregated for purposes of determining the total number of acres added or removed from the HCP/NCCP. For example, if in any year 100 acres were added and 50 acres were removed, it would mean both that 100 acres were added and that 50 were removed for purposes of this provision; it would not mean that only 50 acres were added during that year. Only similar timberland within the Adjustment Area may be added through a Minor Modification. For purposes of this Section, "timberland" means timberland as defined in section 4526 of the CFPR that is capable of growing predominantly redwood and Douglas-fir forest. "Timberland" may also include stands of grand fir, western hemlock, sugar pine, Monterey pine, tanoak, madrone, and chinquapin.
MRC may propose to add timberland located in the Adjustment Area to Covered Lands through a Minor Modification by providing to the Wildlife Agencies a Proposal for the Addition of Lands by a Minor Modification that includes:

- A map depicting the location and boundaries of the lands to be added and
- Evidence that the lands are within the Adjustment Area and are similar in character to lands in the Plan Area;
- Suitable evidence that the lands are timberland;
- A summary of all lands added to Plan Area following the Effective Date;
- A statement that the lands have been managed by MRC in a manner consistent with the HCP/NCCP at all times since MRC first acquired the interest in such lands, excluding management actions that would result in unauthorized Take;
- Evidence acceptable to the Wildlife Agencies and CAL FIRE that MRC has legal control of the lands sufficient to fully implement applicable provisions of this Agreement, the HCP/NCCP, the PTEIR and the Federal and State Permits;

- A summary, based upon the best available information, of relevant characteristics the lands share with the existing Plan Area lands and relevant characteristics the lands do not share with the existing Plan area lands as of the date of the proposal, including but not limited to the following baseline information for the lands:
    - a map showing the location of all roads and fish-bearing streams;
    - number of acres;
    - geology and geomorphology, climate, vegetation;
    - aquatic habitat conditions, including water temperatures, channel and habitat types, and LWD inventory;
    - salmonid population estimates;
    - estimates of Covered Species occurrence and status, and the occurrence and status of any State or Federally listed species that are not Covered Species;
    - timber stand age(s) and composition;
    - presence and extent of natural communities;
    - any changes in the characteristics of the lands since their analysis in the EIS/PTEIR.
- a description of the Covered Activities that will occur on the additional lands;
- an explanation of whether or how the addition of the lands will help achieve HCP/NCCP objectives;
- an explanation of whether the addition of lands is within the scope of the EIS/PTEIR;
- a copy of the previous landowners management plan, if available; and
- the amount and timing of Authorized Take expected to occur on the additional lands.

The Wildlife Agencies and CAL FIRE shall use reasonable efforts to identify within sixty (60) days of receipt of any Proposal for the Addition of Lands by a Minor Modification any information missing from the Proposal that is required by this Section.
Each Wildlife Agency shall approve the Proposal in writing if it concludes that:

- the Proposal conforms with the terms and conditions of the HCP/NCCP

and this Agreement regarding the addition of lands;

- adding the lands to the Plan Area and managing them pursuant to the terms and conditions of this Agreement, the HCP/NCCP during the term of the Federal and State Permits will not result in adverse effects on the Covered Species or other environmental impacts that are different from or greater than those analyzed in the HCP/NCCP or the EIS/PTEIR;

- Covered Activities can be implemented on the added lands without exceeding the Authorized Take limits identified in the Permit issued by that Wildlife Agency; and

- the lands to be added are similar in character to lands in the Plan Area.

CAL FIRE shall approve the Proposal in writing if it concludes that:

- the Proposal conforms with the terms and conditions of this Agreement regarding the addition of lands;

- adding the lands to the Plan Area and managing them pursuant to the terms and conditions of this Agreement and the HCP/NCCP will not result in environmental impacts that are different from or greater than those analyzed in the PTEIR.

If the Wildlife Agencies and CAL FIRE approve the Proposal for the Addition of Lands by a Minor Modification, the lands described in the Proposal shall then be added to the Plan Area according to Section 9.6.3 of this Agreement, and MRC shall distribute to the Wildlife Agencies and CAL FIRE an updated map of the Plan Area.

Adding Lands through an Amendment

An Amendment to the HCP/NCCP and the Federal and State Permits shall be required to approve the addition of lands to the Plan Area if, upon review of all of the information required to be provided by MRC under Section 9.6.1, one or more of the Wildlife Agencies concludes that the proposed addition is likely to result in new, significant environmental effects, an increase in the severity of previously identified significant effects, or an increase in the severity of previously identified effect that brings it to the level of a significant effect, or that the implementation of Covered Activities on the additional lands would exceed the levels of Authorized Take in the Federal and State Permits. In addition, an Amendment will be required if the proposed addition of lands:

- would bring the total amount of lands added by any mechanism in any calendar year to more than ten-thousand (10,000) acres;

- would bring the overall total amount of land added by any mechanism after the Effective Date to more than fifty-three thousand three hundred and eleven (53,311) acres;

- is more than sixty (60) years after the Effective Date; or

- would add lands that have been deleted from the Plan Area within

the preceding twenty (20) years.

Effect of Adding Lands to Plan Area

Any land that MRC successfully includes for coverage under the Federal and State Permits by a Minor Modification or by an Amendment of the HCP/NCCP and Permits shall thereafter be deemed "Additional Covered Lands" and shall become a part of the Plan Area. Subsequently, all references to the Plan Area in this Agreement or the HCP/NCCP shall be deemed to include such Additional Covered Lands. All provisions of this Agreement, the HCP/NCCP, and the Federal and State Permits that apply to the Plan Area shall apply to the Additional Covered Lands. The approval of such Additional Covered Lands shall not change any provision of this Agreement, the HCP/NCCP, or the Federal and State Permits, including levels of Authorized Take; such provisions must be specifically modified or amended in writing using the Minor Modification or Amendment process under this Section 9.

Effect on Sediment Reduction Plan

Additional Covered Lands will require corresponding increases in Controllable Erosion targets. For additions within the first thirty (30) years after the Effective Date, a road inventory will be prepared, and erosion control and road upgrade will follow the same specifications as outlined in Chapter 8.3.3.2.1 for lands added outside of MRC Coho Core Areas. For additions of land in any MRC Coho Core Area within the first twenty (20) years after the Effective Date, a road inventory will be completed, and MRC will follow the timelines and prescriptions described in Chapter 8.3.3.2.1.

Aquatic Monitoring

If Additional Covered Lands increase the size of the Plan Area to two-hundred and sixty-one thousand (261,000) acres or more, MRC shall, in consultation with the Wildlife Agencies, either identify one (1) additional Focus Watershed, which shall then be subject to Chapter 13 and addressed in substantially the same manner as the initial Focus Watersheds, or augment aquatic monitoring throughout the Plan Area, as further described in Chapter 13.

Northern Spotted Owl Population Objectives

The addition of Covered Lands shall increase northern spotted owl objectives as described in Chapter 10.3.1.2.1.

Adding Lands Outside the Adjustment Area

MRC may propose to add lands located outside of the Adjustment Area to the Plan Area, but only through an Amendment of the HCP/NCCP and the Federal and State Permits.

Removal of Lands

MRC may remove lands from the Plan Area by a Minor Modification of the HCP/NCCP or by an Amendment of the HCP/NCCP, this Agreement and the State and Federal Permits, as provided in this Section. Any lands that MRC removes from the Plan Area ("**Removed Lands**") shall no longer be considered part of the Plan Area as of the date the Minor Modification or Amendment takes effect. All subsequent references to the Plan Area shall be deemed to exclude such Removed Lands and MRC shall no longer be responsible for implementing the Operating

Conservation Program on those lands. The approval of such Removed Lands shall not change any provision of this Agreement, the HCP/NCCP, or the Federal and State Permits, including levels of Authorized Take; such provisions must be specifically modified or amended in writing using the Minor Modification or Amendment process under this Section 9.

Transfer of Lands

Nothing in this Agreement, the HCP/NCCP, or the Federal and State Permits limits or restricts MRC's right as a landowner to transfer its legal title to, or other legal interests in, its lands in the Plan Area. With the exception of land transfers completed through a Minor Modification of the HCP/NCCP; an Amendment of the HCP/NCCP, this Agreement and the State and Federal Permits, under this Section 9.7; or partial permit transfer under Section 9.8., MRC shall immediately notify the Wildlife Agencies if it transfers legal ownership or control of any land within the Plan Area and Authorized Take shall not apply to the lands as of the date of transfer. If MRC transfers legal ownership or control of lands within the Plan Area, other than in accordance with Section 9.7.1 or 9.8, the transfer will be treated as a partial surrender of the Federal and State Permits under Section 11.5 with regard to the transferred lands, and MRC shall be obligated under the Permits to mitigate for all Take that occurred on the transferred lands before the transfer in accordance with 11.5. In addition, if MRC transfers legal ownership or control over any of its lands in the Plan Area without first removing the lands from the Plan Area by a Minor Modification to the HCP/NCCP, if appropriate, or an Amendment to the HCP/NCCP and Federal and State Permits, the transfer will not be in accordance with the HCP/NCCP, this Agreement, and the Permits, and the Permits will be subject to suspension or revocation, at the discretion of the Wildlife Agencies. Following any such transfer of legal ownership or control, the transferred lands will be treated as Removed Lands.

Nothing in this Agreement, the HCP/NCCP or the Federal and State Permits shall be construed as transferring any Authorized Take to the transferee, except as authorized under applicable Federal and State laws and regulations governing the transfer of FESA incidental take permits and NCCPA take authorizations.

Effect of Removal of Lands

The removal of lands in accordance with the HCP/NCCP, this Agreement and the Federal and State Permits will affect certain elements of the HCP/NCCP, as described in this Section.

Effect on Sediment Prevention Plan

Controllable Erosion targets will be reduced in proportion to the total acreage of Removed Lands as described in Chapter 8.3.

Effect on Focus Watershed Studies

If the total acreage of the Plan Area is reduced to one-hundred eighty-one thousand two-hundred fifty-eight (181,258) acres or less by the net sum of Additional Lands and Removed Lands, MRC shall, in consultation with the agencies, eliminate one (1) Focus Watershed; provided, however, that if subsequent additions of lands return the size of the Plan Area to one-hundred eighty-one thousand two-hundred fifty-eight (181,258) acres or more, MRC shall, in consultation with the agencies return one (1) Focus Watershed. As an alternative to eliminating a Focus Watershed, MRC may, with the concurrence of the Wildlife Agencies, reduce the sampling intensity within existing Focus Watersheds.

Effect on Northern Spotted Owl Population Objectives

Northern spotted owl objectives will be decreased in proportion to the total acreage of Removed Lands, as described in Chapter 10.3.1.2.1.

Conditions for Removing Lands Through a Minor Modification

MRC may remove lands within the Plan Area through a Minor Modification of the HCP/NCCP only if the total amount of land remove by any mechanism in any calendar year is less than ten-thousand (10,000) acres and, after giving effect to such transfer, the total remaining acreage of the original Plan Area as of the Effective Date, including any previous additions or removals by any mechanism, would not fall below one-hundred eighty-one thousand two-hundred fifty-eight (181,258) acres. Lands removed by any mechanism will be calculated independently and will not be aggregated with lands added to the Plan Area for purposes of determining the total number of acres removed from the HCP/NCCP. In addition to the acreage limitation described in this paragraph, MRC may remove lands through a Minor Modification only under one of the following three conditions:

- The lands are transferred to any entity, including private or public, if, prior to the transfer, each Wildlife Agency, in its sole discretion and based on any factors it thinks relevant, concludes that the transfer will not compromise the effectiveness of the HCP/NCCP or result in any reduction in required mitigation based on legally assured commitments (e.g., a conservation easement approved as to form and enforceable by the Wildlife Agencies) by the transferee, and the Wildlife Agencies determine that management of such lands will be sufficiently beneficial to the Covered Species; or

- The lands are transferred to a nongovernmental organization with a conservation easement that is enforceable by the Wildlife Agencies, which the Wildlife Agencies conclude ensures that the management of the lands will not compromise the effectiveness of the HCP/NCCP or result in any reduction in required mitigation, or the organization has entered into an agreement with one or more of the Wildlife Agencies that includes legally assured commitments acceptable to the Wildlife Agencies that management of the lands will not compromise the effectiveness of the HCP/NCCP or result in any reduction in required mitigation; or

- The Federal and State Permits, or pertinent portions thereof, are also transferred to the transferee in accordance with Federal and State laws and regulations, as described in Section 9.8, below.

Process for Removing Land under a Minor Modification

To transfer lands from the Plan Area under a Modification, MRC must provide to the Wildlife Agencies a Proposal for the Removal of Lands that includes:

- a map of the lands proposed to be removed from the Plan Area and an area map showing the location of the lands within the Plan Area;

- estimates of Covered Species status and occurrence on the lands;

- a summary of all lands removed from the Plan Area since the Effective Date; and

- information necessary to fulfill one of the three conditions identified in Section 9.7.3.

The Wildlife Agencies shall use reasonable efforts to identify within sixty (60) days of receipt of any Proposal for the Removal of Lands any required information missing from the Proposal, and any additional information reasonably required to review the Proposal. Each Wildlife Agency shall approve the Proposal in writing if it concludes that the Proposal conforms with terms and conditions of the HCP/NCCP and this Agreement regarding the removal of lands through a Minor Modification, including but not limited to Section 9.7.3, 9.7.4 and Chapter 1, and that removal of the lands from the Plan Area will not compromise the effectiveness of the HCP, including mitigation required for past Take, and does not require an Amendment as provided in Section 9.7.5. If the Wildlife Agencies approve the Proposal, the lands described in the Proposal will then be removed from the Plan Area, and MRC shall promptly distribute to the Wildlife Agencies and CAL FIRE an updated map of the Plan Area. If the Wildlife Agencies do not approve the Proposal, MRC may propose the removal as an Amendment.

Amendment

An Amendment to the HCP/NCCP and one or more of the Federal and State Permits shall be required to finally approve the removal of lands from the Plan Area if the removal of lands does not meet the criteria established in Sections 9.7.3 and 9.7.4 and Chapter 1 or one or more of the Wildlife Agencies reasonably concludes:

- that a proposed removal will result in new, significant environmental effects, an increase in the severity of a significant effect previously identified in the HCP/NCCP or EIS/PTEIR, or an increase in the severity of a previously identified effect that brings it to the level of a significant effect;

- that, as a result of a proposed removal of lands, the implementation of Covered Activities would exceed the levels of Authorized Take in the Federal or State Permits;

- that a proposed removal would prevent MRC from achieving one or more of the conservation objectives identified in the HCP/NCCP;

- that a proposed removal would result in a reduced level of protection any portion of the LACMA; or

- that a proposed removal would compromise the effectiveness of the HCP, including mitigation required for past take.

Transfer of Incidental Take Permits as Part of Land Transfer

MRC may request a transfer of the Federal and State Permits in pertinent part in connection with the sale or other transfer of MRC land within the Plan Area through a joint submission by MRC and the proposed transferee. The Wildlife Agencies shall review, and approve or deny, the requested transfer in accordance with applicable Federal and State laws and regulations

REGULATORY ASSURANCES

Purpose

MRC's main purpose in preparing the HCP/NCCP, executing this Agreement, and obtaining the State and Federal Permits is to provide for the long-term reconciliation of profitable timber harvesting within the Plan Area with the conservation and protection of the Covered Species and natural communities. Upon issuance of the State and Federal Permits, MRC will receive the regulatory assurances provided under State and Federal law, which are described in this Section 10.

Federal "No Surprises" Assurances

All of the regulatory assurances provided in the Federal No Surprises rule, currently codified at 50 C.F.R. 17.3, 17.22(b)(5), 17.32(b)(5), and 222.307(g) shall be extended to MRC upon issuance of the Federal Permits in accordance with those regulations.

In the event there are changes to the Federal No Surprises Rule after the Effective Date that render the Federal assurances provided under such rule substantially weaker, MRC may elect to surrender the Federal Permits, and to terminate this Agreement with regard to the Federal Permits, in accordance with 50 C.F.R. 17.22(b)(7) and 17.32.(b)(7) and Section 11.5 or 11.6, as appropriate.

State Assurances

Except as otherwise provided in this subsection or required by law, CDFG shall not require MRC during the term of the State Permit to provide, without its consent, additional land, water or financial compensation, or additional restrictions on the use of land, water, or other natural resources, for the purpose of conserving Covered Species with respect to Covered Activities in the event of unforeseen circumstances, provided MRC is properly implementing this Agreement, the HCP/NCCP, and the State Permit. Measures required for Adaptive Management or changed circumstances in accordance with Chapter 13 are provided for under the HCP/NCCP and therefore are not limited by this Section.

Unforeseen Circumstances Finding

In the event that any Party believes that unforeseen circumstances may exist in accordance with the Federal or State definitions, it shall immediately notify the other Parties. If any Wildlife Agency believes unforeseen circumstances exist, it shall prepare a proposed finding, and clearly document the basis for the finding, regarding the existence of unforeseen circumstances. With regard to any potential unforeseen circumstances finding, USFWS shall adhere to 50 C.F.R. 17.22(b)(5)(iii)(C) and 17.32(b)(5)(iii)(C) and NMFS shall adhere to 50 C.F.R. 222.307(g)(3).

Within thirty (30) days of receiving such notice, the Wildlife Agencies and MRC shall make a reasonable effort to meet and confer to consider the potential unforeseen circumstance, share relevant information, and discuss any potential changes to the Operating Conservation Program, subject to the Federal and State Assurances described in Sections 10.2.1 and 10.2.2

of this Agreement. For purposes of the NCCPA, CDFG shall make any unforeseen circumstances finding based on the best scientific evidence available, after considering any responses submitted by MRC. It shall be CDFG's responsibility to demonstrate that unforeseen circumstances exist.

Effect of Unforeseen Circumstances Finding

Pursuant to the Federal No Surprises rule and Fish and Game Code section 2820(f)(2) and for as long as MRC properly implements the HCP/NCCP, this Agreement, and the State and Federal Permits, if any Wildlife Agency makes a finding of unforeseen circumstances and additional conservation and mitigation measures are deemed necessary to respond to such unforeseen circumstances, the Wildlife Agency may require additional conservation measures from MRC only under certain conditions. Such measures must be limited to Modifications to the Operating Conservation Program for Covered Species that maintain the original terms of the HCP/NCCP to the maximum extent possible. In addition, pursuant to the Federal No Surprises rule and Fish and Game Code section 2820(f)(2), additional conservation and mitigation measures must not involve the commitment of additional land, water or financial compensation, or additional restrictions on the use of land, water or other natural resources otherwise available for development or use under the original terms of the HCP/NCCP, without the consent of MRC. By way of example and not limitation, seasonal timber harvest restrictions more stringent than those provided for in the HCP/NCCP would be considered to be an additional restriction on the use of land.

Interim Obligations Upon a Finding of Unforeseen Circumstances

If any Wildlife Agency makes a finding of unforeseen circumstances, during the period necessary to determine what actions, if any, are available to address such circumstances, MRC shall consult with that Wildlife Agency and will avoid implementing any Covered Activity within the Plan Area that the Wildlife Agency determines, in consultation with MRC, would appreciably reduce the likelihood of the survival and recovery of a Covered Species.

Wildlife Agencies' Response to a Finding of Unforeseen Circumstances

Neither the Federal No Surprises rule nor the NCCPA limits or constrain USFWS, NMFS, or any State, local or Tribal government agency, or a private entity, from taking additional actions at its own expense to protect or conserve a Covered Species.

New Listings of Covered Species

Subject to compliance with all other terms of this Agreement, the HCP/NCCP, and the Federal Permits, the Federal Permits shall become effective as to each Covered Species that is not a Federal Listed Species concurrent with the listing of such species under ESA. The State Permit shall be effective as to each Covered Species regardless of listing status.

An Amendment is required to add species, listed or non-listed, to the list of Covered Species. The Federal and State Permits do not authorize Take of listed species that are not Covered Species.

Migratory Bird Treaty Act

The Federal Permit issued by the USFWS shall constitute a Special Purpose Permit under 50 CFR § 21.27 for the incidental Take of all Covered Species

identified at 50 CFR § 10.13 which are also listed under the ESA as of the Effective Date (and for the incidental Take of unlisted Covered Species identified at 50 CFR § 10.13, when the Federal Permit becomes effective as to such species as provided in Section 10.3) in the amount and/or number and subject to the terms and conditions specified in the Federal Permit. Any such incidental Take will not be in violation of the Migratory Bird Treaty Act of 1918, as amended (916 U.S.C.A. sections 703-12). The Special Purpose Permit shall be valid for a period of three years from its effective date, provided the Federal Permit remains in effect for such period. The Special Purpose Permit shall be renewed provided that MRC remains in compliance with the terms of the Federal Permit and this Agreement. Each such renewal shall be valid for the maximum period allowable under the applicable regulations at the time of the renewal (which, as of the Effective Date, is three years), provided that the Federal Permit remains in effect for such period. [Include corvid and barred owl special use or depredation permit and appropriate FG code sections here, if applicable.]

Federal Consultations

Nothing in this Agreement will limit the right or obligation of any Federal agency to engage in consultation, as required under Section 7 of ESA (16 U.S.C. Section 1536(a)). However, in any consultation with regard to a Covered Activity with respect to a Covered Species involving MRC that may be required pursuant to Section 7 after the Effective Date, USFWS and NMFS shall, to the maximum extent consistent with the requirements of Section 7, rely upon, and utilize their respective Section 7 biological opinions issued during the approval of the HCP/NCCP, provided that the Covered Activity as proposed in the consultation is consistent, and will be implemented in accordance with, the NCCP/HCP, this Agreement and the Permits. Any reasonable and prudent measures and terms and conditions in the biological opinion, shall, to the maximum extent consistent with the requirements of Section 7, be consistent with and not in excess of the measures included in the NCCP/HCP, this Agreement and the Permit.

Critical Habitat

USFWS and NMFS will consider the HCP/NCCP in their preparation of any proposed determination of new critical habitat or revision of existing critical habitat for any Covered Species under their respective jurisdictions. If critical habitat is designated for any Covered species within the Plan Area and MRC is properly implementing the terms of the HCP/NCCP, USFWS and NMFS will not require MRC to commit new, additional or different conservation or mitigation beyond that allowed by the Federal No Surprises Rule except as and only to the extent required by law.

ISSUANCE AND ENFORCEMENT OF STATE AND FEDERAL PERMITS

Authorized Take

As of the Effective Date, MRC may Take the Covered Species while carrying out Covered Activities in the Plan Area, as authorized by and subject to the conditions of the Federal and State Permits, this Agreement and the HCP/NCCP. The Covered Activities include all Covered Activities identified in Chapter 1. The Authorized Take issued to MRC applies to all third persons under MRC's direct control, including MRC's officers, directors, employees, agents, subsidiaries, contractors, and subcontractors, and their officers, directors, employees and agents who engage in any Covered Activity on

behalf of MRC. MRC shall inform all such third persons about the applicable requirements of the HCP/NCCP, this Agreement, and the Permits, and shall fully enforce the HCP/NCCP, this Agreement, and the Permits as to itself and all such third persons. All contracts between MRC and such persons regarding the implementation of Covered Activities shall require their compliance with the Federal and State Permits. Any violation of the State or Federal Permits by MRC or third parties under MRC's direct control may be attributed to MRC.

Fully Protected Species

Nothing in this Agreement, the HCP/NCCP, or the State Permit is intended to or will be construed to allow the Take of any species identified in California Fish and Game Code sections 3511, 4700, 4800, 5050 or 5515.

Original Term

Each of the Federal and State Permits will take effect on the Effective Date and be effective for eighty (80) years, unless it is terminated or revoked.

Remedies In General

Except as set forth below each Party shall have all of the remedies available in equity (including specific performance and injunctive relief) and at law to enforce the terms of this Agreement and the Federal and State Permits, and to seek remedies and compensation for any breach or violation thereof, consistent with and subject to the following:

None of the Parties shall be liable in damages to the other Parties or to any other person or entity for any breach of this Agreement, any performance or failure to perform a mandatory or discretionary obligation imposed by this Agreement, or any other cause of action arising from this Agreement. Notwithstanding the foregoing, each Party shall retain whatever liability it would possess for its present and future acts or failure to act apart from and independent of, this Agreement;

Suspension or Revocation

USFWS and NMFS may suspend or revoke the Federal Permit(s), in whole or in part, for cause in accordance with the laws and regulations in force at the time of such suspension or revocation. As of the Effective Date, these regulations are codified at 50 C.F.R. 13.27 through 13.29, 17.22, 17.32, and 222.306, and 15 C.F.R. Part 904 .
CDFG may suspend or revoke the State Permit, in whole or in part, for a material violation of the State Permit, including a material failure to comply with the HCP/NCCP, or material breach of this Agreement by the MRC, if the CDFG determines in writing that (a) such violation or breach cannot be effectively redressed by other remedies or enforcement action, or (b) revocation or termination is required to avoid jeopardizing the continued existence of a Covered Species or to fulfill a legal obligation of the CDFG under CESA and/or NCCPA. Possible grounds for suspension or revocation of the State Permit include, but are not limited to:

- Failure to adhere to Section 8;
- Failure to maintain rough proportionality between impacts on habitat or Covered Species and conservation measures in accordance with Fish and Game Code section 2820(c), as provided in Section 5.1;

- Implementation of a PTHP that conflicts with the requirements of the HCP/NCCP;

- Continued implementation of a Covered Activity after CDFG has made a finding of Unforeseen Circumstances and notified MRC in writing that continuation of the Covered Activity would likely jeopardize the continued existence of a species listed under CESA;

- Implementation of the Covered Activities in a way that results in Take that exceeds that authorized in the State Permit;

- Patterns and practices of repeated substantive violations of the State Permit;

- Willful or knowing violation of substantive requirements of the State Permit; and

- Falsification of data or reports required by the HCP/NCCP, this Agreement or the State Permits.

Opportunity to Cure

Except where a Wildlife Agency determines that emergency action is necessary to avoid irreparable harm to a Covered Species, it will not suspend or revoke the Federal or State Permit(s) without first (1) specifying appropriate remedial actions, if any are available, and providing reasonable time for MRC to implement them, (2) providing MRC with written notice of the facts or conduct which may warrant the suspension or revocation, and (3) providing MRC a reasonable opportunity to demonstrate why suspension or revocation is not warranted.

Non-Substantive Instances of Non-Compliance

So long as MRC cures, or commences to cure as set forth below in this section, any non-substantive instance of non-compliance (e.g., a temporary delay in providing required information), the Wildlife Agencies will not use the occurrence of such non-compliance as a basis for revoking or suspending the Federal and/or State Permit(s) or for suspending the regulatory assurances described in Section 10. Before commencing any proceeding to revoke or suspend a Federal Permit or State Permit for a non-substantive non-compliance, and before asserting based on a non-substantive non-compliance that MRC is not "fully implementing" or "fully enforcing" the terms of this Agreement, the HCP/NCCP or the Permit with regard to such regulatory assurances, a Wildlife Agency shall provide MRC written notice of the non-substantive non-compliance with supporting documentation adequate to allow MRC to determine the nature and extent of the non-compliance. So long as MRC cures, or commences to cure, the non-substantive non-compliance within thirty (30) days of receipt of the notice, and for those non-compliances which cannot be cured within such thirty-day period completes curing the non-substantive non-compliance within sixty (60) days, the Wildlife Agency shall accept the cure as an adequate resolution of the non-compliance.

By way of example and without limitation, failure to provide any report on the date the HCP/NCCP requires delivery of the report to the Wildlife Agencies

would be a non-substantive instance of non-compliance for the purposes of this section.

Period of Suspension

A suspension may apply to the entire Federal and/or State Permit(s), or may apply only to specified Covered Species, lands within the Plan Area, or Covered Activities. Any notice or order suspending the Federal and/or State Permit(s) shall specify either a date or the fulfillment of a condition or conditions on which the suspension will terminate. If the Wildlife Agency determines that there are no conditions under which the suspension may be lifted, it shall take action to revoke the Permit. The Parties agree that in the event of any total or partial suspension of the Federal or State Permit(s), all Parties shall cooperate to reinstate the Federal or State Permit(s), to the extent consistent with governing law and the terms of the HCP/NCCP. In the event a suspension has not terminated within six (6) months of its effective date, at MRC's request the applicable agency shall within thirty (30) days either terminate the suspension or commence a proceeding to revoke the permit. During the period of suspension, MRC shall remain obligated to perform its obligations under the Operating Conservation Program.

Surrender of Permits

MRC may, at its discretion, surrender any or all of the Federal and State Permits. Such surrender shall be in accordance with the regulations of the applicable Wildlife Agency in force, if any, on the date of such surrender. If no such regulations exist, prior to surrender, MRC shall provide ninety (90) days written notice to the Wildlife Agencies of its intent to surrender any Federal or State Permit that has not been suspended and shall provide thirty (30) days written notice of its intent to surrender any Federal or State Permit that has been suspended. Notwithstanding its surrender of the Federal or State Permits, MRC shall remain obligated to fully mitigate, as determined pursuant to Section 11.6, for the impacts of all Take that occurred under the Federal and/or State Permit(s) prior to surrender, in accordance with this Agreement and the HCP/NCCP. The State Permit and the Federal Permits shall each be deemed canceled only upon a determination by the Wildlife Agency that issued the Permit that such outstanding mitigation obligations have been implemented. Upon surrender of the Permit(s), no additional Take shall be allowed under the surrendered Permit(s), except as necessary to carry out any outstanding mitigation obligations under the surrendered Permit(s). In determining the amount of any outstanding mitigation obligations for Take that occurred prior to surrender, the Wildlife Agencies will consider impacts on Covered Species that are plants as Take.

Post-Termination Mitigation Obligation

Upon any early termination of the Federal and/or State Permits, whether through revocation or surrender, and provided MRC has properly implemented the HCP/NCCP and complied with the Permits up to the date of revocation or surrender, MRC's post-termination mitigation obligations shall be limited to implementation of the post-termination measures described in Appendix Y of the HCP/NCCP.

MISCELLANEOUS

Temporary Prevention of Performance

In the event that MRC is wholly or partially prevented from performing

obligations under this Agreement because of unforeseeable causes beyond the reasonable control of and without the fault or negligence of MRC, including but not limited to third party actions, sudden actions of the elements (e.g., earthquakes, forest fires, or tsunamis) or actions of federal or state agencies or other local jurisdictions, MRC shall be excused from whatever performance is affected by such unforeseeable cause to the extent so affected, provided that nothing in this Section shall be deemed to authorize any Party to violate ESA or CESA, and provided further that:

- The suspension of performance is of no greater scope and no longer duration than is required and in no event extends beyond one timber harvest operating season;

- Within thirty (30) days after becoming aware of the condition wholly or partially preventing performance, MRC gives the Wildlife Agencies written notice describing the condition, an estimate of how long MRC expects it to persist, and how MRC plans to remedy the effects of the suspension of performance;

- MRC uses its best efforts to remedy its inability to perform (however, this paragraph shall not require the settlement of any legal action on terms which in the sole judgment of MRC are contrary to its interest);

- When MRC is able to resume performance of its obligations, MRC shall do so immediately and give the Wildlife Agencies written notice to that effect; and

- This Section 12.1 does not apply to occurrences or events identified as changed circumstances in the HCP/NCCP.

Notices

All notices, demands, or communications from one Party to another may be personally delivered, or sent by facsimile, electronic mail, U.S. Mail, or recognized overnight delivery service, to the addresses provided in this section and shall be deemed received by the receiving Party at the time of receipt of the personal delivery, or the receipt of the facsimile, electronic mail, or overnight delivery, or five days after deposit in the U.S. Mail; provided, however, that any communication described in this Agreement that requires a response within a limited period of time must be sent by certified mail to initiate that time period.

MRC:	**President**
USFWS:	**[Names & Addresses]**
NMFS:	**[Names & Addresses]**
CDFG:	**[Names & Addresses]**
CAL FIRE:	**[Names & Addresses]**

Any Party may change the address to which such notices, demands, or other communications may be sent by giving the other Parties written notice of such change.

When signed documents are necessary, with the exception of this Agreement and any Amendments hereto, or any agreement resulting in the transfer of one or more of the State or Federal Permits, the Parties will accept signed documents transmitted by facsimile, portable document format (e.g., "document.pdf"), or other similar reprographic technology, and to rely upon such documents as if they bore original signatures. The Parties will provide, within fourteen (14) days after transmission of such documents, the original signed documents to each of the other Parties.among the Parties with respect to the subject matter hereof and contains all of the covenants and agreements among them with respect to said matters; and each Party acknowledges that no representation, inducement, promise or agreement, oral or otherwise, has been made by the other Party or anyone acting on behalf of the other party that is not embodied herein.

Entire Agreement

This Agreement, including the HCP/NCCP and the State and Federal Permits which are incorporated by reference, constitutes the entire agreement among the Parties. This Agreement, the HCP/NCCP, and the State and Federal Permits supersede any and all prior agreements, either oral or in writing, among the Parties with respect to the subject matter hereof and contains all of the covenants and agreements among them with respect to said matters; and each Party acknowledges that no representation, inducement, promise or agreement, oral or otherwise, has been made by the other Party or anyone acting on behalf of the other party that is not embodied herein.

Attorneys' Fees

If any action at law or equity, including any action for declaratory relief, is brought by a Party to this Agreement to enforce or interpret the provisions of this Agreement, each Party to the litigation shall bear its own attorneys' fees and costs. If any action at law or equity, including any action for declaratory relief, is brought by a third party to enforce or interpret the provisions of this Agreement, MRC, CDFG, and CAL FIRE shall negotiate a joint defense and/or cost-sharing agreement at the time the litigation is filed.

Duplicate Originals

This Agreement may be executed in any number of duplicate originals. A complete original of this Agreement shall be maintained in the official records of each of the Parties.

Federal and State Appropriations

The duty of the USFWS and NMFS to carry out each of their obligations under this Agreement and the HCP/NCCP is subject to the federal Anti-Deficiency Act and the availability of appropriated funds. Nothing in this Agreement shall be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury. The Parties acknowledge that USFWS and NMFS are not required under this Agreement to expend any federal agency's appropriated funds unless and until an authorized officer of that agency affirmatively acts to commit to such expenditures as evidenced in writing.

The duties of CDFG and CAL FIRE to carry out each of their obligations under this Agreement and the HCP/NCCP is subject to the availability of appropriated funds. Nothing in this Agreement shall be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the Treasury of the State of California. The Parties acknowledge that CDFG or CAL FIRE are not required under this Agreement to expend any State of California agency's appropriated funds unless and until an authorized officer of that agency affirmatively acts to commit to such

expenditures as evidenced in writing.

Governing Law

The terms of this Agreement shall be governed by and construed in accordance with the statutory and regulatory authority of the USFWS and NMFS under the ESA, its implementing regulations and other applicable federal laws, of the CDFG under the CESA, the NCCPA and other applicable state laws and regulations, and of the CAL FIRE under the CFPA and CFPR. In particular, nothing in this Agreement is intended to nor shall be construed to limit or compromise the authority of the USFWS or NMFS to seek civil or criminal penalties for violations of federal law or otherwise fulfill their enforcement and other responsibilities under the ESA or other applicable law; CDFG to fulfill its responsibilities under CESA, the NCCPA, or other applicable law; or CAL FIRE to fulfill its responsibilities under the CFPA, CFPR or other applicable law. Moreover, nothing in this Agreement is intended to limit or diminish the legal obligations and responsibilities of the USFWS or NMFS as agencies of the United States government. Nothing in this Agreement shall limit the right or obligation of any federal agency to engage in consultation required under Section 7 of ESA or other federal law; however, the USFWS and NMFS shall consider the rights and obligations of MRC under the HCP/NCCP and this Agreement, and the avoidance, minimization, and mitigation measures in the HCP/NCCP itself, in any consultation concerning MRC's use of the Plan Area.

No Third-Party Beneficiaries

This Agreement is solely for the benefit of the State of California by and through CDFG and CAL FIRE, the people of the United States of America by and through USFWS and NMFS, and MRC. This Agreement shall not create any right or interest in the public, or any member thereof, as a third-party beneficiary, nor shall it authorize anyone not a Party to this Agreement to maintain a lawsuit or claim for personal or other injuries or damages pursuant to the provisions of this Agreement. The duties, obligations, and responsibilities of the Parties to this Agreement with respect to third parties shall remain as imposed under existing law.

Counterparts

This Agreement may be executed in counterparts. This Agreement shall become operative as of the Effective Date.

References to Regulations

Unless otherwise specified, any reference in this Agreement, the HCP/NCCP or the Federal and State Permits to any regulation or rule of USFWS, NMFS or CDFG shall be deemed to be a reference to such regulation or rule in existence at the time an action is taken.

Due Authorization

Each Party warrants that the signatory is authorized to execute this Agreement on behalf of that Party.

Successors, Assigns and Permit Transfers

This Agreement and each of its covenants and conditions shall be binding on and shall inure to the benefit of the parties and their respective successors and assigns. Assignment or other transfer of the Federal Permits shall be governed by the Services' regulations in effect at the time of transfer. Assignment or transfer of the State Permit shall be governed by applicable law or regulations in effect at the time of transfer or assignment; provided, however, that if neither CDFG nor the Fish and Game Commission has adopted regulations governing the assignment or transfer of take permits under the NCCPA, assignment or transfer of the State

Permit may be effectuated under substantially the same terms and conditions as govern the transfer of the Federal Permits. As of the Effective Date, CDFG has not adopted regulations governing the assignment or transfer of NCCPA Take permits.

Cooperation in Defense of Legal Challenge

Subject to the responsibility of the U.S. Department of Justice for the conduct of litigation, the Parties agree to cooperate as appropriate in defending against any lawsuit to which a Party to this Agreement is a litigant whether filed in federal or state court, challenging the validity of the HCP/NCCP, this Agreement, or the State or Federal Permits. As applied to the USFWS and NMFS, this Section shall apply solely to actions challenging the validity of the NCCP/HCP, the Section 7 biological opinions associated with the NCCP/HCP, or the Federal Permits, or the validity of the EIS/PTEIR under NEPA.

Applicable Laws

All actions by any Party pursuant to the terms of this Agreement shall be in compliance with applicable federal and State law and regulation.

No Partnership, etc.

This Agreement does not make the Parties partners or joint venturers with each other, nor does it create any principal and agent or trustee and beneficiary relationship or other association between any of the Parties. No action taken by any Party pursuant to this Agreement shall create any such relationship.

Timeframes and Schedules

Timeframes and schedules contained in this Agreement and the HCP/NCCP may be modified by mutual agreement of the affected Parties, as long as the subject of the timeframe or schedule will be completed in a timely way under the modification. References to a "year" or "years" in this Agreement are to calendar years.

Effective Date

This Agreement shall take effect on the calendar day after this Agreement has been executed by all Parties and all of the Federal and State Permits have been issued.

No Federal Contract

Notwithstanding any language to the contrary in this Agreement, this Agreement is not intended to create, and shall not be construed to create an enforceable contract between the Federal Agencies and MRC under Federal law with regard to the Federal permit. The sole purposes of this Agreement as between the Federal Agencies and MRC are to clarify the provisions of the HCP/NCCP and the processes the Parties intend to follow to ensure the successful implementation of the HCP/NCCP in accordance with the Federal Permits and applicable Federal law.

Injunctive Relief

The Parties acknowledge that the Covered Species are unique and that their loss as species would be irreparable and that therefore injunctive and temporary relief may be appropriate in certain instances involving non-compliance or violation of the Federal or State Permits.

EXHIBITS

Exhibit A: MRC Plan Area and Adjustment Area

Appendix B

HCP/NCCP Atlas

Contents

B. HCP/NCCP ATLAS **B-1**

B. HCP/NCCP ATLAS

The *HCP/NCCP Atlas* is a collection of maps showing areas of special interest, such as Aquatic Management Zones (AMZs), protection zones for marbled murrelets, and locations of hardwood acres within the plan area. Table B-1 is a list of the maps included on a CD released with the public draft of our HCP/NCCP. The map names in blue font are from ICF Jones & Stokes; with a grant from CDFG, they reviewed our Chapter 12 (*Potential Impacts and Assesment of Take*) and reinforced the data for potential take. Most of the maps divide the plan area into 3 sections:

1. Rockport – North.
2. Noyo inventory block to the Navarro River – Central.
3. Navarro River to the Garcia inventory block – South.

Table B-1 List of Maps in HCP/NCCP Atlas

List of Maps in HCP/NCCP Atlas	
Atlas Map #	**Map Title**
Map 1	MRC Inventory Blocks
Map 2	MRC Watershed Analysis Units
Map 3a	Stream Temperature Monitoring Sites: Plan Area North
Map 3b	Stream Temperature Monitoring Sites: Plan Area Central
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Map 4a	Hardwood and Old Growth Stands: Plan Area North
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Map 4c	Hardwood and Old Growth Stands: Plan Area South
Map 5a	Terrain Stability Units: Plan Area North
Map 5b	Terrain Stability Units: Plan Area Central
Map 5c	Terrain Stability Units: Plan Area South
Map 6a	Marbled Murrelet Surveys 1998 through 2010: Plan Area North
Map 6b	Marbled Murrelet Surveys 1998 through 2010: Plan Area Central
Map 6c	Marbled Murrelet Surveys 1998 through 2010: Plan Area South
Map 7a	Marbled Murrelet Habitat and Known Occurrences (1)
Map 7b	Marbled Murrelet Habitat and Known Occurrences (2)
Map 7c	Marbled Murrelet Habitat and Known Occurrences (3)
Map 7d	Marbled Murrelet Habitat and Known Occurrences (4)

List of Maps in HCP/NCCP Atlas	
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Map 9a	Red-Legged Frog Survey: Plan Area North
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Map 9c	Red-Legged Frog Survey: Plan Area South
Map 10a	Red-legged Frog Distribution: Plan Area North
Map 10b	Red-legged Frog Distribution: Plan Area Central
Map 10c	Red-legged Frog Distribution: Plan Area South
Map 11a	Coastal Tailed Frog Survey: Plan Area North
Map 11b	Coastal Tailed Frog Survey: Plan Area Central
Map 11c	Coastal Tailed Frog Survey: Plan Area South
Map 12a	Coastal Tailed Frog Distribution: Plan Area North
Map 12b	Coastal Tailed Frog Distribution: Plan Area Central
Map 12c	Coastal Tailed Frog Distribution: Plan Area South
Map 13a	Vegetation Structure Class: Plan Area North
Map 13b	Vegetation Structure Class: Plan Area Central
Map 13c	Vegetation Structure Class: Plan Area South
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List of Maps in HCP/NCCP Atlas	
Atlas Map #	**Map Title**
Map 14b	Northern Spotted Owl Surveys: Plan Area Central
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Map 15a	Northern Spotted Owl Distribution (1)
Map 15b	Northern Spotted Owl Distribution (2
Map 15c	Northern Spotted Owl Distribution (3)
Map 15d	Northern Spotted Owl Distribution (4)
Map 15e	Northern Spotted Owl Distribution (5)
Map 15f	Northern Spotted Owl Distribution (6)
Map 15g	Northern Spotted Owl Distribution (7)
Map 15h	Northern Spotted Owl Distribution (8)
Map 15i	Northern Spotted Owl Distribution (9)
Map 15j	Northern Spotted Owl Distribution (10)
Map 15k	Northern Spotted Owl Distribution (11)
Map 15l	Northern Spotted Owl Distribution (12)
Map 15m	Northern Spotted Owl Distribution (13)
Map 16a	Distribution of Rare Plants: Plan Area North
Map 16b	Distribution of Rare Plants: Plan Area Central
Map 16c	Distribution of Rare Plants: Plan Area South
Map 17a	Distribution of Coho Salmon: Plan Area North

List of Maps in HCP/NCCP Atlas	
Atlas Map #	**Map Title**
Map 17b	Distribution of Coho Salmon: Plan Area Central
Map 17c	Distribution of Coho Salmon: Plan Area South
Map 18a	Distribution of Chinook Salmon: Plan Area North
Map 18b	Distribution of Chinook Salmon: Plan Area Central
Map 18c	Distribution of Chinook Salmon: Plan Area South
Map 19a	Distribution of Steelhead: Plan Area North
Map 19b	Distribution of Steelhead: Plan Area Central
Map 19c	Distribution of Steelhead: Plan Area South
Map 20	MRC Plan Area
Map 21	Point Arena Mountain Beaver Management Zone: Plan Area South
Map 22a	Water Drafting Sites: Plan Area North
Map 22b	Water Drafting Sites: Plan Area Central
Map 22c	Water Drafting Sites: Plan Area South
Map 23a	Waterhole Recovery Rate in the Plan Area: Coho Presence, Plan Area North
Map 23b	Waterhole Recovery Rate in the Plan Area: Coho Presence, Plan Area Central
Map 23c	Waterhole Recovery Rate in the Plan Area: Coho Presence, Plan Area South
Map 24a	Waterhole Recovery Rate in the Plan Area: Chinook Presence, Plan Area North
Map 24b	Waterhole Recovery Rate in the Plan Area: Chinook Presence, Plan Area Central
Map 25a	Waterhole Recovery Rate in the Plan Area: Steelhead Presence, Plan Area North

List of Maps in HCP/NCCP Atlas	
Atlas Map #	**Map Title**
Map 25b	Waterhole Recovery Rate in the Plan Area: Steelhead Presence, Plan Area Central
Map 25c	Waterhole Recovery Rate in the Plan Area: Steelhead Presence, Plan Area South
Map26a	Coho Core Areas: Plan Area North
Map26b	Coho Core Areas: Plan Area Central
Map26c	Coho Core Areas: Plan Area South
Map 27a	Red-Legged Frog Management Units: Plan Area North
Map 27b	Red-Legged Frog Management Units: Plan Area Central
Map 27c	Red-Legged Frog Management Units: Plan Area South

Appendix C

Legal Description of the Plan Area

Contents

C. LEGAL DESCRIPTION OF THE PLAN AREA **C-1**

C.1 Deeds and Quit Claims *C-1*

C.2 Excluded Tracts *C-3*

C. LEGAL DESCRIPTION OF THE PLAN AREA

C.1 Deeds and Quit Claims

All that certain real property situated in the County of Mendocino, State of California and more particularly described in the Grant Deed from L-P Redwood, LLC recorded July 1, 1998 as Document Number 98-12040, Mendocino County Records, and modified by the following conveyances:

1. Quitclaim to James G. Follis, Trustee, recorded January 15, 1999 as Document Number 99-01003, MCR.
2. Quitclaim from James G. Follis, Trustee, recorded January 15, 1999 as Document Number 99-01004, MCR.
3. Grant Deed to The County of Mendocino, recorded August 23, 1999 as Document Number 99-16304, MCR.
4. Quitclaim to Gabriela Pisano, recorded December 14, 1999 as Document Number 99-23418, MCR.
5. Quitclaim from Holiday Rose Phelan, recorded January 19, 2000 as Document Number 00-00989, MCR.
6. Quitclaim to Holiday Rose Phelan, recorded January 19, 2000 as Document Number 00-00991, MCR.
7. Quitclaim to Stephen & Elizabeth Arietta, recorded June 29, 2000 as Document Number 00-10311, MCR.
8. Corporate Grant Deed from Salmon Creek Resources, recorded July 5, 2000 as Document Number 00-10674, MCR.
9. Grant Deed from Strickland & Pardini, recorded July 26, 2000 as Document Number 00-12193, MCR.
10. Judgment in the case of Joe & Estelle Risch, recorded September 5, 2000 as Document Number 00-14608, MCR.
11. Grant Deed from Eel River Sawmills, Inc. recorded September 17, 2001 as Document Number 01-18192, MCR.
12. Grant Deed to County of Mendocino recorded November 15, 2001 as Document Number 01-22517, MCR.
13. Grant Deed to County of Mendocino recorded November 15, 2001 as Document Number 01-22518, MCR.
14. Deed from Mendocino Redwood Company, LLC recorded November 26, 2002 as Document Number 02-25815, MCR.
15. Deed to William Dean & Coale Trust recorded November 26, 2002 as Document Number 02-25816, MCR.
16. Deed to Hope Ann Lang recorded November 26, 2002 as Document Number 02-25817, MCR.
17. Deed to Timberlock Ranch, LLC recorded November 26, 2002 as Document Number 02-25822, MCR.
18. Deed to Timberlock Ranch, LLC recorded November 26, 2002 as Document Number 02-25823, MCR.
19. Deed to Timberlock Ranch, LLC recorded November 26, 2002 as Document Number 02-25824, MCR.

20. Deed to Shanley & Quatrochi recorded November 26, 2002 as Document Number 02-25828, MCR.
21. Deed from William Dean & Coale Trust recorded November 26, 2002 as Document Number 02-25814, MCR.
22. Deed from Hope Ann Lang recorded November 26, 2002 as Document Number 02-25818, MCR.
23. Deed from Timberlock Ranch, LLC recorded November 26, 2002 as Document Number 02-25819, MCR.
24. Deed from Timberlock Ranch, LLC recorded November 26, 2002 as Document Number 02-25820, MCR.
25. Deed from Timberlock Ranch, LLC recorded November 26, 2002 as Document Number 02-25821, MCR.
26. Deed from Shanley & Quatrochi recorded November 26, 2002 as Document Number 02-25827, MCR.
27. Deed to State of California recorded June 23, 2004 as Document Number 04-13974, MCR.
28. Deed to County of Mendocino recorded June 29, 2005 as Document Number 05-13302, MCR.
29. Deed from Mendocino Forest Products Company, LLC recorded December 22, 2005 as Document Number 05-27655, MCR. Broaddus Tract B.
30. Deed from Mendocino Forest Products Company, LLC recorded December 22, 2005 as Document Number 05-27656, MCR. Broaddus Tract A.
31. Deed to State of California recorded January 5, 2006 as Document Number 06-00233, MCR.
32. Deed to State of California recorded January 5, 2006 as Document Number 06-00234, MCR.
33. Deed from Eleanor Nash, Trustee recorded November 30, 2007 as Document Number 07-21470 MCR.
34. Deed from Eleanor Nash, et al. recorded November 30, 2007 as Document Number 07-21471, MCR.
35. Deed from Eleanor Nash, et al. recorded November 30, 2007 as Document Number 07-21472, MCR.
36. Deed from Gary and James Newman recorded January 23, 2008 as Document Number 08-00991, MCR.
37. Deed to Coastal Land Trust recorded December 31, 2008 as Document Number 08-17725-4, MRC. Parcel 3—Enchanted Meadow.
38. Deed to Friends of Enchanted Meadow recorded December 31, 2008 as Document 08-17726-3, MCR. Parcel 2—Ravens' Call.
39. Deed to Mendocino Redwood Company, LLC as document Number 08-17727-4, MCR. Parcel 2—Albert Cattalini Conservancy.

C.2 Excluded Tracts

Tracts 1-26 are excluded from the plan area and are shown in the *HCP/NCCP Atlas*, MAP 20.

Last updated: 7/27/2010

Appendix D

HCP/NCCP Report Timelines and Samples

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D. HCP/NCCP REPORT TIMELINES AND SAMPLES

The term of our HCP/NCCP is 80 years. Clearly, during that time period the methods used for surveying species and habitat and reporting on results will change. This is a learning period for both MRC and the wildlife agencies—a period to understand more about the abundance and distribution of species in the plan area and the needs of those species to increase survival and reproduction. Data or statistical analysis that was considered relevant at the commencement of the HCP/NCCP may be superseded by more critical information later on. Media for reporting may change; reports submitted via email, CD, or other electronic media may replace printed reports. The frequency of reports may also change; the wildlife agencies may determine that they need information on a less or more frequent basis. In this appendix, we present sample reports that will provide a starting point for discussions between MRC and the wildlife agencies on information needed to monitor HCP/NCCP conservation measures, establish compliance, determine plan effectiveness, and evaluate take. All reports submitted to the wildlife agencies will include (1) an executive summary that highlights significant findings; (2) a description of QA/QC efforts and their results, including trends and graphs; (3) observations; (4) relevant objectives and conservation measures; (5) hypotheses for validation monitoring; (6) problems encountered; (7) proposed changes and a discussion of how MRC will retain comparability of results; and (8) applications of new or changed methods. MRC will identify whether reports relate to effectiveness, validation, or compliance monitoring or to assessment of take.

! The data in the sample reports, even if derived from existing information, is not intended to reflect current or projected conditions in the plan area. The reports simply illustrate the type of data that MRC will submit for review by the wildlife agencies.

D.1 Types of Reports

D.1.1 Reports on effectiveness and validation monitoring

Table D-1 lists all the sample effectiveness and validation monitoring reports in Appendix D, the sub-sections where the report samples are located, and a monitoring program code (Table 13-1) associated with the report. The reports are in alphabetical order by *Report ID*. These reports provide the wildlife agencies with data on aquatic and terrestrial habitat and species.

Table D-2 lists all the effectiveness and validation monitoring reports not included in Appendix D. MRC will confer with the wildlife agencies to determine the data required for these reports. Finally, MRC will issue monitoring reports either by email or CD, unless the wildlife agencies request a different media, and post a public copy of the reports on our corporate website.

Table D-1 Sample Effectiveness and Validation Monitoring Reports in Appendix D

Sample Effectiveness and Validation Monitoring Reports in Appendix D				
Report ID	Section Number	Report Name	Type	Monitoring Program
AMPHIB_RPT_010	D.3.2.1	Occupancy of Red-legged Frogs in Documented Breeding Sites	E	M§13.6.2.1-2
AMPHIB_RPT_020	D.3.2.1	Baseline Distribution and Habitat Quality of Red-legged Frog Breeding Sites	E	M§13.6.2.1-1
AMPHIB_RPT_030	D.3.2.2	Baseline Distribution of Coastal Tailed Frogs	E	M§13.6.3.1-1

Sample Effectiveness and Validation Monitoring Reports in Appendix D				
Report ID	Section Number	Report Name	Type	Monitoring Program
AMPHIB_RPT_040	D.3.2.2	Distribution and Relative Abundance of Coastal Tailed Frogs	E	M§13.6.3.1-2
FISH_RPT_010	D.3.3.1	Anadromous Salmonid Presence: Annual Salmonid Monitoring Basins (ASMB)	E	M§13.6.1.1-1
FISH_RPT_020	D.3.3.2	Chinook Salmon Monitoring Reaches (CSMR)	E	M§13.6.1.1-3
FISH_RPT_030	D.3.3.3	Anadromous Salmonid Distribution	E	M§13.6.1.1-2
FISH_RPT_040	D.3.3.4	Smolt Abundance	E	M§13.6.1.2-1
FOCWSA_RPT_010	D.2.8.1	Focus Watersheds: Riparian Function	V	M§13.5.1.2-2
FOCWSA_RPT_020	D.2.8.2	Focus Watersheds: Stream Sediment	V	M§13.5.4.1-3
HWD_RPT_010	D.4.3.1	Basal Area of Harvest in Timber Stands: Pre-Harvest	E	M§13.8.1-2
HWD_RPT_020	D.4.3.2	Basal Area of Harvest in Timber Stands: Post Harvest	E	M§13.8.1-2
HWD_RPT_030	D.4.3.3	Post Harvest Follow-up on Hardwood Representative Sample Areas	E	M§13.8.1-3
HWD_RPT_040	D.4.3.4	Acreage and Number of Hardwood Representative Sample Areas	E	M§13.8.1-4
ISC_RPT_010	D.4.7	Invasive Species Control	E	M§13.8.3-1
LCM_RPT_010	D.2.5	Longitudinal Profile and LWD Volume	V	M§13.5.1.2-1
LCM_RPT_020	D.2.5.1	Residual Water Depths, Percent Pool and Riffle Depths	V	M§13.5.4.1-2
LCM_RPT_030	D.2.5.2	Cross Section from Longitudinal Profile	V	M§13.5.4.1-2
LCM_RPT_040	D.2.6	Permeability	V	M§13.5.4.1-2
LCM_RPT_050	D.2.6.1	Focus Watersheds: Individual Bulk Gravel Samples	V	M§13.5.4.1-3
LCM_RPT_060	D.2.6.2	V* Observations	V	M§13.5.4.1-2
MAMU_RPT_050	D.5.3.5	Activity Level of Marbled Murrelets in Lower Alder Creek	V	M§13.9.2.1-1

Sample Effectiveness and Validation Monitoring Reports in Appendix D				
Report ID	Section Number	Report Name	Type	Monitoring Program
MAMU_RPT_060	D.5.3.6	Murrelet Occupancy in Navarro, Greenwood Creek, Albion River Watersheds	V	M§13.9.2.1-2
MAMU_RPT_070	D.5.3.7	Radar Monitoring in Additional Drainages	V	M§13.9.2.2-3
NAT_COM_010	D.4.5	Common Natural Communities	E	M§13.8.2-1
NAT_COM_050	D.4.6	Uncommon Natural Communities	E	M§13.8.2-2
NSO_RPT_010	D.5.2.1	Northern Spotted Owl Territories by Inventory Blocks	E	M§13.9.1.3-1
NSO_RPT_020	D.5.2.2	10-Year Productivity for Northern Spotted Owls by Inventory Block	E	M§13.9.1.3-1
NSO_RPT_040	D.5.2.4	Summary of Visits to NSO Territories to Determine Reproductive Status	E	M§13.9.1.3-1
NSO_RPT_050	D.5.2.5	Nocturnal Surveys for Northern Spotted Owls	E E	M§13.9.1.3-1 M§13.9.1.3-2
NSO_RPT_060	D.5.2.6	Summary of Nocturnal Surveys for Northern Spotted Owls	E E	M§13.9.1.3-1 M§13.9.1.3-2
NSO_RPT_090	D.5.2.9	Northern Spotted Owls: Distribution and Acreage of Nesting/Roosting Habitat	E	M§13.9.1.3-2
NSO_RPT_100	D.5.2.10	Effect of Harvest within 1000 ft of NSO Territories with Limited Protection	V	M§13.9.1.4-4
NSO_RPT_110	D.5.2.11	Effect of Hardwood Density on Northern Spotted Owls	V	M§13.9.1.4-6
OG_RPT_010	D.4.3.5	Acreage and Number of Old Growth Stands and Trees	E	M§13.8.1-5
PAMB_RPT_040	D.5.4.4	Spatial Extent of Known Burrow Systems of Point Arena Mountain Beaver	E	M§13.9.3.1-1
PAMB_RPT_050	D.5.4.5	Creating Habitat with Timber Harvest within Dispersal Distance of Existing PAMB Burrow Systems	E	M§13.9.3.1-2
PLANT_RPT_010	D.6	Status and Trend of Covered Rare Plant Species	E	M§13.10.3-1
ROCK_RPT_010	D.4.4	Distribution and Acreage of Rocky Outcrops	E	M§13.8.1-6

Sample Effectiveness and Validation Monitoring Reports in Appendix D				
Report ID	Section Number	Report Name	Type	Monitoring Program
STRMTEMP_RPT_010	D.2.9	Stream Temperature	E	M§13.5.1.1-5
TIMBRINV_RPT_010	D.2.1.2	Timber Inventory	E E	M§13.5.1.1-1 M§13.5.1.1-2
TREE_RPT_010	D.4.2.1	Pre-harvest Assessment of Snags, Wildlife Trees, and Recruitment Trees	E	M§13.8.1-1
TREE_RPT_020	D.4.2.2	Pre-harvest Downed Wood Assessment	E	M§13.8.1-1
TREE_RPT_040	D.4.2.4	Trends in Snags, Wildlife Trees, Recruitment Trees, and Downed Wood	E	M§13.8.1-1
WS_RPT_010	D.2.2	Watershed Size: Small Class II Watercourses	V	M§13.5.1.2-3

TABLE NOTES

E = effectiveness monitoring
V= validation monitoring

Table D-2 Effectiveness and Validation Monitoring Reports Not Included in Appendix D

Monitoring Code	Type	Description
M§13.5.1.1-4	E	Watershed Analysis: Shade Conditions
M§13.5.2.1-1	E	Watershed Analysis: Mass Wasting
M§13.5.2.1-2	E	Focus Watersheds: Mass Wasting
M§13.5.2.2-1	V	Forensic Monitoring: Landslide Observations
M§13.5.3.1-1	E	Road Inventory: Sediment Prevention
M§13.5.3.1-2	E	Watershed Analysis: Sediment Prevention
M§13.5.3.2-1	V	Focus Watersheds: Sediment Prevention
M§13.5.4.1-1	V	Focus Watersheds: Sediment Budget
M§13.9.1.4-1	V	Population Trends of Northern Spotted Owls
M§13.9.1.4-2	V	Identification of Nesting/Roosting Habitat for Northern Spotted Owls
M§13.9.1.4-3	V	Benefits of High Protection for Northern Spotted Owls and Their Territories
M§13.9.1.4-4	V	Effect of Harvest within 1000 ft of NSO Territories with Limited Protection
M§13.9.1.4-7	V	Effect of Barred Owl Control on Northern Spotted Owls
M§13.9.2.2-1	V	Murrelet Habitat Distribution in LACMA
M§13.9.2.2-2	V	Methods for Accelerating Growth of Murrelet Habitat
M§13.9.3.2-1	V	Defining Habitat for Point Arena Mountain Beavers
M§13.9.3.2-2	V	Creating Potential Habitat with Timber Harvest

TABLE NOTES

E = effectiveness monitoring
V= validation monitoring

D.1.2 Reports on compliance monitoring

Table D-3 list the sample compliance reports included in Appendix D. In addition, for PTHPs, MRC will submit an annual report to the wildlife agencies detailing the items listed in 13.2.1.1, *Compliance under the PTHP process*, #5. This annual report will summarize harvest operations and post-harvest conditions for all covered species and their habitat. We will consult with the wildlife agencies on the development and design of this report.

Table D-3 Sample Compliance Monitoring Reports in Appendix D

Report ID	Appendix D Section Number	Report Name
MAMU_RPT_010	D.5.3.1	Murrelet Assessments within Harvested THPs
MAMU_RPT_020	D.5.3.2	Current Protections for Occupied and Potential Murrelet Habitat
MAMU_RPT_030	D.5.3.3	Completed THP Surveys with Assessment of Murrelet Habitat
MAMU_RPT_040	D.5.3.4	THPs and Other Projects within LACMA
NSO_RPT_030	D.5.2.3	Protection Levels for Northern Spotted Owl Territories by Inventory Block
NSO_RPT_070	D.5.2.7	Conservation Measures for NSO within 0.7 miles of THPs
NSO_RPT_080	D.5.2.8	NSO Banding
PAMB_RPT_010	D.5.4.1	THPs within PAMB Assessment Area
PAMB_RPT_020	D.5.4.2	Surveys for Potential PAMB Habitat
PAMB_RPT_030	D.5.4.3	Buffers for PAMB Burrow Systems
PROPORTIONALITY_010	D.9	Rough Proportionality Annual Report
TREE_RPT_030	D.4.2.3	Snags and Wildlife Trees Felled for Safety

D.1.3 Reports on assessment of take

Table D-4 lists sample reports for assessment of take. These reports conform to the data tables in Chapter 12, *Potential Impacts and Assessment of Take* (section 12.3).

Table D-4 Sample Assessment of Take Reports

Report ID	Appendix D Section Number	Report Name
AOT_Coho_SONCC AOT_Coho_CCC AOT_Chinook AOT_Steelhead	D.7.1	Assessment of Take: Salmonids
AOT_RLF	D.7.2	Assessment of Take: Red-legged Frogs
AOT_CTF	D.7.3	Assessment of Take: Coastal Tailed Frogs
AOT_NSO	D.7.4	Assessment of Take: Northern Spotted Owls
AOT_MAMU	D.7.5	Assessment of Take: Marbled Murrelets
AOT_PAMB	D.7.6	Assessment of Take: Point Arena Mountain Beaver
AOT_CRP	D.7.7	Assessment of Take: Covered Rare Plants

D.1.4 Report on HCP/NCCP budget

MRC will submit to the wildlife agencies an annual budget approved by our Board of Directors (section 7.10.2). The budget will demonstrate that MRC has authorized sufficient funds for expenditure in the upcoming fiscal year to carry out our commitments under the federal and state permits and the HCP/NCCP.

D.2 Reports on Aquatic Habitat

D.2.1 Report timelines

Table D-5 gives the proposed schedule of reports for aquatic habitat.

Table D-5 Timelines for HCP/NCCP Monitoring Reports on Aquatic Habitat

Timelines for HCP/NCCP Monitoring Reports on Aquatic Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
WS_RPT_010	Summarizes the most recent conclusions from the Small Class II watershed size validation monitoring program.	Summarize findings on Small Class II watershed size (deviation from the assumed 100 ac) for each watershed analysis unit. M§13.5.1.2-3	Annually (estimated to be completed within 5-10 years)	February	Electronic report via email attachment or CD	NMFS USFWS CDFG CGS NCRWQCB
WA_RPT_010	Each watershed analysis report will have at least the following resource assessment modules: 1. Mass wasting 2. Surface and point source erosion for roads and skid trails. 3. Hydrology 4. Riparian function 5. Stream channels 6. Fish habitat 7. Amphibian distribution 8. Synthesis	1. Provide assessment of watershed analysis units for cumulative watershed effects. 2. Provide compilation and interpretation of aquatic habitat information for watershed analysis units over time. 3. Report on objectives in M§13.5.1.1-3 M§13.5.1.1-4 M§13.5.2.1-1 M§13.5.3.1-2	On average every 20 years	Submitted as each watershed analysis unit is completed	Electronic report via email attachment or CD	NMFS USFWS CDFG CGS NCRWQCB
LCM_RPT_010	A report of the following observations within long term channel monitoring segments: 1. Longitudinal profile 2. Cross section profiles 3. Stream substrate particle distribution and D50 4. V-star observations 5. Gravel permeability 6. LWD	1. Provide stream channel morphology and habitat conditions to assess the effectiveness of conservation measures for sediment reduction and riparian function. 2. Report on objectives in M§13.5.1.2-1 M§13.5.4.1-2	Once every 10 years When long term channel monitoring is conducted in association with a watershed analysis, observations will be reported in the watershed analysis.	Submitted in the spring following completion of observations of all monitoring segments or when a watershed analysis is completed	Electronic report via email attachment or CD	NMFS USFWS CDFG CGS NCRWQCB

Timelines for HCP/NCCP Monitoring Reports on Aquatic Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
FOCWSA_RPT_010	Report will contain results from periodic observations in focus watersheds, including 1. LWD. 2. Stream canopy cover. 3. Stream temperature effects. 4. Sediment reduction. 5. Bulk gravel percentage of fine particles. 6. Stream channel condition. 7. Skid trail and road effects. 8. Sediment budget. 9. Suspended sediment and turbidity monitoring. 10. Mass wasting.	1. Provide summary and interpretation of the intense focus watershed studies occurring during 3-5 year time blocks. 2. Report on objectives in • M§13.5.1.2-2. • M§13.5.2.1-2. • M§13.5.3.2-1. • M§13.5.4.1-1.	Every 3-5 years	Final report submitted a year after the study—on March 1.	Electronic report via email attachment or CD	NMFS USFWS CDFG CGS NCRWQCB
STRMTEMP_RPT_010	Results of stream temperature monitoring across the plan area, including 1. Location of temperature observations for that year 2. MWAT, MWMT, and maximum temperatures for each site 3. Graph of continuous temperature versus time	1. Provide results of annual stream temperature monitoring to assess the effectiveness of conservation measures for riparian function. 2. Report on objectives in M§13.5.1.1-5.	Annually	January 30	Electronic report via email attachment or CD	USFWS CDFG CGS NCRWQCB

D.2.2 Small class II watershed size

MRC will conduct annual monitoring to test the assumption that 100 ac is the proper size for a Small Class II watercourse (M§13.5.1.2-3). We estimate that this monitoring will be complete 5-10 years after the signing of the HCP/NCCP. A sample report submitted from the 2004 Greenwood Creek Watershed Analysis appears below. The report shows the area for each observed site and indicates if it is spring fed or not. If the observed site had its break of perennial surface water at a confluence of 2 watercourses, this is noted in the table as a maximum area for the watercourse; any additional distance downstream encompasses a different watershed area for a different watercourse. MRC will include maps with this report.

WS_RPT_010 **03/15/2016**
M§13.5.1.2-3

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Monitoring Report
Validation Monitoring
Watershed Size: Small Class II Watercourses

CalWater Planning Watershed	Site ID	Observation Date	Drainage Area (ac)	Meets waterflow criteria?	Maximum area observed?	Spring fed?	Aspect	Distance from Coast (mi)	Approximate Years since Last Harvested
1113.500705	GW1	09/02/2003	115	Yes	Yes	No	N	4	8
1113.120101	NE3	10/05/2002	63	No	No	Yes	S	18	10
1113.567219	RH5	08/07/2003	87	Yes	No	No	E	2	20

D.2.3 Watershed analysis

The wildlife agencies have on file an MRC watershed analysis report. For HCP/NCCP reporting, MRC proposes to use the Elk Creek Watershed Analysis (MRC 2007) as a format template. These reports contain information on LWD, instream shade, and sediment budgets.

D.2.4 Annual report on instream restoration

This report will include information on instream restoration projects, such as LWD installations, fish passage improvements, and riparian restoration treatments.

D.2.5 Long term channel monitoring

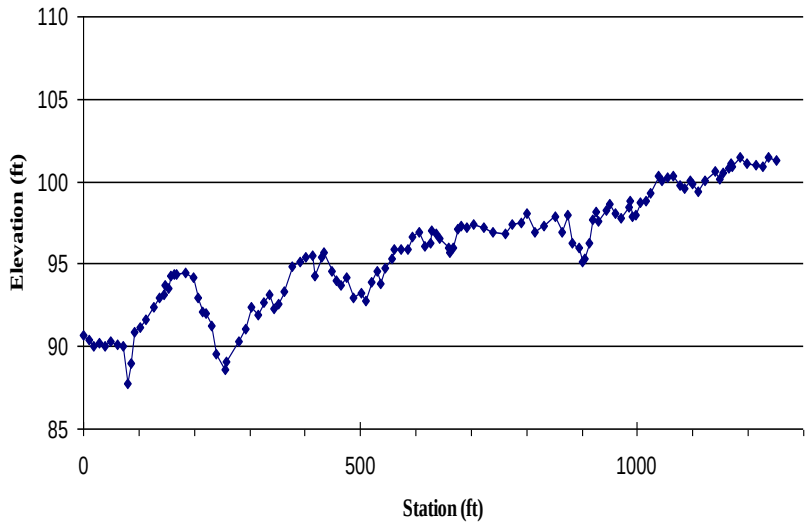
MRC will produce a long term channel monitoring report at least once every 10 years. This single report will include all results for the 60 long term channel monitoring segments, including multiple observations. When MRC conducts watershed analysis, i.e., on average every 20 years, we will report long term channel monitoring by watershed analysis unit. For each monitoring segment we will provide the following information:

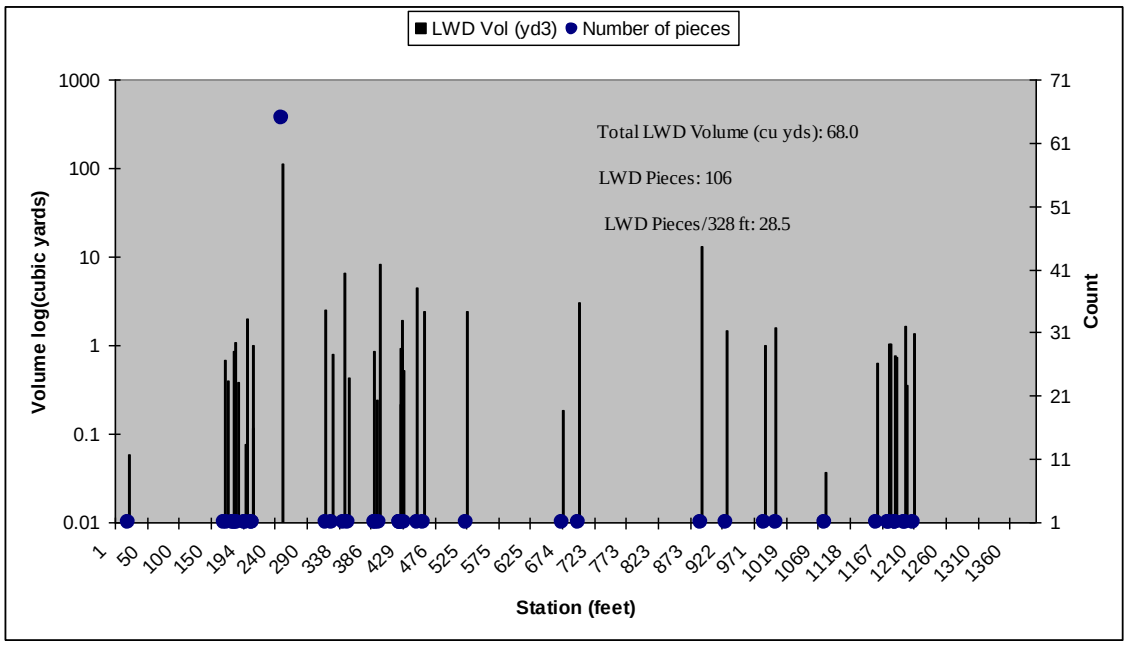
- Graphs of
  - Longitudinal profile.
  - LWD volume in tandem by distance with longitudinal profile.
  - Each cross section.
- Summary of each particle size distribution from pebble counts at each cross section, with D50 calculated (graphs available upon request).
- Mean of residual water depths from longitudinal profile.
- Standard deviation of residual water depths from longitudinal profile.
- Percent pool and riffle lengths from longitudinal profile.
- Individual V-star observations for all pools within each monitoring segment.
- Range and average V-star observations for each monitoring segment.
- Depth and volume of residual pool water.
- Summary of permeability observations within each segment.
- Geometric mean of the median and range of permeability observations within each monitoring segment with calculated survival percentage of anadromous salmonid based on log of geometric mean permeability.
- Discussion of intervening peak flows.
- Synthesis of data.

LCM_RPT_010 **04/15/07**
M§13.5.1.2-1

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Long Term Channel Monitoring
Graph of Longitudinal Profile and LWD Volume

Upper Greenwood Creek





D.2.5.1 Water depths and riffles

LCM_RPT_020 **04/15/2007**
M§13.5.4.1-2

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Long Term Channel Monitoring
Residual Water Depths, Percent Pool and Riffle Depths

Upper Greenwood Creek

Reach Length: 1245.00 ft

Standardized Statistics:
Number of data points in raw data: 127
Number of data points in standardized data: 127

Reach Step Distance: 9.80 ft

Max Residual Depth: 5.84 ft
Mean Residual Depth: 0.85 ft
Standard Deviation: 1.19 ft

Number of non-zero Residual Depths: 97
Percent of Reach as pool: 76.38 %
Percent of Reach as riffle: 23.62 %

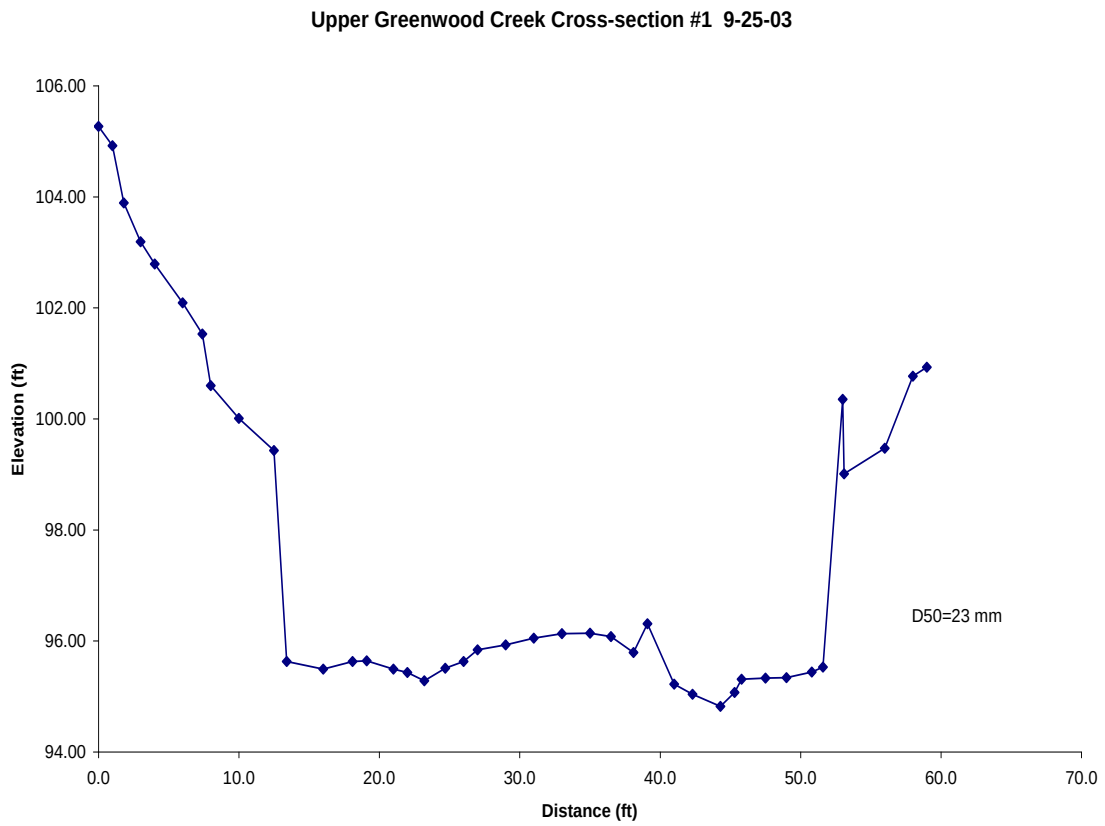
Number of pools greater than 3 ft deep:

D.2.5.2 Cross section

LCM_RPT_030 **04/15/2007**
M§13.5.4.1-2

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Long Term Channel Monitoring
Cross Section from Longitudinal Profile

Upper Greenwood Creek



D.2.6 Gravel permeability

LCM_RPT_040 **04/15/2007**
M§13.5.4.1-2

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Long Term Channel Monitoring
Permeability

Upper Greenwood Creek

Geometric Mean of Median Permeabilities	Standard Error of Median Permeabilities	Survival Percentage	Permeability Range		Observations	
			Low	High	#	Median Permeability
357 cm/hr	317 cm/hr	5%	1 cm/hr	5717 cm/hr	1	269
					2	151
					3	165
					4	1
					5	2618
					6	5717
					7	2117

D.2.6.1 Bulk gravel samples (focus watersheds only)

LCM_RPT_050
M§13.5.4.1-3

01/30/2007

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Focus Watersheds
Individual Bulk Gravel Samples

Upper Greenwood Creek

Tailout #	Date	% Total	% <50.8 mm	% < 25.4 mm	% < 12.5 mm	% < 6.3 mm	% < 4.75 mm	% < 2.36 mm	% < 0.85 mm
3	9/25/2003	100	85	68	45	26	21	13	5
5	9/25/2003	100	61	50	38	25	20	12	6
6	9/25/2003	100	78	55	37	24	20	13	4
7	9/25/2003	100	76	47	33	22	19	13	6

Tailout #	Geometric Mean (mm)	Fredle Index
3	25	3.1
5	32	2
6	41	0.5
7	30	8

D.2.6.2 V* observations

LCM_RPT_060 **04/15/2015**
M§13.5.4.1-2

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Long Term Channel Monitoring
V* Observations

South Fork Cottaneva Creek

Mean V*	Variance of Observations	V* Range		Observations		
		Low	High	Pool #	V*	Pool Volume (cubic meters)
0.14	0.0026	0.08	0.22	01	0.17	3.1
				03	0.10	2.0
				07	0.10	8.5
				09	0.08	6.0
				10	0.13	20.8
				12	0.22	40.9
				13	0.18	125.0

D.2.7 Focus watershed studies—once per decade

MRC will conduct focus watershed studies in 3-5 year blocks of time. Once each decade, a report will detail the results of the studies, methods, and conclusions. In addition, MRC will prepare a status report each year. The status report will summarize (1) methods employed during the previous year; (2) critical evaluations of study progress; and (3) decisions on required changes to the studies. Clearly, however, the reports for the focus watershed studies may change since MRC will develop the actual study protocols 6-12 months after MRC and the wildlife agencies sign the HCP/NCCP.

At a minimum, monitoring in focus watersheds will include the following reports:

- Stream channel observations of LWD, longitudinal profile, cross sections, bulk gravel samples, permeability, V-star, and pebble counts for channel monitoring segments completed during the focus watershed studies will follow the format and example for long term monitoring segments.
- The final report for a 3-5 year block of time will provide comprehensive analysis, integration, and interpretation from ongoing monitoring of turbidity and suspended sediment within the focus watershed studies.
- A sediment budget will provide timed estimates (volume per time period) of sediment delivery from
    - Road surface erosion.
    - Road point source erosion.
    - Skid trail surface and point source erosion.
    - Mass wasting due to roads, skid trails, and hillslopes.
    - Stream bank erosion.
- A report will summarize methods, results, discussions, and conclusions from mass wasting inventory.

D.2.8 Focus watershed studies—annual

MRC will report results from the annual stream surveys as well as observations of turbidity and suspended sediment.

D.2.8.1 Stream channel observations

MRC will prepare an annual report with stream channel observations. The report will include information on LWD (pieces and volume), percent canopy, gravel particle sizes, number of pools, and pool depths. Over time, MRC will compare annual observations using statistical tests and graphs to detect persistent changes in the channel observations.

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Focus Watersheds: Riparian Function

Little Fork Navarro

Stream ID	# LWD Pieces	LWD Volume (yd^3)	# Canopy Observations	Mean Canopy (%)	SD Canopy (%)	Particle Size D50 (mm)	# Pools	Mean of Max Residual Pool Depth (ft)	SD of Max Residual Pool Depth (ft)
EN03	10	17.4	4	80	5	56	7	0.9	0.2
EN38	30	14.9	4	74	11	38	6	1.4	0.3
EN04	65	82.9	4	81	6	55	12	1.3	0.3

D.2.8.2 Suspended sediment and turbidity

MRC will prepare an annual report with monitoring results for suspended sediment and turbidity. The report will include methods, results, and discussion. We will monitor turbidity and suspended sediment with 2 levels of effort: continuous monitoring and grab sample monitoring.

D.2.8.2.1 Continuous monitoring

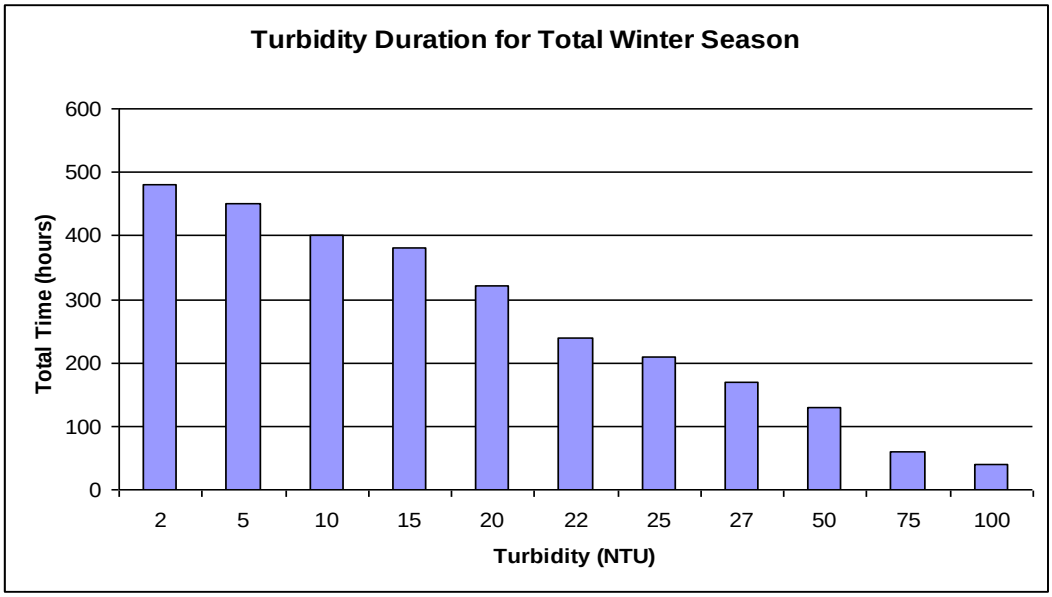
For continuous monitoring of turbidity and suspended sediment, MRC will report on the following parameters:

- Updated relationship of turbidity to suspended sediment.
- Current or updated rating curve for stage-versus-stream flow.
- Graph of continuous hydrograph, turbidity, and suspended sediment (as available).
- Time duration relationship between turbidity levels.
- Turbidity, suspended sediment, and hydrology for the season.

In addition to annual reporting for ongoing monitoring of turbidity and suspended sediment, MRC will provide comprehensive analysis, integration, and interpretation in the final report for the 3-5 year block of time.

FOCWSA_RPT_020 **04/15/2015**
M§13.5.4.1-3

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Validation Monitoring Report
Focus Watersheds: Stream Sediment



*Total number of hours (n) monitored for the season

D.2.8.2.2 Grab sample monitoring

For grab sample monitoring of turbidity and suspended sediment, MRC will report on the following parameters:

- Locations of sampling.
- Date, time, location, turbidity, suspended sediment concentration, and stream flow (table).
- Stream flow versus turbidity relationship for each station (graph).
- Stream flow versus suspended sediment relationship for each station (graph).
- Current or updated turbidity versus suspended sediment relationship from watersheds with grab samples.
- Annual estimate of fine sediment load (tons/yr) from watershed.

D.2.9 Stream temperature

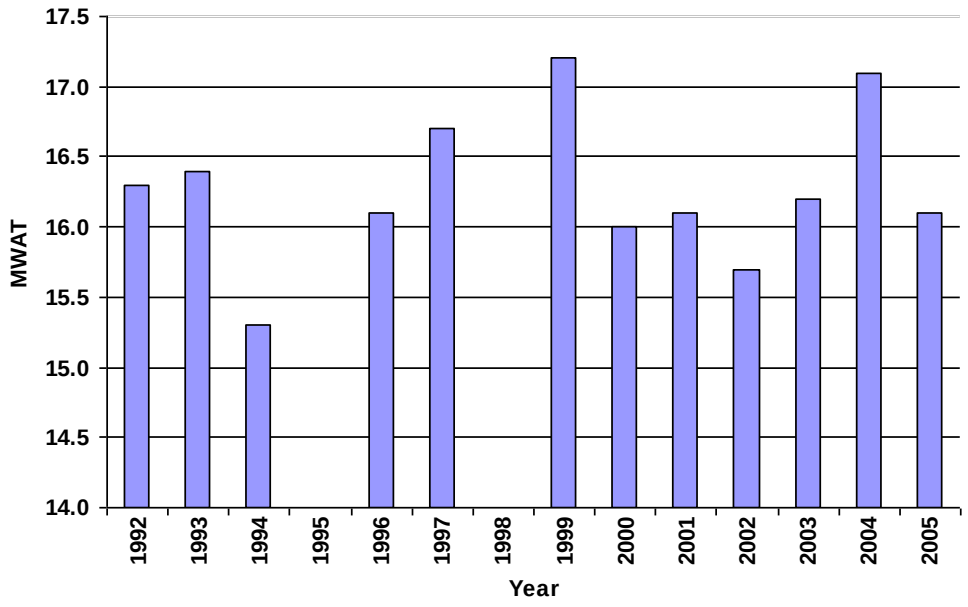
MRC will produce a stream temperature report annually with MWAT, MWMT, and maximum temperature. If requested, we will provide a map of monitoring locations and a graph of continuous temperature observations for each station in the report year.

STRMTEMP_RPT_010 **01/30/2002**
M§13.5.1.1-5

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Stream Temperature

Stream	Site ID	Year	Temperature		
			MAX	MWAT	MWMT
Albion	78-1	2001	20.2	15.5	19.8
Deadman Gulch	78-7	2001	14.2	13.3	13.8
Duckpond Gulch	78-10	2001	21.7	16.7	20.5

Figure T78-05M. Maximum Weekly Average Temperature (MWAT) at Albion River (Site T78-05), Mendocino County, California.



D.2.10 Roads

MRC maintains a road inventory in an online database. This database contains both current and historic records about our road network. We will generate a report from this database for the wildlife agencies every 10 years, or upon request. Appendix F, *Road Inventory Protocol*, describes the database dictionaries with codes for roads, culverts, crossing, landings, road slides, erosion sites, controllable erosion, rock pits, spoil piles, water holes, and gates.

In addition, MRC will submit an annual report, based on the road inventory database, outlining the amount of erosion controlled and road work completed during the previous season. Chapter 13, *Monitoring and Adaptive Management*, outlines the monitoring programs for controllable erosion (M§13.5.3.1-1 and M§13.5.3.1-2). Our annual report will also delineate road segments upgraded to standards in Appendix E *Roads, Landings, and Skid Trails*.

D.2.11 Water drafting

MRC will fill out a report for each drafting site within a THP or operational area (Figure D-1). The report will document any impacts to the drafting area and ensure adherence to water drafting guidelines in the Master Agreement for Timber Operations (MATO).

We will also submit a log of water drafting data for each drafting site (Table D-4). This log will include

- Stream flow and velocity.
- Residual pool depth.
- Drafting intake velocity and flow rate (water truck or storage tank).
- Water temperature of stream.
- Water temperature of return water from storage or truck tank.
- Downstream depth of riffle crest.

Mendocino Redwood Company
Water Drafting Report

Name of person completing report _____

Tract _____

Planning watershed _____

New[1] or existing drafting site? (✓one) New ☐ Existing ☐

Location description or site ID _____

Date drafting commenced (MM/DD/YY) _____

Cubic feet of flow at commencement _____ cfs

Date drafting ceased (MM/CC/YY) _____

Cubic feet of flow at cessation _____ cfs

Name of Licensed Timber Operator (LTO) _____

Type of drafting site (✓ all that apply)

Class I	☐	Storage tank	☐
Class II	☐	Pond	☐
Class III	☐	Blocked culvert	☐
		Other	☐

Any excavation for intake? If yes, list amount

Amt _____

Approximate gallons taken from site Gal _____

Pesticide mixing? Yes ☐ NO ☐

Waterborne pathogens detected within the planning watershed? If yes, list pathogen and methods applied to limit dispersal Yes ☐ NO ☐

Pathogen and methods:

_____

_____

_____

Figure D-1 Sample Water Drafting Report

[1] Please refer to Section VII of MATO (Appendix T) for *General Water Drafting Procedures*.

Table D-6 Sample Water Drafting Log

Date	Location Code or Description	Watercourse Classification (I, II, or III), Pond, Other	Stream Flow (cfs)	Stream Vel. (.ft/sec)	Residual Pool Volume: Average LxWxD (ft^3)	Residual Pool Max Depth (ft)	Intake Vel. (ft/sec)	Intake Flow (cfs or gpm)	Tank Capacity (gals.)	Time to Fill (min.)	Staff Plate (ft)			Source Water Temp (F^0)	Return Water Temp. (F^0)	Down-stream Average Riffle Crest Depth (in.)	Notes
											Begin Pump	During Pump	End Pump				
7/1/09	Hole #5 SBNF Navarro	Class I	33	1.2	10 * 8 * 3 = 240	3.8	0.21	265	4000	25				58	60	3.1	Set up stream-flow stakes and installed re-bar in pool

D.2.12 Timber inventory

MRC maintains timber inventory in an online database. From this database, we will generate a summary, every 10 years, on the current average conditions for AMZ stands on our land and projections for future AMZ conditions. Data will include average tree height, current average basal area by planning watershed, average number of trees by diameter and height, and average canopy closure. We will conduct landscape modeling of stand characteristics and associated tree lists with data on species, computed tree height and weight, diameter at breast height (dbh), live crown ratio (i.e., crown height divided by total tree height), density or canopy closure, and site quality. MRC will produce timber inventory reports at the property-wide and planning watershed levels.

TIMBRINV_RPT_010 **01/30/20012**
M§13.5.1.1-1
M§13.5.1.1-2

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Timber inventory

	Canopy Cover in Class I and Large Class II AMZ by Planning Watershed				
	Years since HCP/NCCP Initiation				
Planning Watershed	0	20	40	60	80
Cottaneva Creek	77%	79%	80%	83%	85%
Dutch Henry Creek	73%	79%	83%	85%	86%
East Branch North Fork Big River	69%	81%	82%	85%	86%
Flynn Creek	77%	83%	84%	86%	85%

Canopy Cover in Class I and Large Class II AMZ

Number of Trees and Average Tree Height

Class I and Large Class II AMZ					
Period of HCP/NCCP	dbh (in.)				Average Tree Height (>24 in.)
	24-32		>32		
	Average Height	Trees per Acre	Average Height	Trees per Acre	
2000	111	7	112	2	111
2005	115	8	117	3	116
2010	119	9	121	3	119

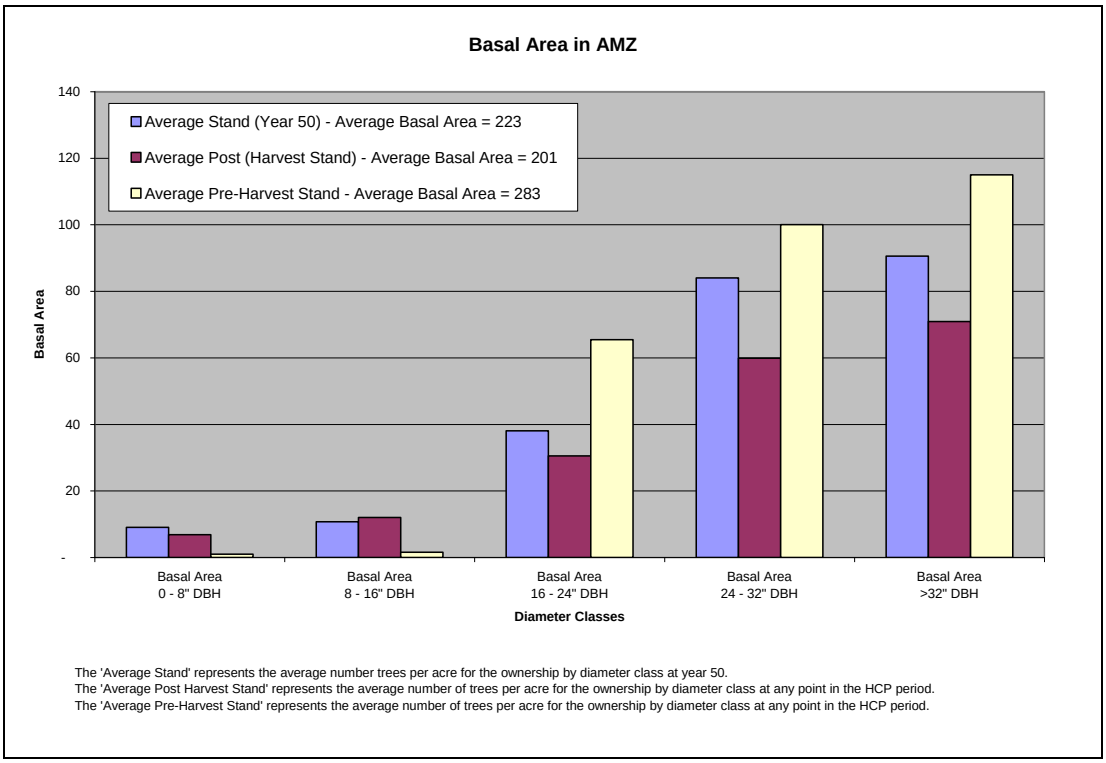


Figure D-2 Basal Area in Class I and Large Class II AMZ

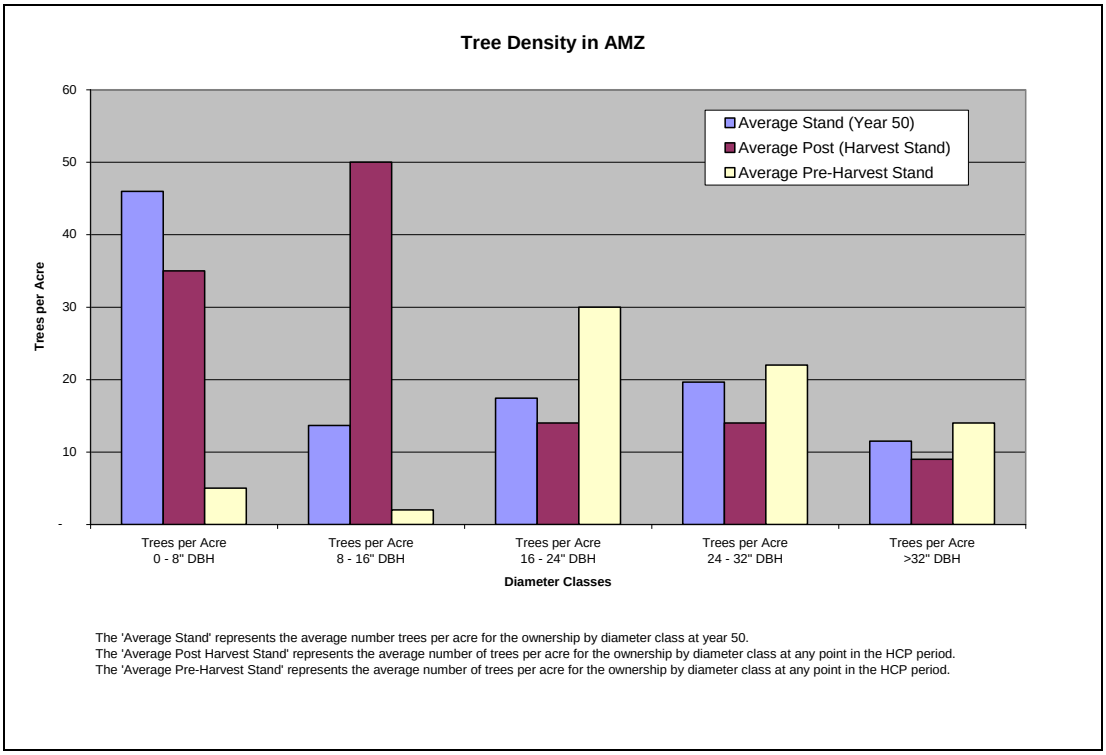


Figure D-3 Tree Density in Class I and Large Class II AMZ

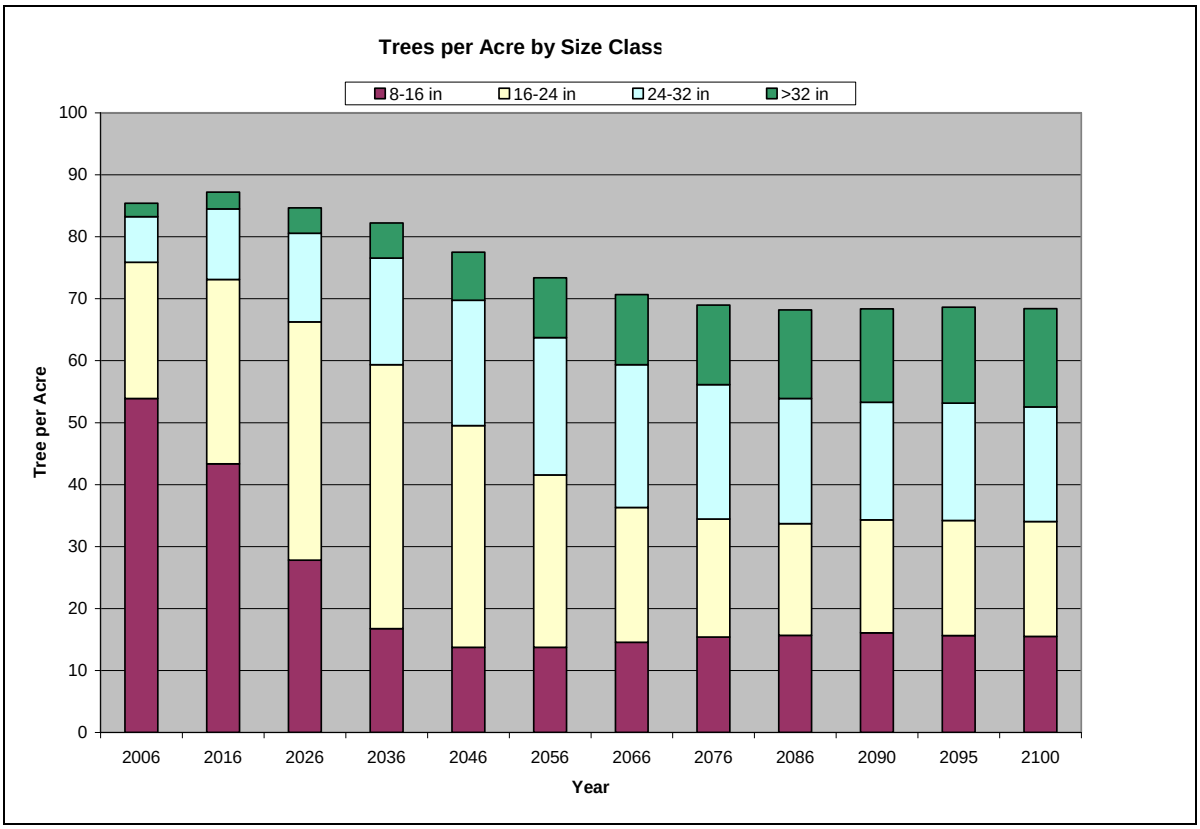


Figure D-4 Trees per Acre by Size Class in Class I and Large Class II AMZ

D.2.13 Mass wasting

MRC will conduct watershed analysis every 20 years. Focus watershed studies will be every 5 years. Forensic monitoring reports will be ongoing throughout the term of the HCP/NCCP. We will submit these reports to the agencies as they are completed.

Information on mass wasting will be part of 3 reports:

- Mass wasting inventory updates in watershed analysis.
- Mass wasting inventory in focus watershed studies.
- Forensic monitoring.

The agencies have on file an MRC watershed analysis report. Future updates, as well as focus watershed studies, will be in this same format. Forensic monitoring will follow the guidelines in the California Geological Survey Note 45.

D.3 Reports on Aquatic Species

D.3.1 Report timelines

D-6 gives the proposed schedule of reports for aquatic species.

Table D-7 Timelines for HCP/NCCP Monitoring Reports on Aquatic Species

Timelines for HCP/NCCP Monitoring Reports on Aquatic Species						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
Amphibians						
AMPHIB_RPT_010	Percent of documented breeding sites occupied within each red-legged frog management unit.	Report on objectives in M§13.6.2.1-2	Annually	15 September	Electronic report via email attachment or CD	USFWS CDFG
AMPHIB_RPT_020	Habitat quality measurements to determine if habitat quality is being maintained or improved.	Report on objectives in M§13.6.2.1-3	Every 5 years	15 September	Electronic report via email attachment or CD	USFWS CDFG
AMPHIB_RPT_030	Surveys to determine baseline distribution of coastal tailed frogs	Report on objectives in M§13.6.3.1-1	One time only	Complete by Year 2 of HCP/NCCP	Electronic report via email attachment or CD	USFWS CDFG
AMPHIB_RPT_040	Surveys to monitor the spatial distribution and relative abundance of coastal tailed frogs.	Report on objectives in M§13.6.3.1-2	Every year	30 December	Electronic report via email attachment or CD	USFWS CDFG
Salmonids						
FISH_RPT_010	Provide data regarding the presence of coho salmon and steelhead in all major basins owned.	Report on objectives in M§13.6.1.1-1	Annually	30 December	Electronic report via email attachment or CD	NMFS CDFG
FISH_RPT_020	Provide results of Chinook salmon monitoring reaches (CSMR)	Report on objectives in M§13.6.1.1-NEW	Annually	30 December	Electronic report via email attachment or CD	NMFS CDFG
FISH_RPT_030	Provide results of surveys to determine distribution of salmonids throughout watercourses.	Report on objectives in M§13.6.1.1-2	Every 12 years	30 December	Electronic report via email attachment or CD	NMFS CDFG
FISH_RPT_040	Provide estimates of outmigrating smolts (coho salmon and steelhead).	Report on objectives in M§13.6.1.2-1	Annually	30 December	Electronic report via email attachment or CD	NMFS CDFG

D.3.2 Amphibians

D.3.2.1 Red-legged frogs

Potential breeding sites

At the commencement of the HCP/NCCP, MRC will identify those planning watersheds in which there are both potential and documented breeding sites for red-legged frogs. These surveys will establish our baseline number of red-legged frog management units with documented breeding sites. Our objective is to ensure that 100% of red-legged frog management units retain their breeding sites. An annual monitoring report will show whether the breeding sites remain in the baseline watersheds.

Documented breeding sites

If MRC determines that a potential breeding site has evidence of red-legged frog reproduction, we consider that site a documented breeding site. We will monitor documented breeding sites annually for presence of red-legged frogs or evidence of reproduction. Our objective is to ensure that 100% of red-legged frog management units retain their breeding sites. In addition, there should be no more than 1 documented breeding site in a planning watershed that is occupied by bullfrogs. An annual monitoring report will show the number of baseline sites in each red-legged frog management unit and planning watershed, the percentage of breeding sites in each red-legged frog management unit that are still occupied by red-legged frogs, and the number of breeding sites with bullfrogs present.

06/15/2010

AMPHIB_RPT_010
M§13.6.2.1-2

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Occupancy of Red-legged Frogs in Documented Breeding Sites

			% of Documented Sites Occupied				
Planning Watershed	**RLF Management Unit**	**Baseline Breeding Sites**	**2005**	**2006**	**2007**	**2008**	**2009**
AL	AL1	4	100	100	75	100	75
AL	AL2	3	100	100	100	100	100
AL	AL3	1	100	100	100	100	100
CU	CU1	2	100	100	100	100	100
CU	CU2	2	100	100	100	50	100
EU	EU1	3	100	100	100	100	100

REPORT NOTES
AL=Lower Albion; AR=Russian Gulch; CG=Lower Greenwood Creek; CU=Upper Greenwood Creek; CM= Mallo Pass Creek; EU= Upper South Branch North Fork Navarro River

5-year report on quality of red-legged frog habitat

After baseline data has been collected for all areas, MRC will measure the quality of potential red-legged frog habitat every 5 years. We will compare this collected data to baseline measurements to ensure that habitat quality and quantity remain stable. Our objective is to ensure that a breeding site maintains at least 75% of its maximum depth and surface area. In addition, at least 90% of the breeding sites must meet this requirement.

AMPHIB_RPT_020 **09/15/2015**
M§13.6.2.1-1

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Baseline Distribution and Habitat Quality of Red-legged Frog Breeding Sites

Baseline					2010		2015	
Planning Watersheds	**# Sites**	**Site ID**	**Max Depth (ft)**	**Surface Area (ft^2)**	**% Max Depth**	**% Surface Area**	**% Max Depth**	**% Surface Area**
EU	6	EU 1001	2.5	1880	95	94	95	94
		EU 1002	3.0	10,200	100	88	100	88
		EU 1003	7.0	800	86	92	86	92
		EU 1004	3.0	555	92	79	92	79
		EU 1005	3.0	780	98	100	98	100
		EU 1005	3.0	780	98	100	98	100
		EU 1006	6.0	1000	100	99	100	99

Total Sites Meeting Objectives:

D.3.2.2 Coastal tailed frogs

Distribution and relative abundance of coastal tailed frogs

Within 3 years of HCP/NCCP implementation, MRC will provide an initial report with baseline data on the distribution of coastal tailed frogs in the plan area. As we encounter new populations, we will update this data. Every year, we will issue a report on the distribution and relative abundance of coastal tailed frogs. Our objective is to maintain (a) larval coastal tailed frogs in at least 95% of the sites where initial distribution surveys detected their presence and (b) relatively stable abundance estimates.

AMPHIB_RPT_030
M§13.6.3.1-1 **09/22/2015**

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Baseline Distribution of Coastal Tailed Frogs

Site ID	Coastal Tailed Frogs Present?
RC-1002	Y
RC-1004	Y
RC-1006	N
RC-1007	Y
RC-1009	Y

% Sites Occupied: 80%

AMPHIB_RPT_040
M§13.6.3.1-2 **09/22/2015**

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Distribution and Relative Abundance of Coastal Tailed Frogs

Site ID	Minutes for Initial Detection	Total Number of CTF's Collected	CTF's per Cubic Meter of Water Searched
Cottaneva Creek			
RC-1002	2	45	3.75
RC-1004	5	56	3.90
RC-1005	4	34	2.75
RC-1007	7	89	7.90

Sites occupied from baseline100%

D.3.3 Salmonids

D.3.3.1 Presence of anadromous salmonid in major drainage basins

MRC will conduct annual surveys within each of the 18 major drainage basins to determine which species of salmonids are present and submit a report to the wildlife agencies.

FISH_RPT_010
M§13.6.1.1-1

12/30/2008

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Anadromous Salmonid Presence: Annual Salmonid Monitoring Basins (ASMB)

Major Basin	Sampling Effort (minutes)	Stream MWAT (C°)	Stream Conductivity (ppm and µS)	PH	Baseline		2006		2007		2008	
					Coho	STH	Coho	STH	Coho	STH	Coho	STH
Hollow Tree	5	18.1	350/175	6.97	X	X	X	X				
Cottaneva	10	14.9	400/201	7.09	X	X	X	X				
Hardy Creek	25	16.2	302/151	8.04		X		X				
Juan Creek	12	15.3	152/077	7.55		X		X				
NF Noyo River	1	19.0	100/049	7.44	X	X	X	X				
Big River	2	22.3	124/062	7.92	X	X	X	X				

REPORT NOTE

STH = steelhead

D.3.3.2 Chinook salmon monitoring reaches (CSMR)

MRC has identified 2 watersheds where Chinook salmon are encountered most frequently for monitoring purposes: Hollow Tree Creek and the North Fork of the Noyo River. We will monitor 1 CSMR in both Hollow Tree Creek and the North Fork Noyo River every year to determine the presence and relative abundance of juvenile Chinook salmon. In addition, we will randomly select 2 other CSMR to monitor every year. This would be a total of 4 CSMR surveys per year, rotating through all 8 historic or potential streams roughly every 4 years.

FISH_RPT_020
M§13.6.1.1-3

12/30/2010

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Chinook Salmon Monitoring Reaches (CSMR)

CSMR	Chinook present?	Estimated Number of Chinook Observed	Date of Survey	Stream Flow (cfs)	Other Salmonids Observed		Length of Reach (mi)
					Coho	STH	
Hollow Tree	Yes	300	03/01/2010	34.2	X	X	1.00
Cottaneva	No	0	03/21/2010	4.5	X	X	0.70
NF Noyo River	Yes	150	04/03/2010	7.44	X	X	1.00
Albion River	Yes	5	04/08/2010	13.0	X	X	0.85

REPORT NOTE

STH = steelhead

D.3.3.3 Anadromous salmonid distribution

MRC will conduct extensive distribution surveys across the entire plan area and sample approximately 450 sites. We will submit reports every 12 years. A report will show the percentage of streams currently occupied by steelhead and coho salmon as compared to baseline data.

FISH_RPT_030
M§13.6.1.1-2

12/30/2015

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Anadromous Salmonid Distribution

Site ID	Sampling Effort (minutes)	Sampling Method	Stream Temperature (C^o)	Stream PH	Baseline		2012		2013		2014	
					Coho	STH	Coho	STH	Coho	STH	Coho	STH
78-15	11	E	17.4	6.71	X	X	X	X	X	X	X	X
78-14	9	E	15.2	7.11	X	X	X	X	X	X	X	X
78-13	5	E	21.2	7.21		X		X	X	X	X	X
78-12	3	E	20.1	6.99		X		X		X		X
78-11	18	E	19.2	6.87		X		X		X		X
78-10	11	E	15.0	6.55	X	X	X	X	X	X	X	X

SUMMARY TOTALS
% of coho sites remaining occupied: 100%
% steelhead (STH) sites remaining occupied: 100%

D.3.3.4 Outmigration of anadromous salmonid smolts

MRC will submit to the wildlife agencies an annual report with cumulative statistics on outmigrant smolts. To calculate the range of salmonid numbers, we will use DARR (Darroch Analysis with Rank Reduction).

FISH_RPT_040
M§13.6.1.2-1 **12/30/2015**

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Smolt Abundance

Focus Watershed	Stream MWAT (C^o)	Year	Coho Salmon	Steelhead
S.F. Albion	16.8	2010	13,178 ± 1678	5,789 ± 985
S.F. Albion	16.2	2011	12,578 ± 2026	1,875 ± 247
S.F. Albion	15.7	2012	13,890 ± 1990	7,981 ± 1209
L.N.F. Navarro	17.4	2013	5,789 ± 985	13,178 ± 1678
L.N.F. Navarro	16.9	2014	1,875 ± 247	12,578 ± 2026
L.N.F. Navarro	16.7	2015	7,981 ± 1209	13,890 ± 1990

D.4 Reports on Terrestrial Habitat

D.4.1 Report timelines

Table D-8 gives the proposed schedule of reports for terrestrial habitat. All terrestrial reports will include an executive summary (a) detailing unique findings and abnormal results and (b) highlighting the results of each monitoring program.

Table D-8 Timelines for HCP/NCCP Monitoring Reports on Terrestrial Habitat

Timelines for HCP/NCCP Monitoring Reports on Terrestrial Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
Monitoring Reports						
TREE_RPT_010	Number of snags, wildlife trees, and recruitment trees within each THP unit prior to harvest	Report on objectives in M§13.8.1-1	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
TREES_RPT_020	Number of pieces of downed wood within THP units proposed for harvest of downed wood.	Report on objectives in M§13.8.1-1	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
TREES_RPT_030	Number of snags and wildlife trees felled for safety reasons.	Compliance	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
TREES_RPT_040	Mean number of snags, snag recruitment trees, and pieces of downed wood on covered lands inventoried over a 10-year period	Report on objectives in M§13.8.1-1	Every 10 years	1 March	Electronic report via email attachment or CD	USFWS CDFG
HDWD_RPT_010	Basal area of hardwoods pre-harvest	Report on objectives in M§13.8.1-2	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
HDWD_RPT_020	Basal area of hardwoods post-harvest	Report on objectives in M§13.8.1-2	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
HDWD_RPT_030	Post harvest follow-up on hardwood representative sample areas	Report on objectives in M§13.8.1-3	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
HDWD_RPT_040	Acreage and number of hardwood representative sample areas	Report on objectives in M§13.8.1-4	Every 10 years	1 March	Electronic report via email attachment or CD	USFWS CDFG

Timelines for HCP/NCCP Monitoring Reports on Terrestrial Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
OG_RPT_010	Acreage and number of old growth stands	Report on objectives in M§13.8.1-5	Every 10 years	1 March	Electronic report via email attachment or CD	USFWS CDFG
ROCK_RPT_010	Distribution and abundance of rocky outcrops	Report on objectives in M§13.8.1-6	Every 10 years	1 March	Electronic report via email attachment or CD	USFWS CDFG
NAT_COM_010	Planting efforts and species distribution planted in harvested conifer stands	Report on monitoring program M§13.8.2-1	Annual	1 March	Electronic report via email attachment or CD	USFWS CDFG
NAT_COM_020	Acres and distribution of structure classes on covered lands	Report on monitoring program M§13.8.2-1	Every 10 years	1 March	Electronic report via email attachment or CD	USFWS CDFG
NAT_COM_030	Reforestation efforts in conifer stands not dominated by redwood or Douglas-fir	Report on monitoring program M§13.8.2-1	Annual	1 March	Electronic report via email attachment or CD	USFWS CDFG
NAT_COM_040	Ecological process re-introduced in uncommon natural communities	Report on monitoring program M§13.8.2-2	Every 5 years	1 March	Electronic report via email attachment or CD	USFWS CDFG
NAT_COM_050	Acres and distribution of uncommon natural communities	Report on monitoring program M§13.8.2-2	Every 10 years	1 March	Electronic report via email attachment or CD	USFWS CDFG
INV_SPE_010	Known invasive species population on covered lands	Report on monitoring program M§13.8.3-1	Annual	1 March	Electronic report via email attachment or CD	USFWS CDFG
INV_SPE_020	Efforts to control invasive species	Report on monitoring program M§13.8.3-1	Annual	1 March	Electronic report via email attachment or CD	USFWS CDFG

D.4.2 Snags, wildlife trees, recruitment trees, and downed wood

The annual reports on snags, wildlife trees, recruitment trees, and downed wood will include compliance and effectiveness monitoring in the plan area. Compliance monitoring consists of pre-harvest marking and tallying of snags, wildlife trees, and recruitment trees to ensure that MRC meets retention targets. Effectiveness monitoring consists of long-term trend monitoring of snags, wildlife trees, recruitment trees, and pieces of downed wood. Since wildlife trees include old growth trees, we will track the number of individual old growth trees through these processes as well.

On rare occasions, MRC may harvest pieces of downed wood; in these instances, we will complete pre-harvest surveys to ensure there are enough pieces of downed wood to meet objectives. Copies of surveys and maps will be available to the wildlife agencies upon request.

D.4.2.1 Pre-harvest[2] snags, wildlife trees (including old growth trees), and recruitment trees

TREE_RPT_010
M§13.8.1-1

03/01/2006

MENDOCINO REDWOOD COMPANY
Ukiah, CA

HCP/NCCP Effectiveness Monitoring Report
Pre-harvest Assessment of Snags, Wildlife Trees, and Recruitment Trees

Inventory Block	THP #	Unit	General forest or special?	Acres	Wildlife Trees and Snags						Recruitment Trees				Total (wildlife trees, snags, and recruitment trees)					
					Old Growth		Snags		Other WT		Conifer		Hardwood		Snags +WT		RT		Total	
					CO	HW	L	S	L	S	L	S	L	S	L	S	L	S	L	S
Big River	1-05-034	A	General forest	25	2	5	9	6	15	5	0	25	0	15	31	11	0	40	31	51
Big River	1-05-034	B	General forest	50	0	1	10	8	19	13	6	40	6	39	38	21	12	79	50	100
Big River	1-05-034	C	General forest	90	10	1	15	20	14	9	50	105	10	52	40	29	60	157	100	186
Big River	1-05-034	D	General forest	100	7	8	25	40	20	30	25	75	15	60	60	70	40	135	100	205
Big River	1-05-034	F	Class I AMZ	10	7	4	10	15	5	4	0	19	0	8	26	19	0	27	26	46

REPORT NOTE
Acronyms: CO = conifer HW = hardwood L = large S = small WT = wildlife trees RT = recruitment trees

[2] MRC assesses and marks snags, wildlife trees, and recruitment trees prior to harvest. At that time we complete initial counts and recruitment tallies. Our inventory system will track overall trends in numbers of snags and wildlife trees to determine if recruitment strategies are working.

D.4.2.2 Pre-harvest downed wood assessment

TREE_RPT_020 **01/15/2007**
M§13.8.1-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Pre-harvest Downed Wood Assessment*

Inventory Block	THP #	Unit	Acres	General Forest or Other	Number of Hard Logs	Required Pieces from Felled Trees (recruitment)
Big River	1-05-034	A	25	general forest	100	25
Big River	1-05-034	B	50	general forest	210	40
Big River	1-05-034	C	90	general forest	502	0
Big River	1-05-034	D	100	general forest	650	0
Big River	1-05-034	F	10	Class I AMZ	58	2

*Number of pieces of downed wood within units proposed for harvest of downed wood

D.4.2.3 Snags and wildlife trees felled for safety

TREE_RPT_030 **01/15/2007**
M§13.8.1-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Pre-harvest Downed Wood Assessment*

Inventory Block	THP #	Unit	Area Type	Tree Type	Large	# of Additional Recruitment Trees Small
Big River	1-05-034	A	general forest	1 large snag 1 old growth	2	0

D.4.2.4 Trends in snags, wildlife trees, recruitment trees, and downed wood

TREE_RPT_040 **03/01/2016**
M§13.8.1-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Trends in Snags, Wildlife Trees, Recruitment Trees, and Downed Wood

Inventory Block	Mean Number of Snags per Acre	SD	Mean Snag Recruitment Trees per Acre	SD	Mean Pieces of Downed Wood per Acre	SD	Previous Mean Snags per Acre (2006)	Previous Mean Snag Recruitment Trees per Acre (2006)	Previous Mean Pieces of Downed Wood per Acre (2006)
Albion	3.5	0.2	10.1	0.6	7.5	0.7	3.4	10.1	6.8
Big River	6.7	0.2	11.2	0.9	8.3	0.1	6.4	11.1	8.2
Garcia	4.4	0.4	12.3	0.1	6.5	0.2	4.4	11.1	6.3
Navarro East	2.3	0.2	8.6	0.3	7.8	0.3	2.1	10.7	6.3
Navarro West	3.4	0.1	5.6	0.1	3.4	0.2	3.3	5.4	3.5
Noyo	4.8	0.2	8.6	0.2	4.9	0.1	4.5	8.4	4.4
Rockport	6.7	0.5	8.3	0.4	5.1	0.5	6.3	7.8	4.9
South Coast	5.0	0.3	12.3	0.3	6.7	0.2	4.4	12.5	6.9
Ukiah	5.1	0.2	9.6	0.5	4.9	0.4	4.8	8.9	4.8
Total	5.1	0.3	9.6	0.4	6.1	0.3	4.4	9.6	5.8

D.4.3 Hardwoods

The annual report on hardwoods will include compliance and effectiveness monitoring. MRC is not proposing validation monitoring for hardwoods. Copies of survey and maps of plots will be available to the wildlife agencies upon request.

D.4.3.1 Pre-harvest hardwoods

HWD_RPT_010 **03/01/2010**
M§13.8.1-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Basal Area of Hardwoods in Timber Stands: Pre-Harvest

Inventory Block	THP #	Unit	Basal Area (BA) > 15 ft^2 Pre THP?	Ratio of Hardwood BA to Conifer BA Pre-harvest
Big River	1	A	Y	N/A
Big River	1	B	Y	N/A
Big River	**1**	**E**	**Y**	N/A
Big River	1	F	N	N/A

D.4.3.2 Post-harvest hardwoods

HWD_RPT_020 **03/01/2010**
M§13.8.1-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Basal Area of Hardwoods in Timber Stands: Post-Harvest

Inventory Block	THP #	Unit	Acres	Plots	Basal Area (ft^2) or Ratio of Hardwood BA to Conifer BA Post Harvest
Big River	1-05-034	A	25	25	25
Big River	1-05-034	B	50	50	.0013

D.4.3.3 Hardwood representative sample areas

HWD_RPT_030 **03/01/2010**
M§13.8.1-3

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Post Harvest Follow-up on Hardwood Representative Sample Areas

Inventory Block	THP	Unit	Acres	Plots	Proportion of Hardwoods: Conifers Pre- harvest (BA %)	Proportion of Hardwoods: Conifers Post-harvest (BA %)
Big River	1-05-034	A	25	25	65	65
Big River	1-05-034	B	50	50	55	55

D.4.3.4 Acres and number of hardwood representative sample areas

HWD_RPT_040 **03/01/2010**
M§13.8.1-4

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Acreage and Number of Hardwood Representative Sample Areas

Acres	Acres Last 10 Years	Number	Number (Last 10 Years)
1400	1400	25	25

D.4.3.5 Old growth

MRC will submit a report every 10 years on the effectiveness of old growth protection measures. If any THPs have been harvested that contain Type I or Type II old growth, MRC will also include a compliance report for those THPs. Copies of surveys and maps will be available to the wildlife agencies upon request.

OG_RPT_010 **03/01/2016**
M§13.8.1-5

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Acreage and Number of Old Growth Stands and Trees

Inventory Block	Stand ID	Assessor(s)	Acres	Ref Photo #	Aerial Photo
Type 1					
Big River	BRXXX	SCB, RR	31	1	BR01
Big River	BRXXY	RBD, MJ	10	2	BR02
TOTAL			**41**	3	BR03
Type II					
Big River	BRXXZ	SCB, RR	05	4	BR04
Big River	BRXXW	RBD, MJ	06	5	BR05
TOTAL			**11**		

D.4.4 Rocky outcrops

MRC will submit a report every 10 years on effectiveness of conservation measures for rocky outcrops. If any THPs have been harvested that contain or are within 1000 ft of rocky outcrops, we will also include a compliance report for those THPs. Copies of surveys, maps, and aerial photos will be available to the wildlife agencies upon request.

ROCK_RPT_010 **03/01/2016**
M§13.8.1-6

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Distribution and Acreage of Rocky Outcrops

Inventory Block	Stand ID	Assessor(s)	Acres	Maintains characteristics?
Big River	BRXYY	TB	24	Yes
Big River	BRXYZ	TB	10	Yes
TOTAL			**34**	

D.4.5 Common natural communities

NAT_COM_010 **03/01/2016**
M§13.8.2-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Common Natural Communities

Inventory Block	Natural Community	Acres Current	Acres Previous

NAT_COM_015 **03/01/2016**
M§13.8.2-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
Reforestation Efforts in Conifer-dominated Stands

Inventory Block	Unit ID	Silviculture	Acres	Planted trees	
				RW	DF
Big River	BR001	Variable retention	24	5119	750
Big River	BR002	Group selection	10	900	100
TOTAL			**34**	6019	850

NAT_COM_020 **03/01/2016**
M§13.8.2-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
Acres and Distribution of Structure Classes in the Plan Area

Inventory Block	Structure Class I (previous decade)	Structure Class I (current decade)	Difference
Big River	5400	5000	-7%
Garcia	3500	3600	+3%
TOTAL	8900	8600	**-3%**

NAT_COM_030 **03/01/16**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
Reforestation Efforts in Conifer Stands Not Previously Dominated by Redwood or Douglas-fir

Inventory Block	Stand ID	Previous Dominant Conifer Species (Proportional Breakdown)	Planting (Proportional Breakdown)
Big River	BR023	60% Sugar pine, 40% Douglas-fir	10% RW, 30% DF, 60% SP

D.4.6 Uncommon natural communities

NAT_COM_040 **03/01/16**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
Ecological Process Re-introduced in Uncommon Natural Communities

Inventory Block	Stand ID	Natural Community Type	Acres Managed	Ecological Process*
Ukiah	UK001	Oak woodland	24	Fire

***Final report will include extensive follow-up data with concurrence of MRC and the wildlife agencies.**

NAT_COM_050 **03/01/16**
M§13.8.2-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Monitoring Report
Uncommon Natural Communities

Inventory Block	Grassland (acres)		Oak Woodland (acres)	
	Current	Previous	Current	Previous
Navarro East	35	35	1400	1400

D.4.7 Invasive species

ISC_RPT_010 **03/01/16**
M§13.8.3-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Known Invasive Species Population in Plan Area

Inventory Block	Stand ID	Invasive Species	UTM Coordinates	Acres
Ukiah	UK004	Harding grass	432000, 4323444	1

ISC_RPT_010 **03/01/16**
M§13.8.3-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Invasive Species Control

Inventory Block	Stand ID	Exotic Treated	Chemical Applied	Acres	Pounds
Ukiah	UK004	Harding grass	Imapazapyr	1	4

D.5 Reports on Terrestrial Species

D.5.1 Report timelines

Table D-9 gives the proposed schedule of reports for terrestrial species. All terrestrial species reports will include an executive summary (a) detailing unique findings and abnormal results and (b) highlighting the results of each monitoring program.

Table D-9 Timelines for HCP/NCCP Reports on Terrestrial Species

Timelines for HCP/NCCP Reports on Terrestrial Species and Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
Monitoring Reports						
NSO_RPT_010	11-section report: 1. NSO territories by inventory block	Report on objectives in M§13.9.1.3-1	Annually (NSO habitat report every 10 years)	1 March	Electronic report via email attachment or CD	USFWS CDFG
NSO_RPT_020	2. 10-year NSO productivity by inventory block	M§13.9.1.3-1				
NSO_RPT_030	3. Protection levels for territories by inventory block	Compliance				
NSO_RPT_040	4. Summary of visits to NSO territories to determine reproductive status	M§13.9.1.3-1				
NSO_RPT_050	5. Nocturnal surveys for NSOs	M§13.9.1.3-1 M§13.9.1.3-2 Compliance				
NSO_RPT_060	6. Summary of nocturnal surveys	M§13.9.1.3-1 M§13.9.1.3-2 Compliance				
NSO_RPT_070	7. Conservation measures for NSO within 0.7 miles of THPs	Compliance				
NSO_RPT_080	8. NSO banding	Compliance				
NSO_RPT_090	9. NSO habitat	M§13.9.1.3-2				
NSO_RPT_100	10. Effect of harvest on NSO	M§13.9.1.4-4				
NSO_RPT_110	11. Effect of hardwood on NSO	M§13.9.1.4-6				

Timelines for HCP/NCCP Reports on Terrestrial Species and Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
MAMU_RPT_010	7-section report: 1. Murrelet assessment within harvested THPs	Compliance	Annually	1 March	Electronic report via email attachment or CD	USFWS CDFG
MAMU_RPT_020	2. Current protections for occupied murrelet habitat and unsurveyed potential habitat	Compliance				
MAMU_RPT_030	3. Summary of murrelet surveys in harvest areas	Compliance				
MAMU_RPT_040	4. Harvest plans and other projects within LACMA	Compliance				
MAMU_RPT_050	5. Radar surveys in Lower Alder Creek	M§13.9.2.1-1				
MAMU_RPT_060	6. Radar surveys in Navarro, Greenwood, and Albion	M§13.9.2.1-2				
MAMU_RPT_070	7. Radar surveys in additional drainages	M§13.9.2.2-3				
PAMB_RPT_010	5-section report: 1. THPs within assessment areas of Point Arena Mountain Beaver	Compliance	Annually (part 4 produced every 5 years)	1 March	Electronic report via email attachment or CD	USFWS CDFG
PAMB_RPT_020	2. Surveys for potential habitat of Point Arena Mountain Beaver	Compliance				
PAMB_RPT_030	3. Buffers for PAMB burrow systems	Compliance				

Timelines for HCP/NCCP Reports on Terrestrial Species and Habitat						
Report ID	**Report Description**	**Purpose of Report**	**Report Frequency**	**Submission Date**	**Form of Submission**	**Receiving Agencies**
PAMB_RPT_040	4. Spatial extent of burrow systems of Point Arena Mountain Beaver	M§13.9.3.1-1				
PAMB_RPT_050	5. Creating Point Arena Mountain Beaver habitat with timber harvest	M§13.9.3.1-2				

D.5.2 Northern spotted owls (NSO)

The annual report on northern spotted owls will include compliance, effectiveness, and validation monitoring. Copies of actual surveys and maps showing nocturnal survey points and activity centers for spotted owls will be available upon request of the wildlife agencies. The full annual report consists of 11 sections:

- Section 1: Northern spotted owl territories by inventory block
- Section 2: 10-year productivity of northern spotted owls by inventory block
- Section 3: Protection levels for territories by inventory block for the upcoming year
- Section 4: Summary of visits to NSO territories to determine reproductive status
- Section 5: Nocturnal surveys for northern spotted owls
- Section 6: Summary of nocturnal surveys for management projects or validation monitoring
- Section 7: Conservation measures applied to THPs in the previous year
- Section 8: Banding report
- Section 9: Habitat report
- Section 10: Required validation monitoring: effect of harvest
- Section 11: Required validation monitoring: effect of hardwood on NSOs

D.5.2.1 NSO by inventory block

NSO_RPT_010 **03/01/2006**
M§13.9.1.3-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Northern Spotted Owl Territories by Inventory Blocks

	Level 1		Level 2		Level 3		Totals	
Inventory Block	**NSOs**	**% of NSOs**	**NSOs**	**% of NSOs**	**NSOs**	**% of NSOs**	**NSOs**	**% of NSOs**
Albion	4	29%	6	42%	4	29%	**14**	**100%**
Big River	1	8%	11	84%	1	8%	**13**	**100%**
Garcia	0	0%	3	50%	3	50%	**6**	**100%**
Navarro East	1	8%	9	56%	6	38%	**16**	**100%**
Navarro West	11	52%	7	33%	3	14%	**21**	**100%**
Noyo	1	8%	8	67%	3	25%	**12**	**100%**
Rockport	0	0%	13	65%	7	20%	**20**	**100%**
South Coast	10	45%	10	45%	2	10%	**22**	**100%**
Ukiah	0	0%	0	0%	0	0%	**0**	**100%**
Total	**28**	**23%**	**67**	**54%**	**29**	**23%**	**124**	**100%**

D.5.2.2 NSO 10-year productivity

NSO_RPT_020 **03/01/2006**
M§13.9.1.3-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
10-Year Productivity for Northern Spotted Owls
by Inventory Block

Albion

DFGID	Survey Years										Total Production	Years of Data	Mean Annual Production	Productivity Level	Protection Level
	95	96	97	98	99	00	01	02	03	04					
MD100	U	1	X	U	U	U	1	A	X	0	2	5	0.40	4	Moderate
MD110	0	U	A	U	1	U	0	1	1	2	5	6	0.83	1	High
MD120	A	1	1	U	0	U	2	U	1	1	6	6	1.00	1	Moderate
MD130	0	1	0	0	2	0	2	X	U	1	6	9	0.66	2	Moderate
Total										4					

Survey Years: Codes and Data
A = not monitored during the year
U = reproductive status unknown
X = absent
# = number of young produced

D.5.2.3 NSO protection levels

NSO_RPT_030 **03/01/2010**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Protection Levels for Northern Spotted Owl Territories
By Inventory Block

DFGID	Mean Annual Production	Productivity Level	Protection Level
ROCKPORT			
MD210	0.50	4	Limited
MD220	0.78	2	Moderate
MD230	1.10	1	High
MD240	0.89	2	Moderate

D.5.2.4 NSO reproductive status

NSO_RPT_040 **03/01/2010**
M§13.9.1.3-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Summary of Visits to NSO Territories to Determine Reproductive Status

Territory ID	Survey Type	Begin	End	Contact Time	Status	Survey Points	UTME	UTM	Survey to protocol?
MD005	Walk-in	08:01	10:00	N/A	X	N/A			
MD005	Nocturnal	20:00	20:40	20:30	F-NU-0U	BS01, BS02, BS03	471740	4346850	Y
MD005	Walk-in	07:00	09:00	07:15	P-NN-0R	N/A	471785	4346990	
MD005	Walk-in	07:00	0:900	08:00	P-NE-2J	N/A	471900	4346856	

D.5.2.5 NSO nocturnal surveys

NSO_RPT_050 **01/15/2007**
M§13.9.1.3-1
M§13.9.1.3-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Nocturnal Surveys for Northern Spotted Owls

Inventory Block	Planning Watershed	Station	Date	Begin	End	Contact	Azimuth	Distance	Sex	Behavior
Big River	THP_AA	BT16	3-10	22:20	22:30					NC
		BT15	3-10	22:35	22:45					NC
		BT21	3-10	22:50	23:00	22:55	160	400	F	4-note
		BT22	3-10	23:10	23:20					NC
Big River	Rice Creek	BI01	3-12							SDTC

Behavior Codes

NC = no contact
4- note = 4 note location call
3-note = 3-note location call
C = contact call
W = fledge whistle
A = agitated location
SDTC = skipped due to contact at nearby stations
DDTAC = dropped due to location of an activity center within 0.5 miles

D.5.2.6 Summary of NSO nocturnal surveys

NSO_RPT_060 **01/15/2007**
M§13.9.1.3-1
M§13.9.1.3-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Summary of Nocturnal Surveys for Northern Spotted Owls

Inventory Block	THP or Planning Watershed	THP # or Project ID	Station	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6
Big River	THP_AAA	1-05-034	BT16	3-10 NC	3-20 NC	6-1 NC			
			BT15	3-10 NC	3-20 NC	6-1 NC			
			BT21	3-10 FV	3-20 NC	6-1 NC			
			BT22	3-10 NC	3-20 NC	6-1 NC			
Big River	Rice Creek		BI01	3-12 SDTC	5-12 SDTC	7-12 DDTAC			
			BI02	3-12 NC	5-12 NC	7-12 NC			
			BI03	3-12 NC	5-12 NC	7-12 NC			
			BI04	3-12 NC	5-12 NC	7-12 NC			
			BI05	3-12 NC	5-12 NC	7-12 NC			

Behavior Codes

NC = no contact
F = female
M = male
V = vocal
O = observed
SDTC = skipped due to contact at nearby stations
DDTAC = dropped due to location of an activity center within 0.5 miles

Note: Surveys are for THPs, projects, and watershed planning

D.5.2.7 Conservation measures for NSO within 0.7 miles of THPs

NSO_RPT_070 **03/01/2006**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Conservation Measures for Northern Spotted Owl Territories within 0.7 miles of THPs

Inventory Block	THP #	Territories within 0.7 Miles	DFGID	Protection Level	500 ac of habitat within 0.7 miles?	Core Area (ac)	Distance from AC to Edge of Core Area (ft)	Extended protection area?	Disturbance Buffer (ft)
Big River	1-05-056	2	MD605	High	Yes	80	1000	Yes	1000
			MD900	Limited	No	N/A		No	500

D.5.2.8 NSO banding

NSO_RPT_080 **03/01/2006**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
NSO Banding

Inventory Block	DFGID	Sex	Age	Re-sight or new?	USFWS Band # (Leg)	Color Band (Leg)	Pattern	Weight	UTM
Big River	MD301	Female	Adult	New	346505 (Left)	WHI-ORN (Right)	Dot	550 g	44604 E 434505 N
Navarro East	MD047	Male	Adult	Re-sight	445606 (Right)	YEL-BLK (Left)	Str2	510 g	44516 E 455605 N

D.5.2.9 NSO habitat

NSO_RPT_090 **03/01/2009**
M§13.9.1.3-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Northern Spotted Owls: Distribution and Acreage of Nesting/Roosting Habitat

Inventory Block	Total Acres	Forestland	Current Nest/Roost	Previous Nest/Roost
Albion	14,797	14,526	6800	6604
Big River	33,479	33,058	4000	3852
Garcia	14,906	14,434	2700	2535
Navarro East	30,863	30,508	2400	2367
Navarro West	23,549	23,120	8000	7951
Noyo	19,350	19,318	2300	2156
Rockport	38,427	38,272	7800	7579
South Coast	34,281	33,446	11200	11,094
Ukiah	3,591	2,466	100	0
Total	213,233	209,148	45,300	44,138

D.5.2.10 Effect of harvest on NSO

NSO_RPT_100 **03/01/2007**
M§13.9.1.4-4

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Validation Monitoring Report
Effect of Harvest within 1000 ft of NSO Territories with Limited Protection

Inventory Block	Territory ID	Occupancy	Pair Status	Productivity	Harvest Distance
Albion	MD069	X	X	X	100 ft
Big River	MD079	M	Single	0 FL	700 ft
Garcia	MD130	Pair	Nesting	1 FL	200 ft
Navarro East	MD160	X	X	X	500 ft

D.5.2.11 Effect of hardwood on NSO

NSO_RPT_110 **03/01/2007**
M§13.9.1.4-6

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Validation Monitoring Report
Effect of Harwood Density on Northern Spotted Owls

Inventory Block	Territory ID	Occupancy	Pair status	Productivity	BA/ac
Albion	MD069	X	X	X	
Big River	MD079	M	Single	0 FL	85 sq. ft
Garcia	MD130	Pair	Nesting	1 FL	15 sq. ft
Navarro East	MD160	X	X	X	10 sq. ft

D.5.3 Marbled murrelets (MAMU)

Marbled murrelet sample report

The annual report on marbled murrelet will include compliance, effectiveness, and validation monitoring. Copies of actual surveys and maps showing survey points and detections for murrelets will be available upon request of the wildlife agencies. The full annual report consists of 5 sections:

- Section 1: Murrelet assessment within harvested THPs
- Section 2: Current protections for occupied murrelet habitat and unsurveyed potential habitat
- Section 3: Completed THP surveys with murrelet assessment
- Section 4: Radar surveys in Lower Alder Creek
- Section 5: Additional validation monitoring completed

D.5.3.1 Murrelet assessments within harvested THPs

MAMU_RPT_010 **03/01/2006**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Murrelet Assessments within Harvested THPs

THP	THP #	Inventory Block	Murrelet Zone	MAMU trees within 100 ft?	Protection Level or Survey Status
THP_AAA	1-05-056	Big River	2	3	Moderate
THP_AAB	1-05-077	Albion	1	5	Surveys completed
THP_AAC	1-05-086	Rockport	1	1	Limited
THP_AAD	1-05-099	Navarro East	3	1	No protection

D.5.3.2 Current protections for occupied and potential murrelet habitat

MAMU_RPT_020 **03/01/2006**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Current Protections for Occupied and Potential Murrelet Habitat

THP	THP #	Inventory Block	Protection Level	Disturbance Buffer (ft)	Habitat Buffer (ft)
THP_AAA	1-05-056	Big River	Moderate	400	200
THP_AAC	1-05-086	Rockport	Limited	N/A	N/A

D.5.3.3 Completed THP surveys with assessment of murrelet habitat

MAMU_RPT_030 **03/01/2006**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Completed THP Surveys with Assessment of Murrelet Habitat

THP	THP #	Inventory Block	Date	Station	Start	End	Detections
THP_AAB	1-05-077	Albion	4/26/05	CH1	06:15	08:15	0
			5/15/05	CH2	05:45	07:45	0
			6/10/05	CH1	05:35	07:35	0
			6/25/05	CH2	05:15	07:15	0
			7/06/05	CH1	05:00	07:00	0
			4/26/06	CH2	06:15	08:15	0
			5/15/06	CH1	05:45	07:45	0
			6/10/06	CH2	05:35	07:35	0
			6/25/06	CH1	05:15	07:15	0
			7/06/06	CH2	05:00	07:00	0

D.5.3.4 THPs and other projects within LACMA

MAMU_RPT_040 **03/01/2006**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
THPs and Other Projects within LACMA

THP	THP #	Area	Silviculture	Acres	Agency Concurrence Date
THP_AAL	1-05-056	LACHA	Selection	25	03/01/05

D.5.3.5 Surveys in Lower Alder Creek

MAMU_RPT_050 **03/01/2006**
M§13.9.2.1-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Validation Monitoring Report
Activity Level of Marbled Murrelets in Lower Alder Creek

Station ID	Date	Ground/Radar	Meets protocol?	Total Detections	Inbound Detections	Outbound Detections	Unknown Detections
CH1	06/15/2005	Radar	Yes	25	15	9	1
CH1	07/05/2005	Radar	Yes	15	5	5	5
CH2	07/06/2005	Radar	Yes	45	35	10	0
CH2	07/15/2005	Radar	Yes	40	25	10	5

D.5.3.6 Radar surveys in Navarro River, Greenwood Creek, and Albion River drainages

MAMU_RPT_060 **03/01/2006**
M§13.9.2.1-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Validation Monitoring Report
Murrelet Occupancy in Navarro, Greenwood Creek, Albion River Watersheds

Station ID	Date	Ground/Radar	Meets protocol?	Total Detections	Inbound Detections	Outbound Detections	Unknown Detections
NAV1	06/15/05	Radar	Yes	0	0	0	0
NAV2	07/05/05	Radar	Yes	3	0	3	0
GW1	07/06/05	Radar	Yes	0	0	0	0
GW2	07/15/05	Radar	Yes	0	0	0	0

D.5.3.7 Radar surveys in other drainages

MAMU_RPT_070 **03/01/2006**
M§13.9.2.2-3

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Validation Monitoring Report
Radar Monitoring in Additional Drainages

Station ID	Date	Ground/Radar	Meets protocol?	Total Detections	Inbound Detections	Outbound Detections	Unknown Detections
COT1	06/15/2005	Radar	Yes	0	0	0	0
COT2	07/05/2005	Radar	Yes	0	0	0	0
GAR1	07/0620/05	Radar	Yes	0	0	0	0
GAR2	07/15/2005	Radar	Yes	0	0	0	0

D.5.4 Point Arena mountain beaver (PAMB)

The annual report on Point Arena Mountain Beaver will include compliance, effectiveness, and validation monitoring. Copies of actual surveys and maps showing survey points and detections of burrow systems will be available upon request of the wildlife agencies. The full annual report consists of 5 sections:

- Section 1: THPs within Assessment Area of Point Arena Mountain Beaver.
- Section 2: Surveys for Potential Habitat of Point Arena Mountain Beaver.
- Section 3: Buffers for Burrow Systems of Point Arena Mountain Beaver.
- Section 4: Survey Results for Burrow Systems of Point Arena Mountain Beaver.
- Section 5: Additional validation monitoring for Point Arena Mountain Beaver.

D.5.4.1 THPs within PAMB assessment areas

PAMB_RPT_010 **MENDOCINO REDWOOD COMPANY** **03/01/2006**
Ukiah, CA
HCP/NCCP Compliance Report
THPs within PAMB Assessment Areas

THP	THP #	Potential habitat?	Potential Acreage	Burrow Systems
THP_AA	1-05-034	No	N/A	N/A
THP_AB	1-05-024	Yes	5	3
THP_AC	1-05-033	Yes	1	0

D.5.4.2 Surveys for potential PAMB habitat

PAMB_RPT_020 **01/15/2007**
MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Surveys for Potential PAMB Habitat

THP	THP #	Survey Dates	Surveyor(s)	Habitat completely covered?	Burrow Systems Located
THP_AB	1-05-024	5/5/05	Billig, S.	No	1
		6/6/05	Holley, M.	Yes	2
THP_AC	1-05-033	5/5/05	Douglas, R.	Yes	0

D.5.4.3 Buffers for PAMB burrow systems

PAMB_RPT_030 **03/01/06**
MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Buffers for PAMB Burrow Systems

THP	THP #	Burrow System ID	100-ft timber management?	400-ft herbicide buffer?	500-ft disturbance buffer?
THP_AB	1-05-024	PAMB008	Yes	Yes	Yes
		PAMB009	Yes	Yes	Yes
		PAMB010	Yes	Yes	Yes

D.5.4.4 Surveys for spatial extent of PAMB burrow systems

PAMB_RPT_040 **03/01/2006**
M§13.9.3.1-1

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Spatial Extent of Known Burrow Systems of Point Arena Mountain Beaver

Burrow System ID	Active?	Habitat measured?	Acres	Canopy Cover	Basal Area of Trees (>4 in. dbh)
PAMB008	Yes	Yes	0.05	30%	5.4
PAMB009	Yes	Yes	0.07	20%	0.3
PAMB010	Yes	Yes	0.02	5%	1.3

D.5.4.5 Creating habitat for PAMB

PAMB_RPT_050 **03/01/06**
M§13.9.3.1-2

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Effectiveness Monitoring Report
Creating Habitat with Timber Harvest within Dispersal Distance of Existing PAMB Burrow Systems

THP ID	THP Name	Acres Created	Method	Burrows after 1 year?
1-06-501MEN	Garcia 2 mile	0.05	Group selection	N
1-06-502MEN	Mill Creek	0.07	Group selection	N
1-06-110MEN	Owl Creek	0.02	Group selection	N

D.6 Rare Plants

MRC will submit an annual summary report to the wildlife agencies. This report will help determine whether conservation measures or implemented revisions have been successful. The report will also note any recent changes in statewide rarity and threat levels, as well as changes in timber harvesting methods in the plan area. MRC will include cumulative data on effectiveness monitoring organized first by inventory block, THP, or other covered activity, and then by species and occurrence. The report will evaluate the current status and trend of all covered rare plant species known to occur in the plan area and disclose annual levels of take.

Below is a sample *Rare Plant Survey Report*. For the sake of brevity, we have not included the THP species list or the list of references with this sample report.

MENDOCINO REDWOOD COMPANY
Fort Bragg, CA
HCP/NCCP Effectiveness Monitoring Report
Status and Trend of Covered Rare Plant Species
Nursey ’08 THP

Summary Information
Project name: Nursey ’08 Timber Harvest Plan (THP)
Legal description: Sections 15 & 22, T16N, R16W, MDBM
USGS 7.5’ Quad: Elk and Navarro
Date of survey: May 30, 2006
Surveyed by: Elicia Wise
Project size: 119 acres
Time spent conducting survey: 6 hours

Communities/habitats within project areaSurvey level
North Coast Coniferous Forest (NCFrs)Floristic

Rare plants identified (CNPS List 1-3)
No rare plants were identified during this survey. The sensitive lichen, *Usnea longissima*, was identified within the plan boundaries.

Methods
Rare plant scoping lists were generated from a 9-quad search using the California Native Plant Societies *Inventory of Rare and Endangered Plants* (CNPS, 2001) as well as querying species using the California Natural Diversity Database (CNDDB). The results of the rare plant scoping and associated habitats are presented in Table 1.

A meandering, floristic survey was conducted on May 30th, 2006 which focused on areas likely to provide habitat for rare species and/or potentially affected (directly or indirectly) by timber harvest operations. These areas include existing roads and skid trails, meadows or openings (landings), culvert inlets and outlets, springs, and areas adjacent to watercourses. Approximately 6 hours were spent conducting the survey.

Plants were identified to the lowest taxonomic level necessary to ensure that it was not a species of concern. Additionally, pendulous lichens in the genus *Usnea* were identified when present. If a species could not be identified on site, it was keyed using the references attached to this report. Refer to the attached map for the survey route.

Survey Results and Discussion

The predominant habitat of the plan area is north coast coniferous forest (NCFrs) with a floristic composition best described by the Redwood Series (Sawyer and Keeler-Wolf, 1995). The canopy is largely composed of scattered second-growth redwood (*Sequoia sempervirens*), Douglas-fir (*Pseudotsuga menziesii*) and tanoak (*Lithocarpus densiflorus*). The variable retention units (VR) are dominated by tanoak and few species compose the herbaceous, understory layer. The portion of plan area designated as group selection hosts a slightly more robust understory layer, however residual slash and sprouting tanoak continue to limit herbaceous

species diversity. As is to be expected, the number of species increased on roads, in openings, and near watercourses. No rare plants were identified in the plan area. A species list is attached with this report.

The sensitive lichen, *Usnea longissima*, was observed in the group selection unit on the east side of the ridge, below the existing haul road. This epiphytic lichen, which was once known from around the world, has declined over the past several decades (Keon and Muir, 2002). Currently, the Pacific coast continues to host populations of *U. longissima* from Alaska to northern California, with no known occurrences south of Sonoma county (Doell 2004; Keon and Muir 2002). Increased interest and survey efforts have revealed that there are over 200 occurrences of *U. longissima* and the species has recently been sponsored for a listing that would be equivalent to a CNPS List 4 (Peterson 2005).

The dominant source tree is a second-growth Douglas-fir with approximately 30% live crown. A source tree is defined as the dominant structure (live tree or snag) which contains the core population of *U. longissima*. The source tree, as well as two adjacent redwoods and one adjacent Douglas-fir, were marked for retention. This retention mark, in addition to the prescribed group selection silviculture, should provide adequate recruitment of potential future source trees. A CNDDB field survey form has been prepared (copy attached) and submitted.

Rare Plant Scoping List for NCFrs Dominated Habitat
Albion Tract

Scientific Name	Common Name	Habitat†	Elevation	Blooming Period							
				Mar.	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch										
Kopsiopsis hookeri	small groundcone	NCFrs, BUFrs (disturbed)	195- 750 m								
Calystegia purpurata ssp. saxicola	coastal bluff morning glory	NCFrs, CCFrs (coastal)	90-885 m								
Campanula californica	swamp harebell	NCFrs, CoDn, CoScr	15-105 m								
Carex californica	California sedge	NCFrs, CCFrs, BgFn, CoPrr, MshSw (fr), Mdws	1-405 m								
Carex virdula var. virdula	green sedge	BgFn, CCFrs, Mdws, CoPrr, MshSw (edge)	90-335 m								
Hesperocyparis pygmaea	pygmy cypress	NCFrs, MshSw, BgFn	3-230 m								
Erigeron biolettii	streamside daisy	NCFrs, CCFrs (podzol soils)	30-500 m				N/A-evergreen				
Erythronium revolutum	coast fawn lily	NCFrs, BUFrs, CmWld	30-1100 m								
Horkelia tenuiloba	thin-lobed horkelia	NCFrs, BUFrs, BgFn	0-1065 m								
Lilium maritimum	coast lily	CoScr, CCFrs, BUFrs, Chprl, VFGr	50-500 m								
Lycopodium clavatum	running-pine	BUFrs, CCFrs, CoScr, CoPrr, MshSw, NCFrs	5-335 m								
Mitella caulescens (LIST 4)	leafy-stemmed mitrewort	MshSw, NCFrs (mesic)	60-790 m								
Monardella villosa ssp. globosa	robust monardella	BUFrs, LCFrs, Mdws, NCFrs	<1700 m								
Pleuropogon hooverianus	Hoover's semaphore grass	Chprl, CmWld, BUFrs, CoScr	185-600 m								
Sanguisorba officinalis	great burnet	NCFrs, BUFrs, MshSw, VFGrs	10-635 m								
Senecio bolanderi var. bolanderi	seacoast ragwort	BgFn, MshSw, BUFrs, Mdws, NCFrs, RpFrs (often serp.)	60 - 1400 m								
Sidalcea malachroides (LIST 4)	maple-leaved checkerbloom	CoScr, NCFrs	30-650 m								
Trifolium buckwestiorum	Santa Cruz clover	BUFrs, CoPrr, CoScr, NCFrs	2-700 m								
Usnea longissima	long-beard lichen	BUFrs, CmWld, CoPrr	105-610 m								
Viola palustris	marsh violet	NCFrs, BUFrs, CCFrs	<656 m				N/A-lichen				
†Key to Habitat Types		CoScr, MshSw, BgFn (coastal)	0-150 m								

TABLE NOTES

BgFn=Bog, fen
BUFrs=Broadleaf upland forest
CBScr=Coastal bluff scrub
CoScr=Coastal scrub
LCFrs=Lower montane coniferous forest
Mdw=Meadow

Rare Plant Scoping List for NCFrs Dominated Habitat
Albion Tract

Scientific Name	Common Name	Habitat†	Elevation	Blooming Period

CCFrs=Closed-cone coniferous forest
Chpl=Chaparral
CmWld=Cismontane woodland
CoDu=Coastal dune
CoPrr=Coastal prairie
VFGrs=Valley foothill grassland
MshSw=Marsh, swamp
NCFrs=North coast coniferous forest
RpFrs=Riparian forest
RpWld=Riparian woodland
UCFrs=Upper montane coniferous forest

D.7 Assessment of Take

Previous monitoring programs address effectiveness and validation monitoring, as well as compliance. MRC also tracks potential take of covered species. Our reports will document whether MRC has created a greater impact on covered species than our permit allows. The numbers in the following sample reports do not correspond to existing or expected data.

D.7.1 Assessment of take: salmonids

AOT_Coho	Acres Harvested Within Class I Habitat HCP/NCCP Implementation					
	Coho in Southern Oregon/Northern California Coast ESU					
WAU	Total Acres Harvested (2020)	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)	% Allowable Harvest Limit (2010-2020)	Gallons of Water Diverted for Drafting (2010-2020)	# Watercourse Crossings Installed or Maintained (2010-2020)
Hollow Tree Creek	0	0	0	0%	8000	8
Noyo River	0	0	0	0%	4000	5
Big River	0	0	0	0%	3000	4
Albion River	1	10	21	48%	7500	6
Garcia River	0	4	17	24%	5200	3

AOT_Steelhead	Acres Harvested Within Class I Habitat HCP/NCCP Implementation					
	Coho in Central California Coast ESU					
WAU	Total Acres Harvested (2020)	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)	% Allowable Harvest Limit (2010-2020)	Gallons of Water Diverted for Drafting (2010-2020)	Number of Watercourse Crossings Installed or Maintained (2010-2020)
Albion River	1	10	21	0%	3500	6
Alder Creek/Schooner Gulch	0	0	0	0%	2100	3
Big River	0	0	0	0%	4400	5
Cottaneva Creek	0	0	0	0%	1800	2
Elk Creek	0	0	5	24%	800	1
Garcia River	0	4	17	0%	3000	4
Greenwood Creek	0	0	0	0%	1300	2
Hollow Tree Creek	0	0	0	48%	5600	7
Navarro River	1	10	21	0%	8500	9
Noyo River	0	0	0	0%	2800	4
Rockport Small Coastal Streams	0	0	0	0%	3900	5

AOT_Chinook	Acres Harvested Within Class I Habitat HCP/NCCP Implementation					
	Chinook in California Coastal ESU					
WAU	Total Acres Harvested (2020)	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)	% Allowable Harvest Limit (2010-2020)	Gallons of Water Diverted for Drafting (2010-2020)	# Watercourse Crossings Installed or Maintained (2010-2020)
Hollow Tree Creek	0	0	0	0%	8000	8
Noyo River	0	0	0	0%	4000	5
Big River	0	0	0	0%	3000	4
Albion River	1	10	21	48%	7500	6
Garcia River	0	4	17	24%	5200	3

AOT_Steelhead	Acres Harvested Within Class I Habitat HCP/NCCP Implementation					
	Steelhead in Northern California Coast ESU					
WAU	Total Acres Harvested (2020)	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)	% Allowable Harvest Limit (2010-2020)	Gallons of Water Diverted for Drafting (2010-2020)	Number of Watercourse Crossings Installed or Maintained (2010-2020)
Albion River	1	10	21	0%	3500	6
Alder Creek/Schooner Gulch	0	0	0	0%	2100	3
Big River	0	0	0	0%	4400	5
Cottaneva Creek	0	0	0	0%	1800	2
Elk Creek	0	0	5	24%	800	1
Garcia River	0	4	17	0%	3000	4
Greenwood Creek	0	0	0	0%	1300	2
Hollow Tree Creek	0	0	0	48%	5600	7
Navarro River	1	10	21	0%	8500	9
Noyo River	0	0	0	0%	2800	4
Rockport Small Coastal Streams	0	0	0	0%	3900	5

D.7.2 Assessment of take: red-legged frogs

AOT_RLF Inventory Block	Area of impact	Annual and Cumulative Acres of Potential Habitat for Red-legged Frogs HCP/NCCP Implementation			
		Measure	Annual	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)
Albion	In AMZ	Acres Proportion	2 3%	2 3%	72
	Outside AMZ	Acres Proportion	5 < 1%	10 1%	1042
	Total	Acres Proportion	7 1%	12 1%	1114
Big River	In AMZ	Acres Proportion	0 0%	0 0%	50
	Outside AMZ	Acres Proportion	50 2%	100 4%	2404
	Total	Acres Proportion	50 2%	100 4%	2454
Garcia River	In AMZ	Acres Proportion	0 0%	4 6%	67
	Outside AMZ	Acres Proportion	50 < 1%	50 < 1%	1167
	Total	Acres Proportion	50 < 1%	54 < 1%	1233
Navarro East	In AMZ	Acres Proportion	0 0%	0 0%	61
	Outside AMZ	Acres Proportion	50 2%	105 4%	2371
	Total	Acres Proportion	50 2%	105 < 1%	2431
Navarro West	In AMZ	Acres Proportion	1 1%	1 1%	111
	Outside AMZ	Acres Proportion	50 4%	100 7%	1393
	Total	Acres Proportion	51 3%	101 7%	1515

REPORT NOTE
Proportion = Proportion of allowable limit for decade

D.7.3 Assessment of take: coastal tailed frogs

AOT_CTF Inventory Block	Area of Impact	Measure	Annual and Cumulative Acres of Potential Habitat for Coastal Tailed Frogs HCP/NCCP Implementation: Annual	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)
Albion	In AMZ	Acres	7	20	49
		Proportion	14%	41%	
	Outside AMZ	Acres	60	100	451
		Proportion	13%	22%	
	Total	Acres	67	120	500
		Proportion	13%	24%	
Big River	In AMZ	Acres	12	12	50
		Proportion	24%	24%	
	Outside AMZ	Acres	100	100	2404
		Proportion	4.1%	4.1%	
	Total	Acres	112	112	2454
		Proportion	4.6%	4.6%	
Garcia River	In AMZ	Acres	0	1	67
		Proportion	0%	1.5%	
	Outside AMZ	Acres	5	10	1167
		Proportion	0.4%	0.9%	
	Total	Acres	5	11	1233
		Proportion	0.4%	0.9%	
Navarro East	In AMZ	Acres	6	15	61
		Proportion	10%	24%	
	Outside AMZ	Acres	24	500	2371
		Proportion	1.0%	21%	
	Total	Acres	30	515	2431
		Proportion	1.0%	21%	
Navarro West	In AMZ	Acres	0	0	111
		Proportion	0%	0%	
	Outside AMZ	Acres	0	0	1393
		Proportion	0%	0%	
	Total	Acres	0	0	1515
		Proportion	0%	0%	
Noyo	In AMZ	Acres	0	10	34
		Proportion	0%	29%	
	Outside AMZ	Acres	5	128	1279
		Proportion	0.4%	10%	
	Total	Acres	5	138	1313
		Proportion	0.4%	11%	

REPORT NOTE
Proportion = Proportion of allowable limit for decade

D.7.4 Assessment of take: northern spotted owls

AOT_NSO	Disturbances and Acres Impacted in NSO territories[3] Entire Term of HCP/NCCP Implementation			
Inventory Block	**Number of Disturbance Events[4] (to date)**	**Number of Allowable Silviculture Events (for term)**	**< 500 ac Units of Habitat Harvested (to date)**	**Allowable Limits on < 500 ac Units of Habitat Harvested**
Albion	2	184	50	946
Big River	1	88	0	422
Garcia River	2	121	25	676
Navarro East	3	215	75	1194
Navarro West	2	115	5	641
Noyo	5	135	0	682
Rockport	10	350	80	1616
South Coast	3	116	0	578
Total	28	1324	10	6754

D.7.5 Assessment of take: marbled murrelet

AOT_MAMU		Acres Disturbed in Marbled Murrelet Habitat				
Area Assessed	**Number of Limited Protection Areas Assessed (to date)**	**Predicted Limited Protection Areas**	**Acres of Potential Disturbance Take[5] (to date)**	**Acres of Allowable Disturbance Take**	**Acres Potential Habitat Take[6]**	**Acres of Allowable Habitat Take**
Plan Area	50	1000	100	15,162	40	6406

[3] In these disturbance events, harvest comes within 1000 ft of an activity center of a northern spotted owl with limited protection during breeding season. The table shows the acres of habitat affected within that buffer.
[4] This is the number of times a harvest event occurs within an individual stand which is within 1000 ft of an activity center of a northern spotted owl.
[5] Acres within a 500-ft buffer surrounding a potential murrelet tree affected by silvicultural events during marbled murrelet breeding season
[6] Acres within a 300-ft buffer surrounding a potential murrelet tree affected by silvicultural events during marbled murrelet breeding season

D.7.6 Assessment of take: Point Arena mountain beaver

AOT_PAMB	Acres Harvested within Burrow Systems of Point Arena Mountain Beaver (PAMB)			
	HCP/NCCP Implementation			
Area	Total Acres Harvested (2020)	Cumulative Acres Harvested (2010-2020)	Allowable Harvest Limit (2010-2020)	% Allowable Harvest Limit (2010-2020)
PAMB assessment area	1	1	1.4	71%

D.7.7 Assessment of take: covered rare plants

AOT_CRP	Take Analysis for Covered Plants with Known Occurrences in the Plan Area				
Common Name	Scientific Name	MC	Core Area Radius (ft)	Allowable Potential Take (ac)	Acres of Potential Take (as of 2011)
Humboldt milk-vetch	*Astragalus agnicidus*	na	50	51.1	10
small groundcone	*Kopsiopsis hookeri*	1	150	0.0	0
swamp harebell	*Campanula californica*	3	50	1.68	0
Oregon goldthreads	*Coptis laciniata*	2	50	0.0	0
pygmy cypress	*Hesperocyparis pygmaea*	4	50	0.76	0
coast lily	*Lilium maritimum*	1	150	0.59	0
Bolander's beach pine	*Pinus contorta* ssp. *bolanderi*	4	50	0.0	0
white-flowered rein orchid	*Piperia candida*	2	50	0.07	0
North Coast semaphore grass	*Pleuropogon hooverianus*	1	150	2.77	0.1

D.8 Finances

The President of MRC will deliver to the wildlife agencies a letter verifying that we have established or maintained an accounting reserve in an amount adequate to implement the HCP/NCCP for that fiscal year. In addition, we will provide a report from an independent auditor confirming that MRC has established or maintained such reserve. The amount of the accounting reserve will reflect the amount shown in the annual budget. In no event will the amount be less than $2,000,000. MRC may draw from the accounting reserve to implement the HCP/NCCP.

D.9 Rough Proportionality

The number of acres on which MRC implements conservation and mitigation each year will meet or exceed the number of acres on which we conduct timber harvest and other covered activities (see section 7.10.1). MRC will include in each annual report the number of acres on which timber harvest occurs and the number of acres on which we implemented HCP/NCCP conservation measures, as well as other conservation efforts. We will deliver the report to the wildlife agencies electronically on or before January 31st of each year of the HCP/NCCP.

Proportionality-010 **01/31/2013**

MENDOCINO REDWOOD COMPANY
Ukiah, CA
HCP/NCCP Compliance Report
Proportionality of Impacts to Conservation Efforts

Impact	Level	Conservation	Level
•Volume harvested	30 mmbf	•Annual growth inventory	95 mmbf
•Acres harvested	7,500 ac	•Acres retained in NSO cores	5,000
•Miles of new road construction	4.1	•Acres – uncommon communities	4,500
•Number of new stream crossings	22	•Number of wildlife trees retained	4,500
▪Class I	1		
▪Large Class II	4		
▪Small Class II	7		
▪Class III	10		
•Miles of stream with wood added	5	•Volume of controlled sediment	30,000 yd^3
•Miles of fish habitat opened up	3		
		•Cost of sediment control	$1 million
		•Number of trees planted	400,000
		•Acres preserved in LACMA	1,237
		•Acres maintained in MHRS	122
		•Pieces of wood added to streams	50
		•Number of fish barriers removed	20
		•Miles of road decommissioned	4.1
		•Miles of road upgraded to HCP standards	15.2

Appendix E

Roads, Landings, and Skid Trails

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E. ROADS, LANDINGS, AND SKID TRAILS

E.1 Overview

Standards are practices from which MRC will not deviate unless one of the following conditions applies:

- MRC obtains approval of the wildlife agencies for explicit alternatives as described in Appendix E and in chapters 8-11 of our *HCP/NCCP*.
- MRC requires a minor modification or major amendment to the HCP/NCCP as described in section 1.13 and in Appendix A, *Implementation Agreement*.
- MRC applies adaptive management as described in Chapter 13, *Monitoring and Adaptive Management*.

Considerations are preferable methods that guide our choices of operation. The conservation measures specified in chapters 8-11 apply in addition to the standards and considerations presented in this appendix.

MRC adheres to standards for

- Design, construction, inspection, reconstruction, maintenance, decommissioning, and use of roads, skid trails, and landings.
- Minimization of road and watercourse crossing density in the plan area.
- Water drafting from watercourses or ponds.

Sections E.2 through E.6 address roads, landings, and watercourse crossings; section E.7, water drafting; and section E.8, skid trails and yarding.

E.2 Standards and Considerations for Road and Landing Design

Poor road design contributes to a significant percentage of mass soil movement and surface erosion on managed forestlands. Proper design of roads and landings prior to construction or reconstruction, therefore, can eliminate many potential erosion problems and environmental impacts. An efficient road system will minimize

- Hydrologic connectivity.
- Point source and surface erosion.
- Probability of mass wasting.
- Maintenance and construction requirements and costs.

MRC follows standards in all road and landing designs. We developed them from "state of the art" methods in the California Forest Practice Rules and the Handbook for Forest and Ranch Roads (Weaver and Hagans 1994), as well as from the experience of MRC road managers. Along with these core methods, MRC may incorporate information from Environmental Hazard Rating Reports (EHRs), the California Salmonid Stream Habitat Restoration Manual, and other data resources such as soil K factors. In addition, with the concurrence of the wildlife agencies, we will apply new technology and science as it becomes available from government, industry, or academic sources. Our intent is to continually improve sediment control as long as the new methods are financially acceptable.

E.2.1 Standards for road classification

1. **Permanent**: a road planned and constructed as an all-season component of the MRC transportation system. These roads, which are generally main haul roads out of a tract, have

a. Surfaces suitable for trucks to haul forest products throughout the entire winter period.
b. Permanent drainage structures at watercourse crossings to prevent turbid water from entering streams.
c. Year-round use.

2. **Seasona**l: a road planned and constructed as a seasonal_component of the MRC transportation system.
   a. Commercial hauling is discontinued during the winter period, except when the risk of sediment delivery is low; for example, hauling may occur during the winter period on seasonal ridge roads which have no watercourse crossings and are hydrologically disconnected from any watercourse.
   b. Access is for fire control, forest management, occasional harvesting of minor forest products, and other necessary activities.
   c. Permanent drainage structures are located at watercourse crossings.
   d. Moderate use occurs during the dry season.
3. **Temporary**: a road used only during timber operations. These roads, which are not main haul roads out of a tract, have
   a. Surfaces adequate for seasonal logging.
   b. Drainage structures, if any, which will be removed prior to the winter period or designed to be self-maintaining.
   c. Low, sporadic use which periodically can become more intense.
4. **Decommissioned**: a road permanently removed from use. These roads
   a. Are impassable to any motorized vehicle.
   b. Provide permanent, maintenance-free drainage.
   c. Minimize concentration of runoff, soil erosion, and slope instability.
   d. Promote native conifer regeneration.
5. **Historic:** a road built before 1972 that is currently impassable, may not have been actively decommissioned, and for which there are no current or future plans to manage as part of the road system. These roads
   a. Will not be opened, rehabilitated, or used, based on a review of the sediment delivery consequences and feasibility of repair.

      EXAMPLE
      MRC will not open and fix an historic road if doing so will deliver more sediment than leaving the road in its current condition.
   b. Will include railroad grades from historic logging that are not currently converted to a haul road.
6. **Mainline:** major arteries for log transportation that are generally used at least 3 out of every 5 years. A mainline road is
   a. Typically a permanent road, but can be seasonal.
   b. Exempt from conservation measures for noise disturbance.
   c. Mapped in the *HCP/NCCP Atlas*.

E.2.2 Standards for laying out roads and landings

1. Minimize watercourse crossings.
2. Follow the standards (C§8.2.3.1.8-1 and C§8.2.3.2.5-1) for road use and construction in AMZs:

   EEZ
   - MRC may use and maintain existing roads.

   Class I, Large Class II, and Small Class II
   - MRC may construct new roads and watercourse approaches within an AMZ if
     - The road does not parallel a watercourse.

- Each approach on either side of a watercourse does not exceed 200 ft in Class I and Large Class II AMZ and 150 ft in Small Class II AMZ.

▪ MRC may construct new roads exceeding 200 ft in the AMZ if
- The road is not associated with a watercourse crossing.
- The conservation measures in C§8.2.3.1.8-1 and C§8.2.3.2.5-1 are applied.

Class III

▪ MRC may construct new truck road crossings.
▪ MRC may construct new roads that do not parallel an AMZ.

3. Set aside "key piece size" logs from all trees felled for new road construction within the AMZ of inner and middle bands of Class I and Large Class II watercourses and within the AMZ of small Class II watercourses; place the logs either in the vicinity of the new facilities or near watercourse sections deficient in LWD.
4. Do not create new landings in the AMZ unless their specific placement has a lower risk for sediment delivery than other locations outside the AMZ; preferably allow only temporary landings.
5. Follow the standards (C§8.2.1.8-1 and C§8.2.3.5-1) for construction of new landings within a Class I, Class II or Class III AMZ and consult with the wildlife agencies prior to construction.
6. Do not construct roads near the bottoms of steep and narrow canyons or in areas with high hazard for mass wasting unless (a) MRC obtains approval of both a California Licensed Geologist and an individual knowledgeable in the relevant aquatic resources and (b) placement of the road at this point has a lower risk for sediment delivery than placement at other locations.
7. Use logging systems that reduce excavation for roads and landings or placement of fills from roads and landings on dormant or historically active mass wasting features.
8. Do not construct roads on inner gorge slopes of Class I or Class II watercourses unless
   ▪ MRC notifies the wildlife agencies and CGS 60 days prior to submittal of a THP that proposes road construction across an inner gorge.
   ▪ MRC includes with the THP a report submitted by a California PG/CEG of their investigation, evaluations, and recommendations according to Note 45 guidelines.
   ▪ MRC either resolves any concerns raised by the wildlife agencies within 60 days of their receipt of the MRC notification or the wildlife agencies do not contact MRC within those 60 days.
9. Do not construct roads or landings on historically active mass wasting features without the approval of both a California Licensed Geologist and an individual knowledgeable in the relevant aquatic resources.
10. Avoid multiple cuts (i.e., switchbacks) if a hillslope is greater than 50%, unless working with a professional geologist.

E.2.3 Considerations in laying out roads and landings

1. Design road networks systematically to minimize total mileage.
2. Make road design conform to topography to minimize disturbance to the natural environment.
3. Do not construct roads through seeps, springs, or wet meadows unless the route is the only alternative that will minimize disturbance to these and other adjacent topographical features. Consult with MRC wildlife biologists prior to operations to determine if covered species are using the topographical feature. Drain seeps, springs, or wet meadows as

close as possible to their original site.

4. Build roads on natural benches, flat slopes, and areas of stable soils using soil type (K-factor) maps to minimize effects on watercourses.
5. Limit landings to the fewest number necessary to conduct yarding operations, so there will be the least amount of stand damage.
6. Restrict landings to the minimum size necessary, based on equipment and worker safety requirements.
7. Select road design consistent with the yarding systems used.
8. Design roads to avoid, if feasible, other sensitive biological and habitat resources, namely plants, fish, and wildlife, in addition to the considerations given above.
9. Avoid multiple cuts (i.e., switchbacks) if a hillslope is greater than 50%, unless working with a professional geologist.

E.2.4 Standards for road prism

1. Construct new seasonal and temporary roads as single lanes, not to exceed 16 ft. (4.8 m) in width except where required below.
2. Construct traveled surfaces to a maximum width of 14 ft (3.6 m) unless MRC requires additional width for (a) alignment, (b) safety, and (c) equipment.
3. Narrow existing roads to a maximum width of 14 ft (3.6 m) at controllable erosion sites.
4. Locate turnouts at reasonable intervals along the road alignment and follow all OHSA safety guidelines so that a minimum excavation or fill will be required to increase the road width.
5. Avoid, where feasible, construction of through-cuts (in lengths greater than those specified for water breaks) in AMZs which are hydrologically connected to watercourses; rock through-cuts if such avoidance is infeasible.
6. Do not construct roads with a grade that exceeds 15%, although
    a. MRC can construct pitches of up to 20% for 500 continuous feet (152.4 m).
    b. MRC can exceed these percentages and distances if (i) there is no other access for harvesting of timber when considering sediment production and economic concerns (i.e., steeper road grades equate to less road construction and, therefore, less cost) or (ii) use of a gradient in excess of 20% will reduce road length and avoid a watercourse.
    c. MRC will minimize construction of through-cut road prisms (in lengths greater than those specified for water breaks) on new roads with gradients greater than 15% and, to the extent feasible, will remove through-cuts on existing roads with gradients greater than 15%.
    d. MRC will rock the surface of the through-cut when it is not feasible to limit the through-cut per E.2.4, 6c.
    e. MRC may construct roads that have a gradient ≥20% and a length of 500 ft or more within areas that may deliver sediment to a watercourse as long as we pave the roads to prevent runoff and sediment delivery.
7. Construct or reconstruct roads as full-benched cut (no fill) or remove fill prior to the winter period on slopes over 50% where cutbank stability is not an issue. Dispose of spoils not used in road construction in stable areas outside of an AMZ. Alternatively, construct roads with balanced cuts and fills, properly engineered or compacted in layers not to exceed a depth of 1 ft (.3 m). Optionally, remove fills on decommissioned and

temporary roads with the slopes recontoured prior to the winter period. Refer to E.2.18 for information on spoil disposal.

8. Construct roads on slopes over 40% with key fill material more than 4 ft in thickness unless an alternative design is proposed by a California Registered Geologist or the road is constructed as full-benched (E.2.4, #8).
9. End-haul materials to a stable location and, when slopes are over 50%, ensure that location is more than 100 ft from the boundary of an AMZ.
10. Balance a road's cut-volume with its fill-volume, when roads are not full-bench construction.
11. Design cut slopes to minimize exposure of mineral soil through use of the maximum grade that will ensure hill-slope stability.
12. Employ maximum feasible road grades to limit road lengths in AMZs.
13. Give preference to an out-sloped road prism as the design standard for all roads.
14. Incorporate waterbreaks, such as rolling dips or waterbars, into out-sloped road prism design.
15. Use in-sloped roads only where necessary to divert road drainage from an unstable area on the outside of a road or to allow for safe hauling operations.
16. Use an insloped road prism when it is necessary to protect fill slopes (i.e., permanent water crossings) or prevent mass wasting from concentrated road drainage. On existing insloped roads with ditch-relief culverts, space the culverts along the road no more than 600-800 ft apart on road segments with gradients less than 4% or 400-600 ft apart on road segments with gradients greater than 4%. Shorten the spacing or re-locate the culvert, if gullies occur.
17. Convert insloped roads to out-sloped, if feasible.
18. Use crowned road prisms with ditches and ditch relief culverts on roads with flatter slopes and large traffic loads or on fills requiring a high level of road surface drainage.
19. Use straw mulch, slash, or equivalent material on fill faces within an AMZ (E.10).
20. Minimize through-cuts, especially long and steep cuts.

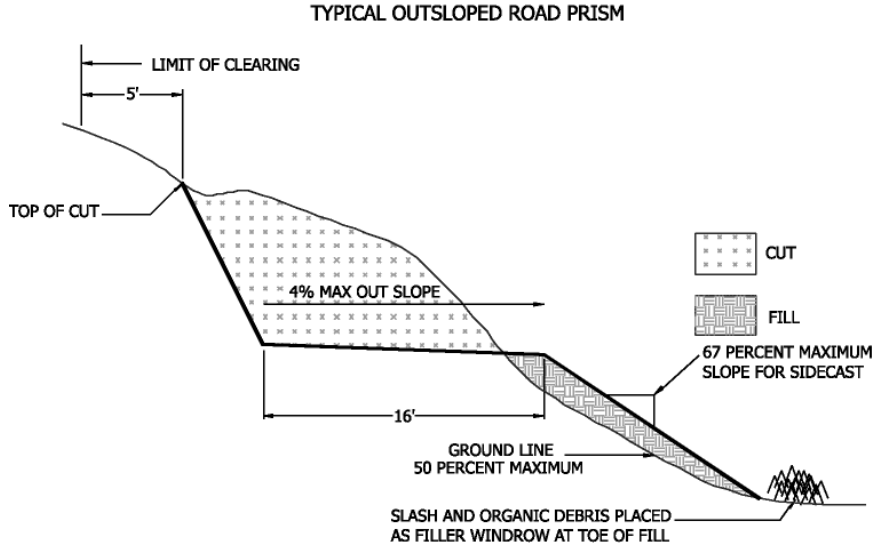

Figure E-1 Road Prism Diagram

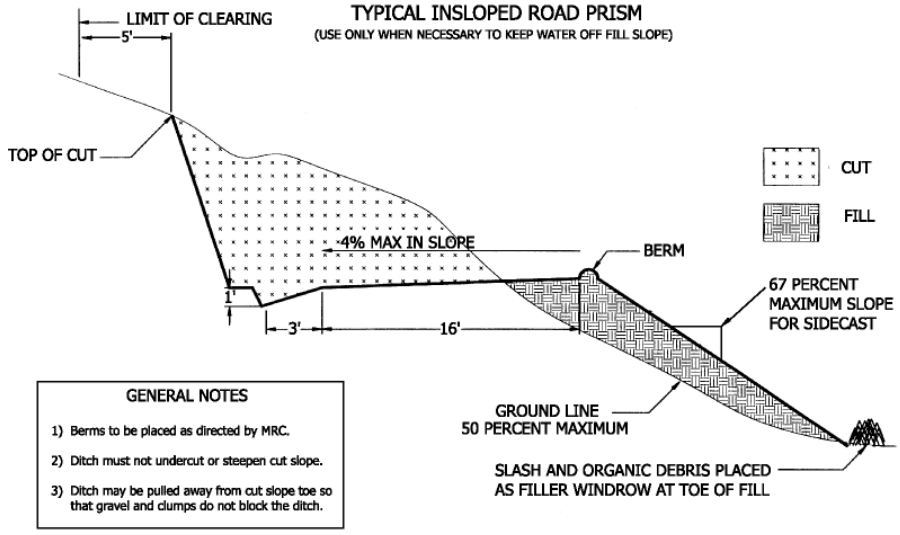

Figure E-2 Insloped Road Prism Diagram

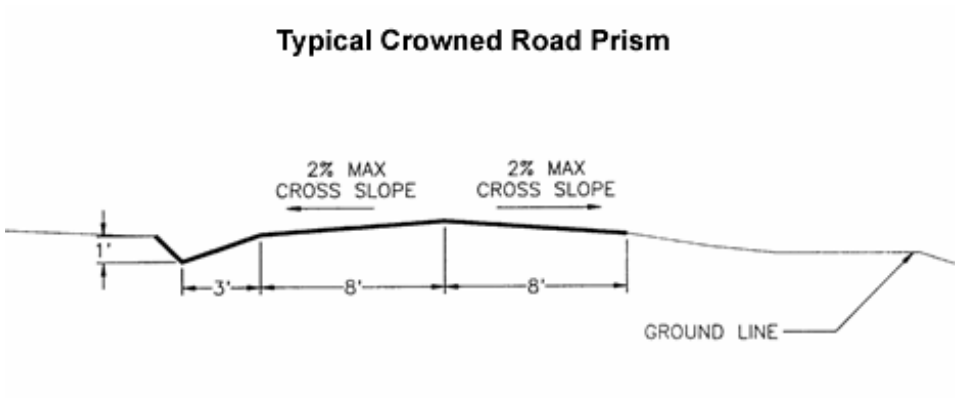

Figure E-3 Crowned Road Prism Diagram

E.2.5 Standards for road and landing surfaces

1. Ensure that rock used on road surfaces is of sufficient competence and depth based on the season, timing, and intensity of use and is not a source of sediment.
2. Stabilize road surfaces and inside road ditches within the AMZ to prevent sediment delivery (E.10):
    a. Surface permanent roads within the inner and middle bands of Class I and Large Class II AMZ or within the AMZ of a Small Class II or Class III watercourses with rock or pavement to minimize fine sediment discharging into watercourses.
    b. Rock or mulch with straw seasonal and temporary roads used during the year which are within the AMZ and without anticipated winter access.
    c. Install waterbars on all other roads in the AMZ with anticipated winter access; space the waterbars at 50 ft intervals for grades over 5% and at 75 ft intervals for grades below 5%. Place additional filters (straw or slash) on outlets of waterbars or installed sumps. Lay 5 ft of straw along the drain side of a road and shape the road to minimize water concentration.

NOTE
The wildlife agencies or MRC may evaluate sediment delivery resulting from these conditions. If the amount of delivery from these conditions would exceed the amount from rocking the road, MRC will instigate alternative measures that are equivalent to rocking or straw mulching during winter; for example, MRC may rock a crossing or mulch an entire road surface. As new technology or techniques become available for determining sediment delivery, the wildlife agencies or MRC may consider their possible use within the plan area.

3. Treat landings within an AMZ per E.5.1 prior to October 15th or per winter standards (E.6.3 to E.6.5) after October 15th and adhere to the following standards for landing use within an AMZ:

Class I and Class II

- MRC may use an existing landing that does not require any reconstruction, if relevant conservation measures (C§8.2.3.1.8-1) are applied.

- MRC may construct new landings if relevant conservation measures (C§8.2.3.1.8-1) are applied and the wildlife agencies concur.

Class III

- MRC may use stable existing landings.
- MRC may construct new landings if relevant conservation measures (C§8.2.3.3.5-2) are applied and the wildlife agencies concur.

4. Surface permanent roads with rock or pavement to a minimum rock depth of 6 in. (15 cm) in order to allow year-round use.
5. Surface approaches to drafting locations on a watercourse with rock to avoid generation of sediment unless the approach is within the bankfull channel (i.e., on a gravel bar).
6. Surface roads used for log or rock hauling during the winter period with rock or pavement unless (a) the road does not cross a watercourse, (b) the road does not drain to a watercourse, and (c) the road is greater than 200 ft from a watercourse.
7. Treat the running surfaces of roads used for timber operations, e.g., by rocking, watering, chemically treating, asphalting, and oiling, to prevent excessive loss of road surface materials.
8. Do not allow oil, asphalt, or chemical treatments to run into a watercourse.
9. Do not store or place oil, asphalt, or chemicals where potential spillage or leakage could run into a watercourse.

E.2.6 Standards for road and landing surface drainage

1. Use out-sloped roads with rolling dips as the preferred drainage structure for permanent and seasonal roads with grades less than 8% (Table E-1).[1]
2. Use suitable energy dissipators (i.e., durable material sized to remain in place during high flows) on drainage structures and drainage facilities of roads or landings to prevent discharge on erodible fill or other erodible material.
3. Install slash, rock, rip-rap, or other suitable material prior to winter on the outlet of all road or landing drainage structures within 100 ft of a watercourse and with less than 90% vegetation buffer (i.e., less than 90% of the ground has vegetative cover). This will create a sediment trap or filter for a watercourse.

[1] Rolling dips are not adequate drainage structures for roads with grades over 8%. Road design and construction should locate breaks (i.e., points at which we can flatten the grade) to accommodate rolling dips on grades 9-15%.

4. Locate waterbreaks to prevent road drainage from discharging directly into a watercourse, wet area, seep, or spring, or onto mass wasting hazards. This requires discharge into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible. Construct a waterbreak to provide for unrestricted discharge at its lower end, so that water will be spread and delivery of eroded soils will be minimized.
5. Do not direct drainage from roads or landing surfaces outside of the mass wasting feature, i.e., at or across the head, toe, or lateral margin of known mass wasting features.
6. Drain water that runs from wet areas, seeps, or springs onto a road to a stable location when there is (a) a safety hazard or (b) a risk for damage to road and landing surfaces or (c) potential for increased sediment delivery. Otherwise, do not disturb the wet area, seep, or spring.
7. Do not exceed the distances between waterbreaks outlined in Table E-2. Decrease waterbar spacing at locations where there is evidence that rills or sediment at the waterbar outlets exceed the filter capacity of the site.
8. Avoid concentration of 2 separate drainage areas into 1 channel (i.e., drainage piracy).
9. Construct rolling dips and road relief culverts to discharge water in a manner that prevents creation or enlargement of gullies and subsequent discharge of sediment to a watercourse.

Table E-1 Recommended Rolling Dip Dimensions

% Road Grade	Unload Approach Length (ft)	Reverse Grade Length (ft)	Depth Below Average Road Grade At Discharge Side Of Dip (ft)	Depth Below Average Road Grade At Inside Edge Of Dip (ft)
<6	55	15-20	0.9	0.3
≥6	65	15-20	1.0	0.2

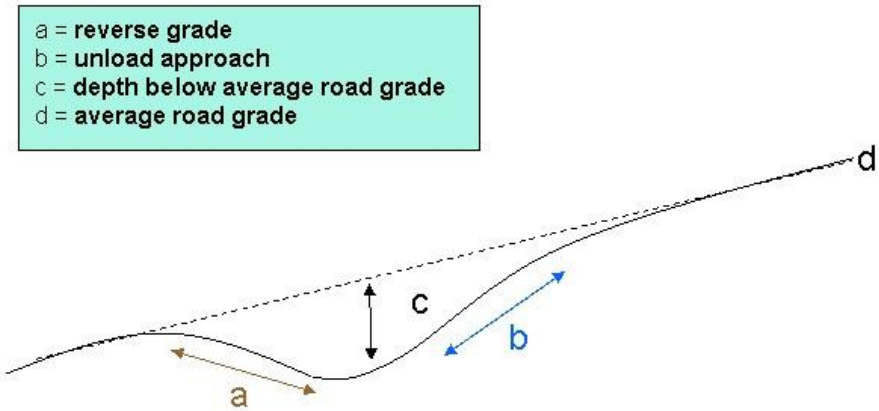

Figure E-4 Rolling Dip

Table E-2 Maximum Distance between Waterbreaks

Estimated Hazard Rating	Road or Trail Gradient			
	<=10%	11-25%	26-50%	>50%
Extreme	100 ft	75 ft	50 ft	50 ft
High	150 ft	100 ft	75 ft	50 ft
Moderate	200 ft	150 ft	100 ft	75 ft
Low	300 ft	200 ft	150 ft	100 ft

E.2.7 Standards for hydrological design

1. Design all new watercourse crossings, such as bridges and culverts[2] which are to remain in place for one or more winter periods (except for vented fords), to a minimum hydraulic capacity in order to safely pass a flow with a return interval of 100 years, including sediment and debris load.
    - Install culverts at the same gradient as the natural stream channel, as feasible. If not feasible, armor outlets and install energy disspators to protect the road fill.
    - Install culverts with a camber or slight hump (between 1.5 to 3 in. per 10 ft of culvert length) to counter the effects of sag once the culvert is buried in the streambed; center the camber under the middle of the pipe, when feasible.
    - Install culverts so that they are aligned parallel to the natural channel to avoid angular deviation.
    - Install culverts so that the width of the constructed channel above the inlet is not excessively wide; the constructed channel should not be more than 2x the diameter of the culvert, if feasible.
    - Use culverts that are at least as wide as the width of the active stream channel (i.e., the zone of active, annual streambed scour and deposition), particularly for small streams.
    - Extend culvert outlets at least 2 ft beyond the fill and preferably at least the length of 1 culvert diameter, if this is greater.
    - Size culverts using a HW:D ratio of 0.67 except for the following circumstances:
        - Culvert diameter is larger than the watercourse channel.
        - Culvert inlet is beveled or mitered to conform to the fillslope and sized to an HW:D ratio of 0.75.
        - Flared metal end section is installed.
        - Field conditions indicate that smaller culverts are likely to be successful.

          NOTE
          This may include measurements of bankfull cross-sectional areas of less than 0.33 of a calculated culvert diameter or other factors that may indicate that 0.67 is not necessary. At these locations, MRC will consult in advance with the wildlife agencies for concurrence on the culvert size. This consultation will include the rationale for not using a HW:D ratio of 0.67.
        - Culvert sizing, as measured on the discharge side of the culvert, increases by 6 in. for every 5 ft of fill above the culvert.

          NOTE
          This condition does not apply if the culvert sizing is adequate to pass a projected 150-year flood event, inclusive of sediment and wood loads.
2. Upgrade, within the initial 30 years of the HCP/NCCP, watercourse culverts that currently could not pass a flow with a return interval of 50 years to one that will pass a

[2] Recommendations for culvert sizing are in Cafferata et al (2004).

flow with a return interval of 100 years. Upgrade all culverts with less than a 50-year return period to ones with a 100-year return period. Upgrade non-functioning culverts that have a 50- to 100-year flow return period to a 100-year flow return period. Leave remaining culverts in place until (a) a road inventory determines they are rusted through; (b) road and crossing inspections indicate they are in need of repair or replacement; (c) they are not passing flood flows; or (d) they are a priority for replacement to meet objectives for controllable erosion. Install diversion protection, when equipment is in the area, on culverts that do not meet a 50-year return flow and that are not scheduled for replacement based on criteria in 8.3.3.2.1, E.2.13, and E.2.14.

NOTE
Non-functioning culverts (a) contain rusted holes; (b) cause frequent aggradation above the inlet; (c) produce excessive scour at the outlet that cannot be mitigated by improved energy dissipation, or (d) no longer allow water to pass through.

3. Over-size, reinforce, or remove drainage structures and erosion-control features before the completion of the timber operation, when there is an immediate risk for sediment delivery. Examples of such risks are large or deep crossing fill volumes; high bed load transport in a watercourse; and high debris transport in a watercourse.
4. Construct or maintain permanent watercourse crossings and associated fills and approaches to prevent diversion of stream overflow down the road and to minimize fill erosion if (a) the drainage structure becomes obstructed; (b) road and crossing inspections indicate they are in need of repair or replacement; (c) they are not passing flood flows; or (d) they are a priority for replacement to meet objectives for controllable erosion.

E.2.8 Considerations for choosing watercourse crossing type

1. Employ temporary crossings when there is no need for pick-up access after completion of operations.

   NOTE
   In MRC experience, this is typically on road segments less than 0.75 miles long.
2. Employ fords, typically on Small Class II and Class III watercourses where log hauling occurs, if the channel is dry and pick-up access is needed after operations.
3. Design and install vented fords so that (a) minimal water flows and (b) all flow passes through the vent during hauling.

   NOTE
   MRC will design vented fords for (a) minimal winter flows; (b) flows through the culvert; (c) high flows; and (d) flows across a road surface. We will use vented fords in locations that may not receive adequate winter monitoring. Because plugging of the vent is likely, its capacity will not contribute to the 100-year design flow of a crossing.
4. Use culverts on Large Class II watercourses or on smaller watercourses if the channel is not dry during log hauling; install culverts so that they are accessible for winter monitoring and minor winter maintenance.
5. Give preference to bridges as the crossing device for all Class I watercourses.

   NOTE
   Consider use of bridges when other structures are not feasible or when a watercourse is at least 4 ft wide.

E.2.9 Standards for temporary watercourse crossings

1. Refer to standards in the MSAA.
2. Re-install temporary Class II and Class III crossings, which require activity in the active channel, after April 1, if the crossing is dry; otherwise, re-install the temporary crossings when the channel is dry or after May 15, whichever condition occurs first. Remove the temporary crossings before the threshold for cumulative precipitation is met.

NOTE
For temporary crossings installed prior to June 1, size the pipes to convey a 50-year storm.

3. Install temporary crossings with culverts on Class I watercourses after June 1.
4. Surface log stringer bridges with a layer of rock over filter fabric or straw to prevent any material from entering the active channel during use.
5. Do not install temporary crossings or construct watercourse crossing or upgrades on Class I watercourses prior to June 15 unless there is no activity within the channel; for example, MRC may place a bridge upon constructed abutments.
6. Size temporary crossings on Class I watercourses, installed before June 1, to pass a 50-year flow.
7. Construct temporary crossings on Class I watercourses to allow for movement of juvenile anadromous salmonids upstream or downstream of the crossing.
8. Use temporary crossings up to October 15; use of temporary crossings can occur after October 15 but they must adhere to the standards for the early winter period or to prescriptions within the MSAA.
9. Install culverts with rock or log fill when it is difficult to remove all fill material from locations that could deliver to a watercourse (e.g., watercourses with deep, incised, steep, or rough channel bottoms) or from flow that could transport fill downstream. Ensure culverts are of sufficient size to accommodate the largest projected flow during the period of their intended use. Clean or wash rock fill so that it is free of soil material. Construct crossings with log fill so that they can be removed with minimal disturbance to streambeds and banks. Cover log fills with filter fabric as well as straw mats or rock; surface the road with a local topfill. Excavate the top fill, prior to removal, with mechanized equipment or hand tools, as necessary, and place the fill where it will not enter the channel. Remove the logs so as to minimize further disturbance to the banks. Employ an alternative process meeting the same goals, if CDFG gives approval in advance.
10. Pump or divert water around a temporary crossing to prevent sediment from being carried down to a watercourse during the installation or removal process.
11. Restore, after use, the watercourse channel at the site of the temporary watercourse crossing to its approximate original configuration with all fill material removed from the site except for alluvial gravels.
12. Excavate fills in the watercourse crossing to form a channel that is wider than the natural channel and as close as possible to the natural watercourse grade and orientation.
13. Slope excavated material, and any resulting cut bank, away from the channel. Stabilize it by seeding, mulching, rocking, or other suitable treatment (see E.10) in order to prevent slumping and soil erosion.
14. Restore aquatic habitat features (e.g., LWD and boulders) removed during installation of temporary crossings or replace them in equal quantities on-site or near-site.
15. Re-spread, after culvert removal, alluvial gravels to approximate conditions prior to culvert placement.

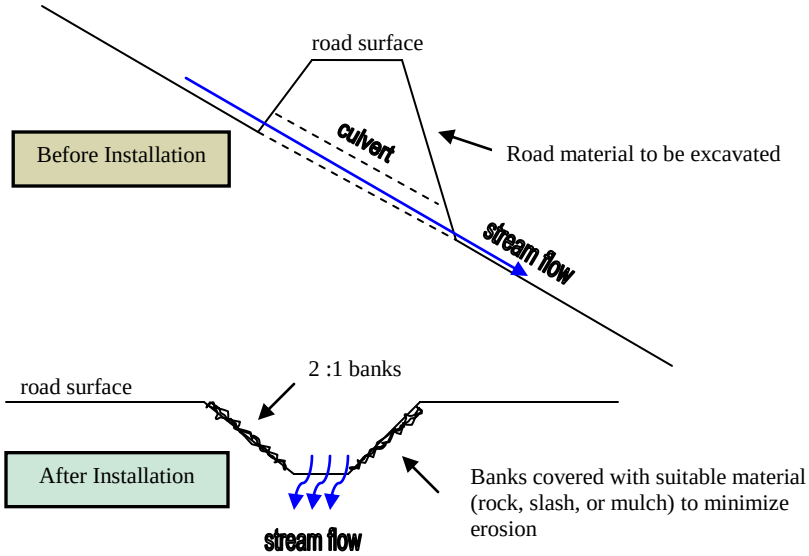

Figure E-5 Installation of Temporary Watercourse Crossing

E.2.10 Standards for fords

1. Refer to standards in the MSAA.
2. Do not install fords on Class I watercourses, except in very unique circumstances specified within the MSAA.
3. Do not haul logs or rock over a ford when there is flowing water across the surface, although light pick-up traffic is acceptable; allow an exception in the case of Class I fords, as specified in the MSAA.
4. Limit access over Class II fords for timber management to dry conditions in the watercourses during hauling periods. Limit use to ATVs or pick-ups, if conditions are not dry or if the running surface will be dried by installation of a vented ford or placement of rock over a temporary pipe.
5. Place a culvert, rock drain, or other water conveyance facility in Class II or Class III fords to convey sub-surface flow through the fill of the rocked ford if there is evidence of significant subsurface flow (i.e., exposed soil pipes above, at, or below the crossing) or evidence of year-round water flow from upstream seeps or springs.
6. Build a dip in the road at the axis of the rocked ford. Dish out the outside face of the fill material at the ford and armor it with rock large enough to withstand a 100-year flow. Size the rock to be non-transportable; rock size should exceed the size of the substrate upstream and downstream of the crossing under similar channel conditions (gradient, confinement, etc.).
7. Construct fords by excavating beneath the roadbed to form an exaggerated dip and spillway under the crossing. Employ the maximum feasible grades in the dip to allow the desired access for ATVs, pick-ups, and log trucks and to minimize the fill needed for the crossing. Provide in the final road alignment a dip with a cross sectional area greater than that required for a culvert at the same location (Table E-3).

Table E-3 Minimum Outlet Sizing at Permanent Fords

100-year Pipe Diameter (in.)	Equivalent Area (ft^2)	Average Design Depth (ft)	Design Width (ft)
18	2	0.33	10
24	4	0.33	20
36	8	0.50	25
48	13	0.50	30
54	16	0.60	35
60	20	0.75	40
72	29	0.75	45
80	35	1.00	50
92	47	1.00	55

8. Surface the road with rock to at least a 6 in. (15 cm) depth. Armor the bed of the road with rock extending past the width of the dip (Table E-4).
9. Place a culvert, rock drain, or other water conveyance in the road fill to convey sub-surface flow through the fill of the rocked ford.
10. Rock the road surface for a distance of at least 5 times the channel width. If the channel width is 2 ft, for example, rock 10 ft on each side of the channel; for well-traveled roads, rock 25 ft on each side of the channel. Determine the channel width upstream of the crossing. Use at least 4-inch rocks laid to a depth of 6 in. on the road surface; compact the rock into the channel at the crossing.
11. Ensure that the ford fill is composed of competent rock, generally greater than 3 in. and containing less than 20% fines for crossings where (a) the drainage area is greater than 75 ac (measured at the crossing); (b) large amounts of fill (i.e., more than 100 yds^3) are required; or (c) other on-site factors exist that require a heightened level of concern (e.g., a high likelihood of mass wasting or a highly unstable channel above the crossing).
12. Armor the road surface, road edge, and fill face wide enough to prevent flows from circumventing the channel and armored face, as well as from back-cutting the road. Include in the width the full extent of the road's outside edge that may receive flow if the channel adjusts after operations. Allow rock armoring to extend 2-6 in. above the outside edge of the road surface, but include a low point to control channel movements at the spillway thalweg.
13. Armor the downstream fill face with large rock capable of handling a 100-year flow event. Size the rock to be non-transportable; determine the size by reviewing the stream substrate upstream and downstream of the crossing. Generally, the rock should be 6 – 24 in. with a mean diameter of 12 in. Ensure there is a mix of different size rocks to fill the voids between the large rocks. If a fill face has a slope greater than 50%, place rocks into a deepened keyway at the bottom of the fill prism. Preferably place all keyways at least 24 in. below the outfall stream grade.
14. Do not replace or upgrade existing fords, if the ford is properly functioning.

    NOTE
    A functioning ford does not have significant back-cutting across the road surface and does not divert flows around the armoring on the fill face.

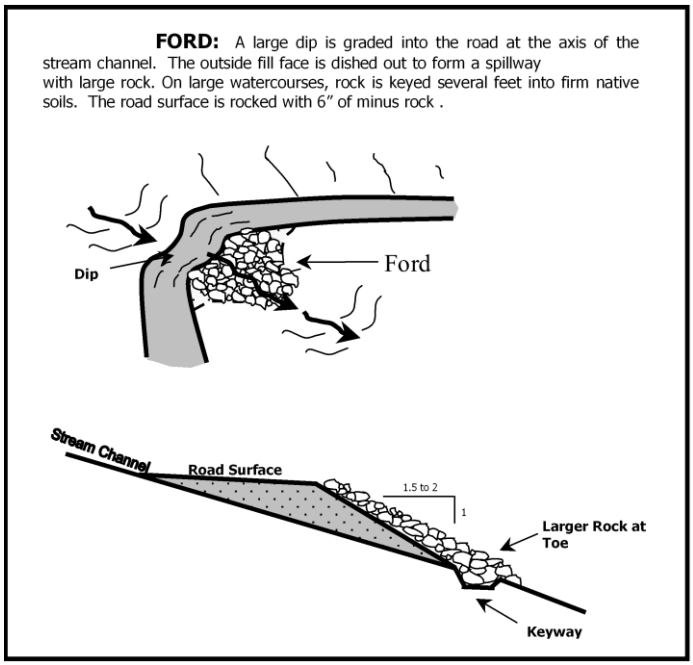

Figure E-6 Ford Diagram

E.2.11 Standards for vented fords

1. Do not haul logs or rock over a vented ford if there is flowing water across the surface; light pick-up traffic is acceptable.
2. Build a dip in the road at the axis of the vented ford. Dish out the outside face of the fill material at the ford and armor it with rock large enough to withstand a 100-year flow. Size the rock to be non-transportable. Determine the size by checking the substrate up and down the stream. Surface the road with rock to a depth of at least a 6 in. (15 cm). Armor the bed of the road with rock that extends past the width of the dip.
3. Design and install vented fords so that (a) minimal water flows, and (b) all flow passes through the vent during hauling. Create the dip at least 1.5 times the width of the upstream channel. Increase the width to slow down the water prior to going over the spill way and to prevent back cutting.

   NOTE
   MRC will use vented fords in locations that may not receive adequate winter monitoring. Because plugging of the vent is likely, its capacity will not contribute to the 100-year design flow of a crossing.
4. Rock the road surface 5 times wider than the channel. If the channel width is 2 ft, for example, rock 10 ft on each side of channel, or, in the case of well-traveled roads, 25 ft on each side of the channel. Determine the channel width upstream of the crossing. Rock the road surface with at least 4-inch rock at an approximate depth of 6 in. Compact the rock into the channel at the crossing
5. Armor the fill faces with rock large enough to accommodate a 100-year flow. Size the rock to be non-transportable, generally 6 -24 in. with a mean diameter of 12 in. Determine the size by checking the substrate up and down the stream. Provide for a mix of different size rocks to fill the voids between any large rocks. Place rocks in a deepened keyway at the bottom of the fill prism, if the downstream fill face is over 50%.
6. Extend, if desirable, rock armor 2-6 in. above the outside edge of the road surface; create the armor wide enough to prevent erosion to the sides of the armoring and back cutting.

7. Size vents (typically culverts) to minimize the fill volume in the crossing while allowing for passage of a 10-year flow. Use multiple pipes (no less than 12 in. in diameter) rather than single pipes in order to minimize fill in the crossing.
8. Ensure that vents are not steeper than the natural gradient of the channel.

E.2.12 Considerations for fords

1. Use rocked fords as the preferred structure for intermittent or ephemeral watercourses or for lightly traveled watercourse crossings.

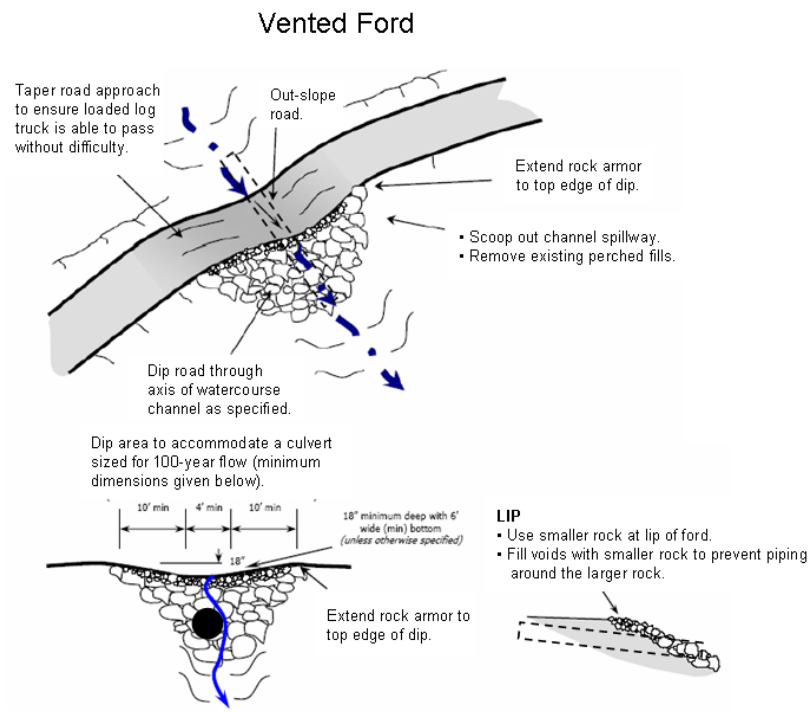

Figure E-7 Vented Ford[3]

E.2.13 Standards for watercourse culverts

1. Refer to conditions of the Master Streambed Alteration Agreement (MSAA).
2. Allow for (a) upstream and downstream passage of fish or listed aquatic species during any life stage and (b) the natural movement of bedload to form a continuous bed through the culvert, when installing permanent culverts in Class I watercourses (NMFS 2001).
3. Install oversize culverts, drop inlets, trash racks, or similar devices when there is evidence that soil and other debris is likely to significantly reduce culvert capacity below design flow in order to minimize culvert blockage.
4. Do not use drop inlets and trash racks on Class I watercourses.
5. Design watercourse culverts so that, if they plug, the water is diverted directly across the road and back into the watercourse channel. If the culverts already exist without this

[3] MRC modified an illustration from an undocumented source to create this graphic. The intent of a "vented ford" is to allow normal year-round low flows to run through the culvert, while larger flows "over-top" the culvert. In larger flows, the vented ford acts as a rocked ford crossing.

design or a site cannot incorporate this design in the construction, then build a rolling dip to catch the diverted water, if the culvert plugs, and send it back into the channel.

6. Place energy dissipaters at the outlet of watercourse culverts and downspouts, unless they hinder fish passage or suitable channel armor is present (i.e., bedrock or boulder channel). The energy dissipaters should be a sufficient distance from the outlet of the culvert to slow the flow and prevent scouring or erosion.
7. Anchor each downspout at the culvert and at its base. Downspouts should not exceed 20 ft (6 m) in length. Anchor downspouts at intervals no greater than 10 ft (3 m). Use a stable anchor that may include, but is not limited to, pipe, t-posts, concrete re-bar, wooden beams, and logs.
8. Ensure that half-round downspouts, if installed, are (a) at least one size larger than the culvert; (b) sized to accommodate the entire design flow from the culvert; (c), in line with the culvert; (d) securely attached to at least 3 ribs in the culvert; and (e) not cut or otherwise modified to create a hinge.
9. Place rock or other suitable armor material around the inlet of a watercourse culvert. Construct rip-rap, when used, to remain in place during 100-year flows and to extend at least as high as the top of the culvert. Extend rip-rap as "wing walls" on inlets for a sufficient distance upstream to prevent bank erosion.
10. Taper or flare inlets on watercourse culverts with diameters greater than 30 in (.7 m).
11. Leave in place culverts with a 50-100 year flow, if they are functioning and subject to periodic inspection (E.2.7, #2).
12. Avoid installation of culverts with angles.
13. Compact fill faces by tractor-walking, if site-specific conditions permit; otherwise, compact fill faces with a vibra-compacter, an excavator, or equivalent tools.
14. Slash or mulch fill faces; do not exceed an 80% slope, unless the fill faces are armored with rock, rip-rap, or concrete blocks.
15. Protect fill faces at inlets and outlets, which will be exposed to the design flow, from stream flow erosion by armoring that consists of graded rock rip-rap or other non-erodible material and by design (e.g., concrete head wall). Rip-rap culvert outfalls, if necessary, in a U-shaped channel, with clean material of sufficient size to remain in place during a 100-year peak flow event. Set rip-rap in the active channel downstream of the culvert below stream grade in order to allow the natural accumulation and transport of bedload at stream grade.
16. Counter-sink culverts, if the natural channel grade is less than 3%, in order to allow for aggradation in the channel.

E.2.14 Standards for ditch-relief culverts

1. Ensure new ditch-relief culverts are at least 18 in. (45 cm) in diameter.
2. Place ditch-relief culverts at least at a grade 2% greater than the contributing road prism or a minimum of 10% so they are self-cleaning. Place the culverts with the inlet at a skew of 30-35% to the normal road alignment in order to improve water flow into the culvert.
3. Space ditch-relief culverts 600-800 ft apart (182-243 m) on road segments with gradients less than 4%.
4. Space ditch-relief culverts 400-600 ft apart (121-182 m) on road segments with gradients greater than 4%.
5. Allow no more than 150 ft between ditch-relief culverts, if a road has more than a 10% gradient and is within 300 ft of a watercourse.
6. Create less distance between ditch-relief culverts if soils or geology indicate that discharge may create a new channel or scour an existing channel.

7. Ensure (a) that spacing between ditch-relief culverts is sufficient to prevent water discharge onto road-fill and (b) that there is enough filter material to prevent sediment transport to a watercourse.
8. Place energy dissipaters (i.e., durable material sized to remain in place during high flows) at the outlet of ditch-relief culverts or downspouts. Extend energy dissipaters a sufficient distance from the outlet of the culvert to slow the flow and prevent scouring or erosion unless the culvert discharges to a stable location with little risk of surface or gully erosion.
9. Design ditch-relief culverts with controllable sediment so that, if they plug, the water is diverted directly across the road. If the culvert already exists without this design or a site cannot incorporate this design in the construction, then build, if feasible, a rolling dip to catch the diverted water (in the event the culvert plugs) and send it across the road.
10. Use downspouts if there is annual monitoring, with maintenance performed as needed. Anchor each downspout at the culvert and at its base. Downspouts should not exceed 20 ft (6 m) in length. Anchor downspouts at intervals no greater than 10 ft (3 m) using a stable anchor. This may include, but is not limited to, pipe, t-posts, concrete re-bar, wooden beams, and logs.

E.2.15 Standards for bridges

1. Follow standards set forth in the MSAA.
2. Select bridge spans that avoid encroachment of bridge abutments or piers into floodprone areas, unless there are other design considerations such as the need for protecting large amounts of fill for the abutments. Consult with the wildlife agencies prior to construction, if there are design considerations like the one cited.
3. Suspend bridges, where possible during installation, across the watercourse using cables and heavy equipment or cables and corner blocks to avoid altering the stream bed and bank and crossing the wetted channel with heavy equipment.
4. Place the bottom or toe of the bridge abutment so that the channel of the watercourse under the bridge is at least 1.25 times the width of the bankfull channel.
5. Provide erosion protection for bridge abutments, piers, and watercourse banks influenced by the hydraulic conditions of the bridge, at least up to the level of a 100-year flow or to the edge of the terrace or the topographic bench the bridge rests on.
6. Dip built-up approaches to allow floods to flow over and around them.
7. Align bridges perpendicular to the channel unless the road approach would require additional cutting or soil-disturbance in the hillslope to facilitate this alignment.
8. Design approaches to bridges to prevent surface runoff and sediment from draining directly onto the bridge deck or into the watercourse. Incorporate road drainage into the bridge approaches to divert road runoff and filter sediments. Rock or pave approaches to prevent sediments from draining onto the bridge deck or into the watercourse.
9. Incorporate guardrails or bumper rails into the bridge to safeguard bridge traffic.
10. Do not exceed 1:1 grade on bridge abutments unless the abutment is bedrock. A bridge abutment grade of 2:1 is preferable. If bridge abutment approaches exceed a 1:1 grade, then use a retaining wall or other geotechnical design to stabilize the abutment slope.
11. Ensure that the freeboard (i.e., the distance between the water level and the lowest part of a bridge superstructure) exceeds 100-year flow levels, unless there are other design considerations, approved by the wildlife agencies, such as the need for large amounts of fill for the abutments.
12. Ensure that the surfacing material for log stringer bridges is screened, washed, durable, clean rock if it is not otherwise planked, plated, or paved; erect side-boards to retain the surfacing materials on the running surface.

E.2.16 Considerations for bridges

1. Give preference to a bridge as a watercourse crossing on a Class I streams.

   NOTE
   Over 90% of the time, MRC gives preference to a bridge for a Class I crossing.
2. Consider a bridge for streams other than Class I.
3. Consider a bridge if a watercourse crossing requires a culvert with 48 in. (1.2m) or greater diameter.

E.2.17 Standards for fill material for landings

1. Do not place fill for landings on slopes greater than 50%, unless there is no risk for sediment delivery.
2. Apply these standards on slopes greater than 40%, with fills greater than 4 ft (1.2 m) in vertical height at the outside of the landing:
   a. Construct fills on a bench, excavated at the proposed toe and wide enough to compact the first lift.
   b. Compact fills to prevent sediment discharge in approximately 1 ft (.3 m) lift from the toe to the finished grade; compact fills, if possible, to 90%.
   c. Preclude all organic material from fills.

E.2.18 Standards for spoil piles, borrow areas, or soil disposal

1. Control erosion in areas where there are large expanses of bare soil, such as spoil piles, borrow sites, and rock pits. Proper location, excavation and topographic development of spoil disposal sites and rock pits are key elements in assuring controlled drainage and in minimizing erosion and sediment problems. When placed on slopes, spread soils in lifts and compact them to develop strength in the materials.
2. Do not locate spoil piles (a) near streams or where sidecast, tailing, or sediment-laden runoff can reach a watercourse or (b) within an AMZ unless topography prevents runoff from entering a watercourse.
3. Cover spoil piles in AMZs to minimize risk of sediment delivery to watercourses.
4. Stockpile, if possible, the overburden from a rock pit or borrow area for re-distribution over the site in order to take advantage of an on-site seed-bank.
5. Identify possible disposal sites in advance to minimize impacts to biologically sensitive areas under emergency conditions or routine road maintenance

E.2.19 Standards for rock pits

E.2.19.1 Use of existing rock pits

MRC will excavate, load, sort, crush, blast, or conduct other activities involving rock according to the following standards.

E.2.19.1.1 Restrictions for winter conditions

Early winter

1. Cease operations when there is sufficient precipitation to generate overland flow off the road and deliver sediment to a watercourse.
2. Resume operations only under the following conditions: (a) there has been ½ in. or less rainfall in the previous 24-hour period;[4] and (b) there has been no rain in the current 24-hour period.

[4] As reported by the National Weather Service for Fort Bragg

3. Install drainage structures and erosion control facilities if one of the following conditions apply:
    - **Condition A**
        i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
        ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.
4. Do not remove overburden during periods of soil saturation.
5. Cease removing overburden if 4 cumulative inches of rain has fallen in the water year.

Mid winter

6. Cease operations when there is sufficient precipitation to generate overland flow off the road and deliver sediment to a watercourse.
7. Resume operations only under the following conditions: (a) there has been ½ in. or less rainfall in the previous 24-hour period;[3] and (b) there has been no rain in the current 24-hour period.
8. Install drainage structures and erosion control facilities if one of the following conditions apply:
    - **Condition A**
        i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; **or**
        ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.

Late winter

9. Cease operations when there is sufficient precipitation to generate overland flow off the road and deliver sediment to a watercourse.
10. Resume operations only under the following conditions: (1) there has been ½ in. or less rainfall 48 to 72 hours ago[3]; and (2) there has been no rain for the last 48 hours.
11. Install drainage structures and erosion control facilities if one of the following conditions apply:
    - **Condition A**
        i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
        ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.

Exception to Winter Operating Period

MRC may make an exception to the winter operating times only if we need to immediately prevent sediment delivery to a watercourse where the volume of sediment is greater than the volume produced from rock pit excavation.

E.2.19.1.2 Protection for covered species

1. Refer to the HCP/NCCP conservation measures regarding blasting near habitat of covered species: northern spotted owls (C§10.3.2.3.1-13, C§10.3.2.3.1-32); marbled murrelets (C§10.3.2.3.10-5, C§10.3.2.3.11-4, C§10.3.2.3.12-4), and Point Arena mountain beavers (C§10.3.3.3-11).
2. Refer to Appendices K, *Northern Spotted Owl Data and Protocols*, and Appendix L, *Marbled Murrelet Data and Protocols*.

E.2.19.1.3 Expansion of rock pit footprint

1. Conduct a rare plant survey prior to expansion of a rock pit or storage area for overburden.
2. Follow the survey and protection protocols for covered species described within Chapters 8-11.
3. Prepare an internal Archeological Report similar to those in a THP and record the survey in the MRC GIS.
4. Submit information on discovered sites to a professional archeologist for review and for potential mitigations.
5. Minimize the extent of the disturbed area necessary to produce the required rock material for 3 years or less.
6. Store overburden close to or on site so that it is available for reclamation operations.
7. Store overburden, if feasible, in a pit or below the grade of the rock pit floor to prevent sediment discharge to a watercourse.
8. Mulch overburden stored above the grade of the rock pit floor (E.10).
9. Adhere to the following guidelines for overburden storage if it is not stored in a pit with no run-off to a watercourse:
    a. If the ground slope is 0-30%, store the overburden at least 50 ft from a Class I or Large Class II watercourse.
    b. If the ground slope is 30-50%, store the overburden at least 75 ft from a Class I or Large Class II watercourse.
    c. If the ground slope is more than 50%, store the overburden at least 100 ft from a Class I or Large Class II watercourse.

14. Consult with the wildlife agencies and obtain their approval for creation or expansion of any rock pit within 100 ft of a Class I watercourse or within 75 ft of a Large Class II watercourse.

E.2.19.2 Development of new rock pits

E.2.19.2.1 Pre-development field work

1. Conduct a rare plant survey prior to rock pit development, including in prospective storage areas for overburden.
2. Follow the survey and protection protocols for covered species described within Chapters 8-11.
3. Prepare an internal Archeological Report similar to those in a THP and record the survey in the MRC GIS.
4. Submit information on discovered sites to a professional archeologist for review and for potential mitigations.
5. Avoid, if feasible, establishing new rock pits within the AMZ of a Class I or Class II watercourse. If avoidance is not feasible, submit to the wildlife agencies for their approval site-specific erosion control plans for proposed rock pits within the AMZ of a Class I or Class II watercourse including measures for (a) placement of erosion control structures (i.e., berms, waterbars, catch basins, etc.), (b) storage of

overburden, (c) storage of fuel, and (d) maintenance of heavy equipment. If MRC cannot reach consensus with the wildlife agencies, we will not establish the new rock pit.

E.2.19.2.2 New rock pits

1. Develop rock pits in accordance with the above measures for rock pit use.
2. Permit the removal of small amounts of gravel from gravel bars in accordance with the MSAA.
3. Follow the operational standards and restrictions specified in the MSAA.
4. Reclaim rock pits once mining operations are complete, according to site-specific conditions and the intended use of the site.
5. Apply the measures specified in Appendix E, *Roads, Landings and Skid Trails*, if the site is intended for a road or landing; otherwise, slope the site to stable angles.
6. Spread available overburden across the site and use it as a growth medium for planting native species.
7. Develop a site-specific drainage plan that will minimize the risk of sediment entering a watercourse.

E.3 Standards for Road and Landing Construction and Reconstruction

Road or landing construction or reconstruction will follow the design standards specified earlier in this appendix. In addition, the following rules will apply:

1. Follow the guidelines under E.2.3 for new roads within AMZs.
2. Follow the guidelines under E.2.3 and E.2.5 for new landings within AMZs.
3. Adhere to the default conservation measures for a particular terrain stability unit (TSU) identified, on the ground, by an RPF or PG, or for a mass wasting feature on which MRC may construct a road or landing (section 8.3.3).
4. Install the necessary protective structures on all culverts at watercourse crossings in which water is flowing at the time of installation. This should be concurrent with the placement of a crossing's fill material. Install other permanent drainage structures no later than October 15. Adhere to early winter period standards for construction and reconstruction of roads after October 15.
5. Do not bury organic waste, such as uprooted stumps, cull logs, accumulations of limbs and branches, or non-merchantable trees in the main body of road or landing fills. Use this solid waste, if necessary, to provide for downslope sediment filtration except at prepared crossings, including crossing approaches.
6. Restrict clearing limits to 60 ft (18 m) total - approximately, but not always, 30 ft (9 m) on either side of the centerline.[5]
7. Fell any tree over 12 in. (30.5 cm) dbh with more than 25% of the root surface exposed by road or landing construction, if necessary to ensure road safety and slope stability.
8. Construct roads or landings without overhanging banks.
9. Prevent the footing of a road or landing from rotting away by removing or scarifying the organic layer of the soils during road and landing construction (especially on slopes greater than 35%) and later placing the fill.
10. Remove overhanging or unstable concentrations of slash, woody debris, and soil along the downslope edge or face of roads or landings when located on slopes over 50% unless the slash piles are intended for winter burning.

[5] Clearing limits are defined by side slope. Full bench roads on steep slopes need a longer upslope limit than length of cleared area below center line.

11. Seed, plant, mulch, remove, or treat sidecast or fill material with access to a watercourse or lake (see E.10).
12. Ensure that the slope created from sidecast or fill material is no steeper than 65%.

E.4 Standards for Road Inspections and Maintenance

E.4.1 Road inspection[6] schedule

1. Conduct 5 inspections over 5 years after work completion on all seasonal roads and associated road points constructed, reconstructed, or decommissioned (Table E-4).
2. Do not survey sites if decommissioned roads no longer allow equipment access; instead, perform informational surveys on these decommissioned roads within 2 years to document problems for future decommissioning projects addressed as part of adaptive management.[7]
3. Conduct at least 1 inspection of a new temporary road each year for a period of 4 years following construction (Table E-4).
4. Inspect permanent roads annually.
5. Inspect all roads with permanent structures (culverts or bridges) during the road inventory update at 10-year intervals unless a road is decommissioned or has maintenance-free structures.[8]
6. Conduct informal inspections annually. Informal inspections are for roads actively being used beyond the 5-year timeline; MRC will record only problems areas.
7. Make repairs, using hand tools, at the time of discovery, if feasible, or within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings to eliminate the likelihood of related sediment reaching Class I, Class II or Class III waters.
8. Schedule repairs requiring more than hand tools during those times when heavy equipment can access the site—according to winter and wet weather operating guidelines.

Table E-4 Five-Year Road Inspection Schedule

Year	*Inspections*
1	• 3 inspections ▪ 1st inspection after the first significant rainfall or cumulative rainfall of 10 in. in the water year. ▪ 2nd inspection after the first streamflow with a 2-year or greater return interval or after April 1. ▪ 3rd inspection after May 31.
2	• 1 inspection after at least 25 in. of rainfall in the water year. ▪ Problem sites from previous years that have had rehab work done during the summer will follow the same schedule as Year 1
3	• No inspections, unless a large streamflow event occurs (>20 year return)
4	• No inspections, unless a large streamflow event occurs (>20 year return)
5	• 1 inspection after the last significant rain

TABLE NOTE
If a site fails or requires additional heavy equipment work during the inspection period, the 5-year timeline will be reset.

[6] Inspections include viewing roads, landings, and drainage structures and checking that they function as designed (e.g., ensuring downspouts are operative).

[7] This situation occurs when roads have been "re-contoured" to the degree that return access with equipment would essentially require construction of a new road.

[8] Drainage structures that require no maintenance have no controllable erosion and no culverts.

E.4.2 Road and road point maintenance

1. Base decisions for road maintenance on inspections (Table E-3) and on the priority of the road repair (Table E.4).
2. Maintain all roads and road points, constructed or upgraded, at their road class designation (permanent, seasonal, temporary, and abandoned).
3. Do not sidecast material from road grading into watercourses.

E.4.3 Priority maintenance

MRC goals for priority maintenance are to

- Maintain all roads and road points to design standards.
- Comply with intended uses for all active roads and for restored road points.
- Perform restoration and enhancement work, as needed, to bring roads up to current design standards.
- Decommission roads that cannot be brought up to current design standards.

Table E-5 Road Priority Maintenance

Group	Priority Maintenance for Roads and Road Points
1	Roads and road points that have had upgrade or decommissioning work or are identified as having problems.
2	Roads and road points that are in active use by MRC but have had no recent (last 5 years) road work
3	Roads and road points that are not in active use and that MRC road inventory has identified as requiring maintenance.

TABLE NOTE
Groups refer to connected road segments in close proximity to each other. Groups are in order of priority; Group 1 is the highest priority.

Prioritization for maintenance will use the same priority list as road upgrades or decommissioning (8.3.3.2.1) to determine the order of maintenance work within each group. In some situations, a maintenance issue may be addressed from a lower group (i.e., Group 2) prior to finishing all of a higher group (i.e., Group 1). These situations typically occur when it is more efficient to make use of available equipment or personnel at a lower group site in the vicinity of a higher group site.

E.5 Standards for Road and Landing Decommissioning

The proper decommissioning of roads and landings can result in significant sediment reduction. Decommissioning of a road or landing

- Requires long-term maintenance-free drainage.
- Minimizes concentration of runoff, soil erosion, and slope instability.
- Promotes native vegetation regeneration.
- Prevents access by motorized vehicles.

E.5.1 Standards for road, skid trail, and landing decommission

1. Decommission a road, skid trail, or landing, preferably prior to October 15; after October 15, follow the standards for the early-winter period.
2. Notify CDFG is when there is a risk of impacts to stream bed, bank, active channel, or aquatic habitat, including risks of elevated sediment delivery to the bankfull channel.
3. Do not decommission roads in the mid-winter period.

4. Block decommissioned roads, when necessary, using appropriate barriers to prohibit the use of motorized vehicles.
5. Out-slope road, skid trail, and landing surfaces and remove berms, unless (a) doing the work is likely to cause more sediment delivery than not doing the work or (b) doing the work would remove large amounts of established vegetation in close proximity to a watercourse.
6. Remove all watercourse crossings.
7. Employ salvage operations (see Appendix T) when covered fish species are present in Class I watercourses if MRC is decommissioning crossings that require heavy equipment in the water.
8. Excavate fills in the watercourse crossing to form a channel that is as close as possible to the natural watercourse grade and orientation, and that is wider than the natural channel.
9. Slope back excavated material and any resulting cut bank from the channel and stabilize it to prevent slumping and soil erosion. Stabilize this material by seeding, mulching, armoring with rock, or by other suitable treatments (E.10).
10. Re-establish natural flow paths of surface drainage.
11. Pull or shape fills or sidecast, where necessary, to prevent discharge of materials into watercourses.
12. Install appropriate waterbreaks or rolling dips to limit accumulated runoff from the road prism that may create increased erosion. Space waterbreaks according to specifications.
13. Scarify or rip road and landing surfaces to loosen compacted soil and facilitate regeneration, unless advanced regeneration on site is undisturbed by other decommission activities.
14. Ensure that decommissioned roads are re-vegetated by natural or artificial means with woody vegetation within 3 years after the decommissioning.
15. Create a breeding site for red-legged frogs if a decommissioned road had a documented breeding site; the site should be of similar dimensions, created in the most appropriate location, and as close to the original site as possible.
16. Plant a mix of native hardwood and conifer on disturbed areas where erosion can deliver to a watercourse; ensure the mix is appropriate for the vegetation type of the project area and is planted at the same density as in reforestation (conifer) or as occurs naturally (hardwood). Do not re-plant sections of old road bed which do not require decommissioning treatments or roadways that receive excessive shade.

E.6 Standards for Road and Landing Use

The appropriate use of roads, particularly during the winter period, is an important factor in road maintenance and sediment reduction. Road use restrictions are also important for limiting trespassing as well as disturbance and harassment of wildlife. This section presents general road-use restrictions, temporary road restrictions, and winter period restrictions. There are species-specific guidelines for northern spotted owls (C§10.3.1.3.1-10, C§10.3.1.3.1-11, C§10.3.1.3.1-17, C§10.3.1.3.1-27, C§10.3.1.3.1-34) ; for Point Arena mountain beaver (C§10.3.3.3-15, C§10.3.3.3-17, C§10.3.3.3-18); for marbled murrelets (C§10.3.2.3.1-10, C§10.3.2.3.1-14, C§10.3.2.3.1-16, C§10.3.2.3.1-20, C§10.3.2.3.1-30, C§10.3.2.3.1-38); and for red-legged frogs (C§10.2.2.3-2, C§10.2.2.3-3); and coastal tailed frogs (C§10.2.3.3-1). In addition, there are habitat-specific guidelines for wet areas, wetlands, wet meadows, seeps, and springs (C§8.2.3.5.1-1, C§8.2.3.5.1-2, C§8.2.3.5.2-3) and for rare plants (section 11.4.2.3).

E.6.1 Standards for general use

1. Restrict access to roads during the winter period; gates on roads leading into the MRC property will control access.

2. Close temporary roads and associated landings prior to the winter period, unless the guidelines for the early and late winter periods are followed.
3. Permit All Terrain Vehicle (ATV) use on temporary roads during the closure periods.
4. Patrol road closures (gates) and areas with frequent public contact.
5. Repair gates rendered ineffective by vandalism, especially gates where trespassing is prevalent, to reduce unauthorized access.
6. Grant permits for public access to MRC land and roads.[9]
7. Do not haul logs or rock or use heavy equipment on roads where restrictions apply for northern spotted owls (C§10.3.1.3.1-10, C§10.3.1.3.1-11, C§10.3.1.3.1-17, C§10.3.1.3.1-27, C§10.3.1.3.1-34).
8. Do not use heavy equipment or log trucks on seasonal roads during the mid-winter period unless repairs are needed or mid-winter guidelines can be met.
9. Allow the following exceptions to the operating measures for wet weather or winter: (a) hauling on a paved road or (b) use of heavy equipment for immediate road repair to prevent significant sediment delivery if left unattended.
10. Install waterbreaks (Table E.2) on seasonal roads prior to October 15, unless following standards for early and late winter periods:

Early winter	Interval from October 15 until streamflow responds directly to precipitation. This occurs when there is at least 4 in. of cumulative precipitation in the water year.[10]
Mid winter	Interval from the end of early winter to March 31.
Late winter	Interval from April 1 to May 1.

E.6.2 Standards for temporary road use

1. Refer to MSAA and E.2.9 for specific standards of temporary road crossings.
2. Close temporary roads prior to October 15, if feasible.
3. Follow the standards for the early-winter period, if closing temporary roads after October 15.
4. Out-slope temporary road and landing surfaces and remove berms when not in use and prior to the mid-winter period.
5. Remove all watercourse crossings with culverts unless the watercourse crossing is left maintenance-free or there is no controllable erosion.
6. Pull or shape fills or sidecast, where necessary, when a road is not in use to minimize discharge of materials into watercourses due to failure of cuts, fills, or sidecast.
7. Install appropriate waterbreaks or rolling dips when a temporary road is not in use to limit accumulated runoff from the road prism that may increase erosion. Space waterbreaks to specifications in Table E.2.

E.6.3 Standards for early winter period

1. Conduct tractor yarding or use of tractors, graders, excavators, and other heavy equipment for construction of fire breaks, roads, landings, or tractor roads only during extended dry, rainless periods with low antecedent soil wetness (no more than ½ in. of rain in the previous 24-hour period, as reported by the National Weather Service for Fort Bragg) and when soils are not saturated.

[9] The permit process allows MRC to maintain control over where and when the public enters our land, particularly during periods of closure (i.e., winter periods).

[10] A water year begins October 1 of the preceding year and ends September 30. For example, the 2003 water year began in October 1, 2002 and ended September 30, 2003.

2. Do not haul or load logs, construct roads or landings, decommission roads, or use skid trails for a period of 24 hours after ½ in. of rain or more has fallen in the previous 24 hours, as reported by the National Weather Service for Fort Bragg.
3. Install drainage and erosion control facilities on all constructed skid trails and tractor roads prior to sunset if one of the following conditions apply:
    - **Condition A**
        i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
        ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Winter operations have ceased.

4. Provide mulch or cover (E.10) to soil disturbed by road or skid trail construction within the AMZ that exceeds 100 contiguous sq. ft., if one of the following conditions apply:

    - **Condition A**
        iii. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
        iv. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Winter operations have ceased.

5. Keep on hand at the work site materials to mulch or cover exposed soils for immediate deployment during this period.
6. Disturb or remove the organic layer of the soils during road and landing construction especially on slopes greater than 35% and prior to fill placement in order to prevent the footing of the road or landing from rotting away.
7. Limit the size of road, skid trail, and landing use or construction to (a) whatever the operator can complete within 24 hours, including application of all erosion control practices, if the National Weather Service forecasts rainfall for Fort Bragg in the next 3 days or (b) whatever the operator can complete in 3 days if there is no forecast of rain for the days of expected operation..
8. Stop tractor yarding or use of tractors, graders, excavators and other heavy equipment for construction of fire breaks, roads, landings, or tractor roads if (a) 4 in. of cumulative precipitation has occurred within the water year or (b) the National Weather Service forecasts for Fort Bragg a "chance" (30% or more) that precipitation will exceed this rain threshold. Sometimes, in the plan area, this occurs in early October, followed by extended dry periods up to November 15th. In these circumstances MRC may request, with approval of the wildlife agencies, an extension of logging activities until November 15th. This will allow MRC to complete some logging jobs and obviate the need to re-open the road system the following year in order to log the remaining volume.
11. Do not grade more than once to obtain a drier running surface on short lengths of road (i.e., a contiguous length of less than 0.25 miles) before reincorporating any resulting beam back into the road surface; grade at least 24 hours before any forecasted rainfall. Leave all graded materials on the running surface of the road or dispose of them in a place where there is no possibility of delivery to a watercourse. Cease hauling until the road is “truckable,” i.e., in a condition that log trucks can operate, if it is necessary to grade more than ¼ mile.

9. Keep only one skid trail system[11] open per piece of skidding equipment during the early winter periods. Ensure that a skid trail system is not too large, namely that it can have drainage facilities and structures completely installed within 2 hours.
10. Construct new roads or skid trails in sections between watercourse crossing points and install all erosion controls and drainage systems on a section before moving on to construct additional sections.
11. Construct outsloping and rolling dips prior to moving onto the next section of road.
12. Do not construct new roads, skid trails, or landings when precipitation is sufficient to generate overland flow off the road, skid trail, or landing.
13. Haul logs on only one road (for each active landing), if a road has an unrocked surface.
14. Maintain hand-dug erosion control facilities.
15. Install drainage and erosion control facilities on all roads not used for hauling in the mid-winter period and stabilize road surfaces within the AMZ per the E.2.3.
16. Do not load and haul logs or conduct ground-based skidding of logs
    a. When vehicles can create ruts[12] in the surface of a road, skid trail, or landing, i.e., when there is an indication of saturated soil.
    b. When precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.

    NOTE

    - Do not resume road use under the above conditions until and unless the road surface is dry. A dry road is one in which moisture is less than or equal to that found during normal watering (dust abatement) treatments or light rainfall. Further, vehicles are not rutting a road surface or pumping fines causing a visible increase in turbidity in any drainage facility, construction/reconstruction site or road surface, any of which drains directly to Class I, II ,or III waters.
    - Do not apply E.6.3 #17b to small wet segments (i.e., <30 ft (9 m) on an otherwise dry road, except when sediment may potentially deliver to a watercourse.
    - Repair any damage, from permitted use, to a road surface, drainage facility, water bar, or stream crossing within at least 24 hours if precipitation is forecast, in order to eliminate the likelihood of related sediment reaching Class I, Class II or Class III watercourses.
17. Permit light vehicles (e.g., crew trucks, pickups trucks, ATVs, quadra-tracts, and motorcycles) during periods of wet weather.
    a. Limit access to ATVs whenever rutting of the logging roads would occur (so that runoff is carried along the ruts) or waterbars would be breached (so that they no longer would function as intended) as a result of use by light vehicles.
    b. Make repairs, using hand tools, at the time of discovery, if feasible, or within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings to eliminate the likelihood of related sediment reaching Class I, Class II or Class III watercourses.

E.6.4 Standards for the mid-winter period

1. Do not conduct tractor yarding or heavy equipment use for construction of fire breaks, road reconstruction, landing construction, or construction of roads or skid trails.
2. Do not use landings within the AMZ for any forest harvest operations.
3. Do not construct, reconstruct, or abandon roads.
4. Do not use logging roads, tractor roads, or landings at any location where
    a. Saturated soil conditions exist.
    b. Stable logging roads or landings do not exist.

[11] A skid trail system consists of all skid trails that lead to one landing.

[12] MRC defines a rut as a depression caused by a vehicle's tires capable of conveying water and sediment along the road's running surface and possibly off the road prism and into a watercourse.

   c. Visibly turbid water from the road, landing, skid trail surface, or inside ditch may reach a watercourse or lake.
5. Limit the operation of log trucks and heavy equipment on roads and landings to permanent road surfaces with at least a 6 in. (15 cm) rock surface unless the road does not drain to a watercourse and (a) is a ridge-top road or (b) is greater than 200 ft from a watercourse.
6. Do not use tractors within an AMZ except for longlines from an existing road within the AMZ or from outside of the AMZ.
7. Permit upgrading of a road surface to rock if no measurable rainfall has occurred within the last 5 days and no rain is forecast for the next 5 days; maintain the road surface (i.e., patch rock for less than 100 contiguous feet) at intervals allowed for log or rock hauling.
8. Do not load or haul logs or rock when
   a. Vehicles can create ruts in the surface of a road, skid trail, or landing, i.e., when there is an indication of saturated soil.
   b. Precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.

      NOTE

      Once road use has ceased due to the foregoing conditions, do not resume use until and unless the road surface is dry. A dry road is one in which moisture is less than or equal to that found during normal watering (dust abatement) treatments or light rainfall. Further, vehicles are not rutting a road surface or pumping fines causing a visible increase in turbidity in any drainage facility which drains directly to Class I, Class II or Class III waters.
18. Permit light vehicles (e.g., crew trucks, pickups trucks, ATVs, quadra-tracts, and motorcycles) during periods of wet weather.
   a. Limit access to ATVs whenever rutting of logging roads would occur (so that runoff is carried along the ruts) or waterbars would be breached (so that they no longer would function as intended) as a result of use by light vehicles.
   b. Make repairs, using hand tools, immediately if feasible or otherwise within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings has occurred in order to eliminate the likelihood of related sediment reaching Class I, Class II, or Class III watercourses.
   c. Perform emergency repairs when the risk for sediment delivery from the damage is higher than the risk for sediment delivery from the access for repair.

E.6.5 Standards for the late winter period

1. Do not install temporary crossings, conduct watercourse crossing construction or upgrades on Class I watercourses prior to June 15 unless there is no activity within the channel, e.g., placing a bridge where the abutments have already been constructed.
2. Do not conduct tractor yarding or use tractors for construction of fire breaks, road construction/reconstruction, landing construction, or the construction of tractor roads within a Class I or Large Class II AMZ.
3. Do not use logging roads, tractor roads, or landings at any location where visibly turbid water from the road, landing, skid trail surface, or inside ditch may reach a watercourse or lake.
4. Do not load and haul logs or rock or conduct ground-based skidding of logs when
   a. Vehicles can create ruts in the surface of a road, skid trail, or landing, i.e., when there is an indication of saturated soil.
   b. Precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.

      NOTE

      Once road use has ceased due to the foregoing conditions, do not resume use until and unless the road surface is dry. A dry road is one in which moisture is less than or equal to that found

during normal watering (dust abatement) treatments or light rainfall. Further, vehicles are not rutting the road surface or pumping fines causing a visible increase in turbidity in any drainage facility, construction/reconstruction site or road surface, any of which drains directly to Class I, II ,or III waters. This provision does not apply to use of a small segment of wet road (< 30 ft) on an otherwise dry road or when spot rocking can control road soft spots. If any permitted use results in damage to the road surface, drainage facilities, water bars, or stream crossings, repair the damage within 24 hours after it occurs, or sooner if precipitation is forecast, to eliminate the likelihood of related sediment reaching Class I, Class II, or Class III waters.

5. Do not (a) load or haul logs or rock, (b) tractor yard, (c) construct roads and landings, or (d) abandon roads until at least 2 consecutive days elapse without rain, if one of the following conditions apply:
    - **Condition A**
      The National Weather Service reports that 0.5 in. of rain has fallen in Fort Bragg in the previous 24-hour period; and
    - **Condition B**
      Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).

6. Resume operations after at least 2 consecutive days elapse without rain, if the following conditions apply:
    - **Condition A**
      The National Weather Service reports that 0.5 in. of rain has fallen in Fort Bragg in the previous 24-hour period; and
    - **Condition B**
      There has been no rain in Fort Bragg in the current 24-hour period.

7. Install temporary crossings only on one road per active landing on Small Class II or Class III watercourses.
8. Size temporary crossings on Small Class II or Class III watercourses to pass a 25-year flow.
9. Install drainage facilities and structures on all constructed skid trails and tractor roads prior to sunset if one of the following conditions apply:
    - **Condition A**
      i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
      ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.

10. Provide mulch or cover (E.10) on soil disturbed by road or skid trail construction within the AMZ that exceeds 100 contiguous sq. ft. and extends beyond the AMZ but is contiguous with the AMZ, if one of the following conditions apply:
    - **Condition A**
      i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
      ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.

11. Keep on hand at the work site materials to mulch or cover (E.10) exposed soils for immediate deployment during this period.
12. Keep open only one skid trail system per piece of skidding equipment during the late winter periods.
13. Ensure that a skid trail system can have drainage facilities and structures installed within 2 hours, i.e., that it is not too large.
14. Do not grade more than once to obtain a drier running surface on short lengths of road (i.e., a contiguous length of less than 0.25 miles) before reincorporating any resulting berm back into the road surface. Leave all graded materials on the running surface of the road or dispose of them in a place where there is no possibility of delivery to a watercourse. Cease hauling until the road is "truckable," i.e., in a condition that log trucks can operate, if it is necessary to grade more than ¼ mile.
15. Construct new roads in sections between watercourse crossing points and install all erosion controls and drainage systems before moving on to construct additional sections.
16. Construct outsloping and rolling dips prior to moving onto the next section of new road construction.
17. Do not proceed with construction when precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.
18. Use slash or mulch (E.10) to reduce soil loss prior to sunset if one of the following conditions apply:
    - **Condition A**
      ii. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
      iii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.

19. Install drainage and erosion control facilities prior to sunset according to the EHR high rating, if one of the following conditions apply:
    - **Condition A**
      i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; **or**
      ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
    - **Condition B**
      Operation stoppage exceeds 24 hours.
    - **Condition C**
      Winter operations have ceased.
19. Permit light vehicles (e.g., crew trucks, pickups trucks, ATVs, quadra-tracts, and motorcycles) during periods of wet weather.
    a. Limit access to ATVs whenever rutting of the logging roads would occur (so that runoff is carried along the ruts) or waterbars would be breached (so that they no longer would function as intended) as a result of use by light vehicles.
    b. Make repairs, using hand tools, at the time of the discovery, if feasible, or within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings to eliminate the likelihood of related sediment reaching Class I, Class II, or Class III watercourses.

E.6.6 Standards for equipment maintenance and fueling

1. Fuel and maintain heavy equipment at least (a) 100 ft from a watercourse, spring, seep, or wet area; (b) 500 ft from a current activity center of a northern spotted owl territory; or (c) 0.25 miles from an occupied marbled murrelet site, unless equipment breaks and MRC must repair it in place.
2. Clean accidental spills immediately and dispose of hazardous waste according to applicable county, state, and federal laws.

E.7 Standards for Water Drafting

Water drafting is a general term that describes MRC operations for obtaining water for covered activities. Typically, the water is for dust abatement and road maintenance. The term *water impoundment* also describes specific water drafting activities. Within our HCP/NCCP, water drafting includes water impoundment,

During water drafting operations, MRC will follow the guidelines in the Master Streambed Alteration Agreement (Section VII), as well as the standards listed below. In situations where MRC cannot follow these standards, we will prepare a site-specific water-drafting plan and submit it to the wildlife agencies for approval.

For other water drafting guidelines affecting species and habitat, refer to the HCP/NCCP:

- Red-legged frogs (C§10.2.2.3-4, C§10.2.2.3-5).
- Wet areas, wetlands, wet meadows, seeps, and springs (C§8.2.3.5.1-10, C§8.2.3.5.1-11, C§8.2.3.5.2-11, C§8.2.3.5.2-12).

E.7.1 Class I and II watercourses, seeps, springs, wet lands/areas/meadows

1. Use screen mesh with the following specifications:
    a. Size: ≤ 3/32 in. for Class I watercourses and ≤1/8 in. for Class II watercourses.
    b. Approach velocity: ≤0.33 ft per second.
    c. Pump rate: ≤350 gallons per minute.
2. Clean screens as often as necessary to maintain an approach velocity ≤0.33 ft per second.
3. Submerge screens completely.
4. Support screens above the streambed. Set the screen on top of instream objects, such as rocks or use any other means.
5. Rock approaches to water drafting sites that are within the inner or middle band of the AMZ, unless the road is on a gravel surface within the floodplain.
6. Rock approaches to the nearest upslope water bar or rolling dip to control sediment delivery.
7. Ensure that bypass streamflows are at least 2 ft^3 per second and pump rate is no more than 10% of the instantaneous stream flow.
8. Do not reduce the volume of the pool at the intake by 10% or more.
9. Develop a water drafting plan to meet the following requirements if MRC cannot comply with E.7.1 #7 and #8:
    a. Do not draft water when the depth of the immediate downstream riffle crest is ≤ 2.4 in.
    b. Permit reduction of riffle crest depth below 2.4 in. at the outlet of the drafting pool if
        i. Monitored by an RPF or hydrologist.

        NOTE
        MRC will monitor at intervals sufficient to detect when the drafting cut-off needs to occur.

ii. Surface flow remains continuous over the riffle crest during the entire diversion episode.
iii. Diversion does not lower the flow over the next 2 downstream riffle crests more than ½ of their un-diverted depth.
iv. Diversion is limited to one site per stream and one truck at each site.
v. Diversion is ≥ 1 hour of riffle crest depth at unimpaired flow depths between diversion episodes.

c. Do not decrease the wetted widths of habitat units by more than 25%. MRC will not draft water if the stream channel within 30 bankfull widths downstream of the drafting site is intermittent or goes intermittent as a result of a diversion.
d. Inspect the draw-down zones during the greatest effect of the diversion in the reach of the watercourse. An RPF will perform the inspection and CDFG may participate on-site. Such inspection will minimize the risk of salmonids stranding during subsequent diversion. Use streambed materials from the thalweg to fill, with a hand tool, any low spots that become isolated during the draw-down. Do not fill these areas until they are drained of water and confirmed to be free of covered species.
e. Do not decrease pool riffle crest velocity below 1.0 ft per second, unless riffle crest depth is below 2.4 in.
f. Do not divert if water temperatures exceed 18^0 C at a location and coho salmon are present. Do not divert if water temperatures exceed 20^0 C if steelhead are present. Measure water temperature at 1 ft depth or greater. Temperature criteria do not apply from sunset until 10 am the next morning. Place diversion intake, if feasible, downstream of the drafting pool's deepest point and at least 1/3 of the distance between that point and the downstream riffle crest.
g. Survey new or unsurveyed sites for development in Class II watercourses, wet areas, wetlands, wet meadows, seeps or springs for covered species during the optimum time for their detection. Conduct an initial habitat survey. If there is suitable habitat, survey from the intake downstream to the confluence of the next stream but not more than 1500 ft. Consult with the wildlife agencies prior to drafting if MRC detects covered species. Follow the conservation measures relevant to any detected covered species.

i. Do not reduce the wetted width more than 50% below the point of the diversion, measured upstream of the diversion tank flow.
ii. Ensure that bypass flows (instantaneous) are more than 50% of the unimpaired surface flow. Determining un-diverted and bypass flow for compliance monitoring may be difficult in many locations. Use buckets and stop watches, if meters do not work.
iii. Place the intake downstream of the drafting pool's deepest point, when channel morphology permits, at a point at least 1/3 the distance from the deepest point and the downstream riffle crest. Do not place the intake at the deepest part of the pool.

E.7.2 Ponds

1. Use a screen with a mesh size less than 1/8 in. and an approach velocity of 0.33 ft/sec or less.
2. Do not exceed a drafting rate of 350 gpm.
3. Do not reduce the average pool width by more than 10% when drafting from Class I ponds.

4. Do not reduce residual pool width or depth by more than 50% when drafting from Class II ponds hydrologically connected to watercourses (including subsurface flow).
5. Do not reduce average pool width (defined as the pool width at the start of drafting for the season) by more than 50% prior to July 1 or 80% on or after July 1, when drafting and re-drafting from hydrologically isolated Class II ponds.
6. Limit water drafting on documented red-legged frog breeding habitats (both natural and man-made):
    a. Apply the date restrictions from E.7.2, #5.
    b. Locate pump intakes away from emergent vegetation and elevated at least 6 in. above the substrate, if not using Class I designed screens.
    c. Do not draft when egg masses of red-legged frogs are present.
7. Conduct pond maintenance and dredging after July 1 to allow red-legged tadpoles to metamorphose and leave the pond before disturbance.
    a. Do not conduct vegetation management more than once every 3 years.
    b. Limit vegetation management to 50% of a site's perimeter.

4. Build all new upslope ponds with drain fixtures in case bullfrogs invade.

E.7.3 Dust abatement plan

Dust abatement is a critical during harvest operations to reduce dust in the air and soil erosion from dusty roads. For decades, the most common form of dust abatement has been applying water from streams and rivers to logging roads via water-spray trucks. However, drafted water can lower available water for aquatic species in the streams. MRC will pursue reasonable and feasible alternatives for reducing the amount of water taken from watercourses for dust abatement, including the use of products such as lignin or magnesium chloride, as they become available and approved. In addition, we will minimize water drafting, by reducing the amount of water applied to roads when daily watering is unnecessary (e.g., on shaded roads) and watering at night to allow the soil to set. When preparing roads for harvest, we will:

1. Investigate additional Class 2 watercourses as potential sources of water drafting in order to reduce the amount of water taken from Class 1 watercourses.
2. Consider lignin or magnesium chloride for dust abatement under the following conditions:
    a. On mainline roads where tracked equipment will not be operating on the road surface.
    b. On road gradients that are generally less than 10% and have few tight turns for treatments to be effective.
    c. On other surfaces where lignin or magnesium chloride treatments are more cost effective than water.
3. Consider other products that become available for road surface treatment, if their use is reasonable, feasible, and cost effective.
4. Plan harvest entries to use as few roads as possible by concentrating harvest operations in a given year and allowing multiple THPs to use the same haul road, if feasible.
5. Consider use of non-surface flow, if feasible, including off channel pools, existing wells, and springs which do not hydrologically connect to watercourses.
6. Water roads early or late in the day to reduce the evaporation rate of water on roads.
7. Coordinate harvest operations with Licensed Timber Operators (LTOs) to reduce watering of roads, e.g., schedule cable and tractor yarding units to use a road simultaneously.

E.8 Standards for Skid Trails and Yarding

The use of skid trails can significantly

- Increase the density of compacted surfaces.
- Alter natural drainage and flow paths.
- Increase sidecast or fill material available for erosion.
- Create, at times, hillslope instability.

Appropriate management of skid trails will minimize sediment delivery, particularly as compared to historic skid trail practices. Much of the skid trail network on the MRC property is associated with historic practices. In its future use of skid trails, MRC will follow the guidelines presented below.

E.8.1 Standards for skid trails

1. Limit skid trails in number and width to the minimum necessary for removal of logs.
2. Use stable existing skid trails, where possible, instead of constructing new ones unless the existing trails pose greater risk for sediment delivery.
3. Keep the number of watercourse crossings to a minimum.
4. Use a prepared watercourse crossing, such as a bridge, culvert, or temporary culvert, to protect the watercourse from siltation, where tractor roads cross a watercourse in which water may be present during the life of the crossing.
5. Exclude skid trail use in the following areas:
    a. Class I and Class II AMZ unless (i) the skid trail is for a single entry for restoration and erosion control or (ii) the skid trail poses a lower risk for sediment delivery than alternative locations or alignments.
    b. Toes of historically active rockslides or earthflows unless there is a field review by both a California Licensed Geologist, according to Note 45 of the California Department of Conservation, and an individual knowledgeable in the relevant aquatic resources.
    c. Slopes steeper than 65%.
    d. Slopes steeper than 50% where the hazard rating for soil erosion is high or extreme.
    e. Slopes over 50% which lead without flattening to sufficiently dissipate water flow and trap sediment before it reaches a watercourse or lake.
    NOTE
    MRC can, in this instance, use skid trails once to control sediment.
6. Follow the conservation measures (C§8.3.3.1.2-1 through C§8.3.3.1.2-8) for inner gorge slopes.
7. Limit skid trails to existing, stable skid trails, that do not require reconstruction, in the following areas:
    a. Slopes between 50% and 65%, where the erosion hazard rating is moderate.
    b. TSU 1, TSU 2, or TSU 3 that are not inner gorge slopes.
    c. Toe of dormant rockslides or earthflows.
    d. Historically active (active within the last 100 years) mass wasting features unless there is a field review approved by both a California Licensed Geologist, according to Note 45 of the California Department of Conservation, and an individual knowledgeable in the relevant aquatic resources of concern.
8. Install all waterbreaks prior to October 15 unless MRC follows the standards for the early winter period.
9. Do not disturb the soil, other than for road or landing maintenance intended to prevent erosion or mass wasting, with tractors or cables under excessively wet ground conditions that could result in substantial soil compaction and erosion.

10. Do not exceed the standards for distances between waterbreaks (see Table E-2).
11. Locate waterbreaks to allow water to be discharged into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible; otherwise, decrease the spacing and add erosion-resistant materials to the outlets such as slash or straw.
12. Construct waterbreaks to provide for (a) unrestricted discharge at the lower end of the waterbreak so that water will not pool or overtop the waterbreak, and (b) unhindered spread of water to minimize erosion and encourage sediment to settle.
13. Cut waterbreaks diagonally, a minimum of 6 in. (15.2 cm) into the firm roadbed of the skid trail.
14. Construct waterbreaks to sufficient depth to prevent overland flow and concentration of water on the surface of a skid trail.
15. Space water breaks to control and distribute overland flow without causing rilling or gullies.
16. Keep a continuous firm embankment of at least 6 in. (15.2 cm) in height immediately adjacent to the down-road edge of the waterbreak cut.
17. Re-establish all natural drainage flow paths following skid trail use and assure no skid trail captures a natural watercourse.
18. Remove all watercourse crossings prior to October 15 or follow the standards for the early winter period.
19. Excavate fills in the watercourse crossing to form a channel that is as close as possible to the natural watercourse grade and orientation and that is wider than the natural channel.
20. Slope back excavated material and any resulting cut bank from the channel and stabilize it to prevent slumping and minimize soil erosion. Stabilize this material by rock-armoring or by other treatments (E.10).
21. Treat per E.10 all bare areas, excluding roads, which are (a) at least 100 ft^2 and (b) within the AMZ or (c) beyond the AMZ but contiguous to it.

E.8.2 Standards for cable yarding erosion control

1. Install waterbreaks on a cable road only when the cable roads are (a) cut deeply enough to divert water and carry water for distances greater than 100 ft without dispersing or (b) able to deliver cable road runoff into a watercourse.
    a. Space the waterbreaks at 100 ft intervals to ensure water disperses before becoming erosive.
    b. Cut waterbreaks diagonally a minimum of 6 in. (15.2 cm) into the cable road and keep a continuous firm embankment of at least 6 in. (15.2 cm) in height immediately adjacent to the down-road edge of the waterbreak cut.
2. Install waterbreaks by hand if the ground site is not designated for heavy equipment.
3. Treat bare soil exposed by cable roads for at least 100 ft^2 that is (a) within the AMZ or (b) beyond the AMZ but contiguous with it.

E.9 Precipitation Threshold for Mid-Winter Period

The mid-winter period begins when streamflow responds directly to precipitation (i.e., rises above baseflow). During the first 5 years of the HCP/NCCP, the wildlife agencies may evaluate sediment delivery under these conditions. If there is no evidence of sediment delivery during operations performed in the early months of the mid-winter period, the wildlife agencies and MRC will consult to adjust the evaluation trigger, if necessary. To determine the mid-winter period, there may be a precipitation adjustment, i.e., 4 in. of cumulative precipitation in the water year. Adjustments to the total cumulative rainfall may more accurately reflect ground conditions

related to sediment control. After the first 5 years, the wildlife agencies and MRC may adjust the evaluation trigger based on climate trends over the 80-year term of the HCP.

E.9.1 Method for determining precipitation threshold

MRC uses the long term precipitation and streamflow record (1964-2001) from South Fork Caspar Creek. The South Fork Caspar Creek represents a small watershed (approximately 1700 ac) in coastal Mendocino County nested within MRC land. Smaller watersheds respond faster to precipitation than larger watersheds, therefore, use of a small watershed to define the threshold is more conservative. South Fork Caspar Creek is the gauged watershed that most closely reflects the vegetation and soil types in the HCP/NCCP plan area.

We calculated the mean daily precipitation and mean daily streamflow from 1964-2001. The 7-day average was calculated from the mean daily precipitation and streamflow to "smooth" the data set; average day-to-day values bounced somewhat over the 36 years. We summed the 7-day average of the daily average precipitation to provide the cumulative total through the early portion of the water year. Then we plotted the 7-day mean precipitation and streamflow as well as the lower 90% confidence interval.

E.9.2 Precipitation threshold for HCP/NCCP purposes

Based on the graph of the 7-day average cumulative precipitation and streamflow it appears that, on average, the week of Nov. 6 and Nov. 13 shows the first readily apparent deviation of streamflow above baseflow. This corresponds to a mean cumulative precipitation for the water year of 4.5 and 6.3 in. respectively. The lower 90% confidence interval is more conservative; in that case, streamflow response above baseflow for the weeks of Nov. 6 and Nov. 13 is from cumulative precipitation of 4.1 and 5.5 in. respectively. For the HCP/NCCP, MRC defines the threshold as 4 in. of cumulative precipitation occurring after October 1st in the water year (Figure E-8).

E.10 Standards for Surface Erosion Control

MRC will control surface erosion by using straw mulch, seeding, slash, rocks, or other non-erodible materials to minimize sediment delivery to watercourses. If using mulch or slash, we will cover at least 90% of the surface area to a depth of 1 in. or more with hand-laid straw. Under conditions of equal cost and availability, MRC will use weed-free straw, locally available mulch, or erosion matting. If MRC cannot obtain weed-free straw, we will conduct exotic control during the following spring.

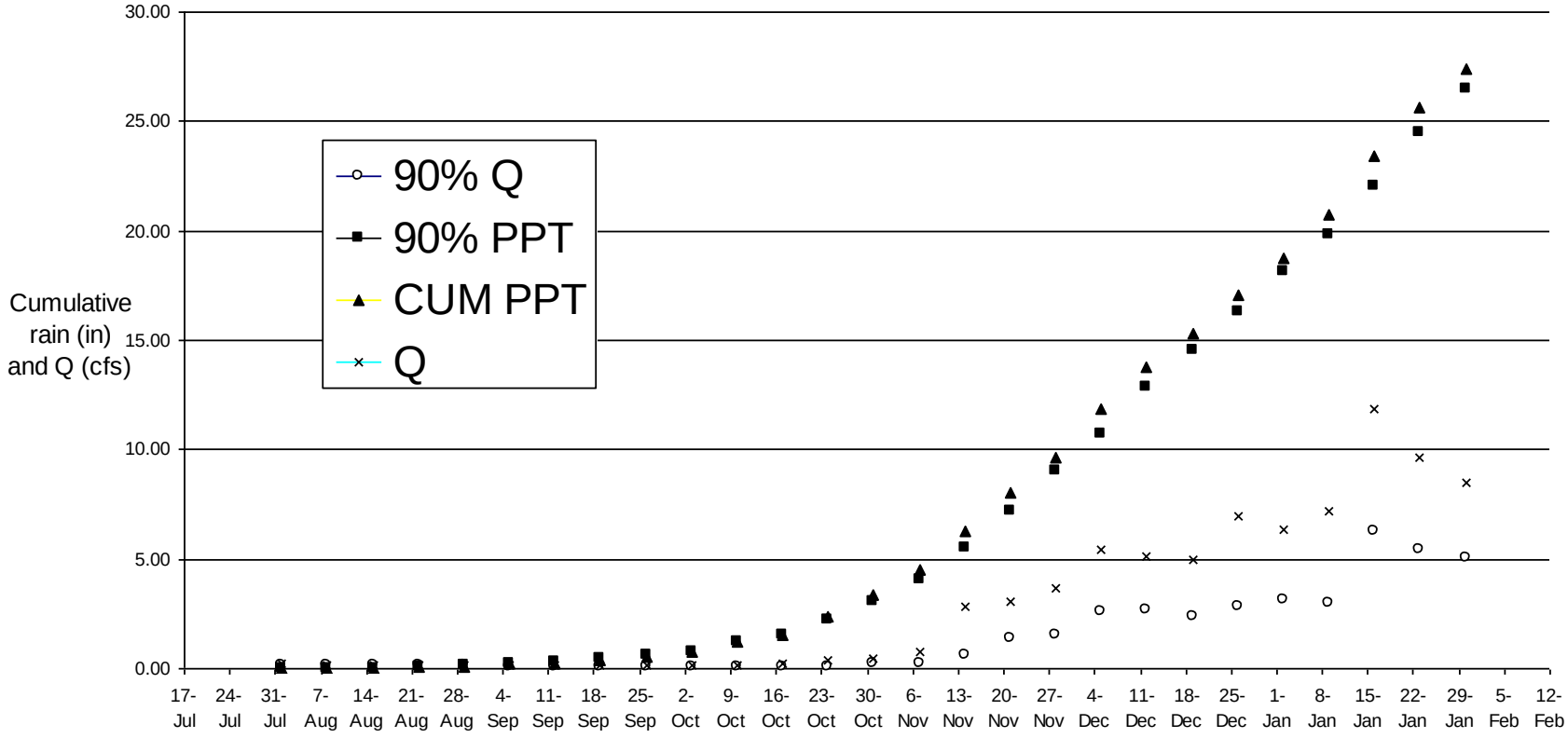

Figure E-8 Precipitation Threshold

Appendix F

Road Inventory Protocol

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F. ROAD INVENTORY PROTOCOL

Our Global Positioning System (GPS) allows MRC to collect data on our roads and road features (e.g., culverts, crossings, landings) that could potentially deliver sediment to watercourses. This satisfies the state requirement for road inventory of potential sediment-producing sites within listed "impaired" watersheds in northern California. Road data also helps MRC prioritize our own projects for installation, maintenance, and removal. Sections F.1 and F.2 list the types of data collected. The MRC Road Department will provide data collectors with training and written instructions to ensure that we are providing accurate and comparable information throughout the term of the HCP/NCCP.

F.1 MRC Roads

Road Data
▪ Letter ID for mainline road (A-Z)
▪ Road number
▪ Road name
▪ Description of road use (e.g., public road, road on MRC land)
▪ Description of road status (permanent, seasonal, temporary, decommissioned, historic, undetermined)
▪ Type of road surface (paved, rocked, native, undetermined)
▪ Type of road prism (outsloped, insloped with ditch, crowned, flat, or combination)
▪ Average road width (ft)
▪ Road grade (<15%, >15%, undetermined)
▪ Length of road grade (0-300 ft, 300-800 ft, 800-1300 ft, >1300 ft, undetermined)
▪ Erosion Hazard Rating (EHR) of road surface
▪ Road passable for ATV? (yes/no)
▪ Source for the geographic location of the road (GPS, forester, or aerial photos)
▪ Road on MRC land? (yes/no)
▪ Inventory block in which the road is located
▪ Watershed Analysis Unit (WAU) in which the road is located
▪ Planning watershed in which the road is located
▪ Date of road survey
▪ Surveyor comments

F.2 MRC Road Points

F.2.1 Culverts

Culvert Data
▪ Site number

Culvert Data

- Culvert type (watercourse culvert or ditch relief culvert)
- Culvert material (steel, aluminum, plastic, combination, or other)
- Culvert diameter (in.)
- Culvert length (ft)
- Culvert condition (functional or non-functional)
- Culvert marking (mile post #)
- Interior condition of inlet (open, partially plugged, or plugged)
- Exterior condition of inlet (crushed, rusty, or bottom rusted out)
- Maximum channel width (ft) above an inlet area of a culvert at peak flow
- Maximum channel depth (ft) above an inlet area of a culvert at peak flow
- Channel slope (%) above an inlet area of a culvert
- Structures installed for erosion control at the inlet? (yes, no, repair, or install)
- Trash rack installed or in need of repair? (yes, no, repair, or install)
- Inlet bevel cut to increase flow capacity? (yes/no)
- Drop inlet installed? (yes, no, repair, or install)
- Flared inlet installed? (yes, no, repair, or install)
- Interior condition of the outlet (open, partially plugged, or plugged)
- Exterior condition of the outlet (crushed, rusty, or bottom rusted out)
- Structures installed for erosion control at the outlet? (yes, no, repair, or install)
- Outlet has logs or boulders acting as energy dissipators? (yes, no, repair, or install)
- Downspout installed at culvert outlet? (yes/no)
- Downspout installation or repair needed to minimize erosion? (install, repair, replace, or none)
- Culvert on a potentially fish-bearing stream? (known, unknown, or does not apply)
- Drop height (ft) below a culvert outlet
- Gradient of ditch relief culvert >10% or >2% of road prism? (yes, no, or does not apply)
- Inlet of ditch relief culvert skewed >35%? (yes, no, or does not apply)
- Length of ditch that drains to inlet? (0-50, 50-100, 100-200, 200-400, 400-800 or >800 ft)
- Measured length of road that drains surface runoff to a watercourse crossing?
- Culvert has diversion potential? (yes, road; yes, ditch; no diversion potential; already diverted)
- Drainage structures installed? (water bar, rolling dip, rocked rolling dip, does not apply, none)
- Type of fill over the culvert? (paved, rocked, native, or native rock)
- Evidence of past erosion at the site? (rill, gully, washout, or slide)
- Estimated fill volume (yd^3) at crossing
- Volume (yd^3) of past erosion (measured and calculated) which delivered to a watercourse

Culvert Data

- Potential for a site to deliver sediment to a watercourse? (high, moderate, low)
- Estimated volume of controllable erosion (yd^3)
- Need for immediate treatment at the site? (high, moderate, low)
- Work already completed on the site? (yes/no)
- All erosion measures have been implemented and erosion controlled? (yes/no)
- Source of the geographic data for the site feature? (GPS, forester, aerial photos)
- Name of MRC employee, contractor, or consultant doing the site inspection
- Survey data automatically generated by GPS
- Additional comments about the site

F.2.2 Crossings

Crossings Data

- Site number
- Crossing type (dipped, low water, bridge, ditch relief, Humboldt, other)
- Crossing site passable with an ATV? (yes/no)
- Crossing site rocked to minimize future erosion at the site? (yes/no)
- Maximum channel width (ft) above an inlet area of a culvert at peak flow
- Maximum channel depth (ft) above an inlet area of a culvert at peak flow
- Channel slope (%) above an inlet area of a culvert
- Type of bridge construction (log, flatcar, other)
- Decking material on the bridge (dirt, steel, wood)
- Type of bridge rails currently installed (logs, steel, decking, none)
- Length of the bridge (ft)
- Width of the bridge (ft)
- Maximum flow width that can pass under the bridge (ft)
- Height of the bridge (ft)
- Rails installed on the bridge? (yes/no)
- Bridge rails at least 8 in. x 8 in.? (yes/no)
- Condition of the bridge sill (good, poor)
- Condition of the bridge decking (good, poor)
- Overall condition of the bridge (good, poor)
- Culvert on a potentially fish-bearing stream? (known, unknown, does not apply)
- Length of road (ft) that drains surface runoff to the watercourse crossing site
- Culvert has diversion potential? (yes, road; yes, ditch; no diversion potential; already diverted)

Crossings Data

- Drainage structures to divert erosion? (i.e., water bar, rolling dip, rocked rolling dip, none)
- Estimated fill volume (yd^3) at crossing
- Evidence of past erosion at the site (rill, gully, washout, slide)
- Volume (yd^3) of past erosion which has already delivered to a watercourse
- Potential for a site to deliver sediment to a watercourse (high, moderate, low)
- Estimated volume of controllable erosion (yd^3)
- Need for treatment at the site? (high, moderate, low)
- Work already completed on site? (yes/no)
- All erosion measures have been implemented and erosion controlled? (yes/no)
- Source of the geographic data for the site feature? (GPS, forester, aerial photos)
- Name of MRC employee, contractor, or consultant doing the site inspection
- Survey data automatically generated by GPS
- Additional comments about the site

F.2.3 Landings

Landings Data

- Site number
- Size of landing area (0-3000, 3000-6000, 6000-10,000, 10,000-15,000 or >15,000 ft^2)
- Landslide occurred at or near the landing? (yes/no)
- Fill condition (stable, unstable or failed-active; failed-dormant, if landslide occurred)
- Perched material (unstable fill, slash, or cull logs) that should be pulled back? (yes/no)
- Potential volume of future slide (yd^3)
- Evidence of past erosion at the site (rill, gully, washout, slide)
- Volume (yd^3) of past erosion which has already delivered to a watercourse
- Distance between land and the nearest watercourse (0-50, 50-200 or 200+ ft)
- Potential for the site to deliver sediment to a watercourse (high, moderate, low)
- Estimated volume of controllable erosion(yd^3)
- Need for treatment at the site (high, moderate, low)
- All erosion measures have been implemented and erosion controlled? (yes/no)
- Is this the last landing on the road? (yes/no)
- Source of the geographic data for the site feature? (GPS, forester, aerial photos)
- Name of MRC employee, contractor, or consultant doing the site inspection
- Survey data automatically generated by GPS
- Additional comments about the site

F.2.4 Road slides

Road Slide Data
▪ Site number
▪ Type of road slide (potential fill failure, failed cutbank slide, active streambank slide)
▪ Status of the road slide (already failed, potential failure, or active)
▪ Potential volume of future slide (yd^3)
▪ Slide size class (0-25, 25-50, 50-100, 100-200 or 200+ yd^3)
▪ Distance of the road slide to the nearest watercourse (0-50, 50-200 or 200+ ft)
▪ Potential for the site to deliver sediment to a watercourse (high, moderate, low)
▪ Estimated volume of controllable erosion(yd^3)
▪ Need for treatment at the site (high, moderate, low)
▪ Source of the geographic data for the site feature? (GPS, forester, aerial photos)
▪ Name of MRC employee, contractor, or consultant doing the site inspection
▪ Survey data automatically generated by GPS
▪ Additional comments about the site

F.2.5 Erosion

Erosion Data
▪ Site number
▪ Site able to deliver sediment to a watercourse? (no, major rilling, gully)
▪ Rill length (ft)
▪ Gully length (ft)
▪ Gully width (ft)
▪ Gully depth (ft)
▪ Length of road that drains surface runoff to the watercourse crossing site (ft)
▪ Distance between the site and the nearest watercourse (0-50, 50-200 or 200+ ft)
▪ Volume (yd^3) of past erosion which has already delivered to a watercourse
▪ Potential for a site to deliver sediment to a watercourse (high, moderate, low)
▪ Estimated volume of controllable erosion(yd^3)
▪ Need for treatment at the site (high, moderate, low)
▪ Work already completed on site? (yes/no)
▪ Source of the geographic data for the site feature? (GPS, forester, aerial photos)
▪ Name of MRC employee, contractor, or consultant doing the site inspection
▪ Survey data automatically generated by GPS
▪ Additional comments about the site

F.2.6 Rock pits

Rock Pit Data
▪ Site number
▪ Average size of the rock pit base area (ft^2)
▪ Maximum height of the rock pit's face (ft)
▪ Vehicle access to the rock pit? (yes/no)
▪ Rock pit drained to minimize the potential for erosion? (yes/no)
▪ Any perched material near the top of the rock pit? (yes/no)
▪ Evidence of past erosion at the site (rill, gully, washout, slide)
▪ Volume (yd^3) of past erosion which has already delivered to a watercourse
▪ Potential for a site to deliver sediment to a watercourse (high, moderate, low)
▪ Estimated volume of controllable erosion(yd^3)
▪ Need for treatment at the site (high, moderate, low)
▪ Source of the geographic data for the site feature? (GPS, forester, aerial photos)
▪ Name of MRC employee, contractor, or consultant doing the site inspection
▪ Survey data automatically generated by GPS
▪ Additional comments about the site

F.2.7 Spoil piles

Spoil Pile Data
▪ Site number
▪ Size of the spoil pile (ft^2)
▪ Distance between the spoil pile and the nearest watercourse (0-50, 50-200 or 200+ ft)
▪ Evidence of past erosion at the site (rill, gully, washout, slide)
▪ Volume (yd^3) of past erosion which has already delivered to a watercourse
▪ Potential for the site to deliver sediment to a watercourse (high, moderate, low)
▪ Estimated volume of controllable erosion(yd^3)
▪ Need for treatment at the site (high, moderate, low)
▪ Source of the geographic data for the site feature? (GPS, forester, aerial photos)
▪ Name of MRC employee, contractor, or consultant doing the site inspection
▪ Survey data automatically generated by GPS
▪ Additional comments about the site

F.2.8 Water holes

Water Hole Data
▪ Site number
▪ Waterhole type: watercourse pool (P), riffle (R), blocked culvert (B), pond (P), lake (L), or other (O)
▪ Vehicle access to drafting site? (yes/n
▪ Access road to the water hole needs work? (none, minimal, extreme)
▪ Approach to the water hole rocked in order to minimize road surface erosion? (yes/no)
▪ Recovery rate for water hole after water truck fill-up? (fast, 1 hour; slow, 1 day)
▪ Evidence of past erosion at the site (rill, gully, washout, slide)
▪ Volume (yd^3) of past erosion which has already delivered to a watercourse
▪ Potential for the site to deliver sediment to a watercourse (high, moderate, low)
▪ Estimated volume of controllable erosion(yd^3)
▪ Need for treatment at the site (high, moderate, low)
▪ Work already completed on site? (yes/no)
▪ All erosion measures have been implemented and erosion controlled? (yes/no)
▪ Source of the geographic data for the site feature? (GPS, forester, aerial photos)
▪ Name of MRC employee, contractor, or consultant doing the site inspection
▪ Survey data automatically generated by GPS
▪ Additional comments about the site

F.2.9 Landslides

Landslide Data
▪ Site number
▪ Landslide affected the road prism? (yes/no)
▪ Volume of material that is currently on the road surface (yd^3)
▪ Length of the landslide site (ft)
▪ Width of the landslide site (ft)
▪ Depth of the landslide site (ft)
▪ Distance between the landslide and the nearest watercourse (0-50, 50-200 or 200+ ft)
▪ Source of the geographic data for the site feature? (GPS, forester, aerial photos)
▪ Name of MRC employee, contractor, or consultant doing the site inspection
▪ Survey data automatically generated by GPS
▪ Additional comments about the site

Appendix G

Watershed Analysis: Background and Methods

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G. WATERSHED ANALYSIS: BACKGROUND AND METHODS

G.1 Introduction

This appendix introduces the methods used in our watershed analysis reports prior to the initiation of the HCP/NCCP in order to

- Show how we produced our data summaries on aquatic habitat conditions (Table 3-8) and sediment input (Table 3-11).
- Allow comparison of past and future methods and data.
- Document any differences between MRC methods and standard methods.

Table G-1 lists our completed reports by watershed analysis unit (WAU), along with any updates.

Table G-1 Completed Watershed Analyses in the Plan Area as of 2010

WAU	Report Completion Date	
	Original Report	Latest Update
Garcia River	1998	2003
Albion River	1999	2004
Noyo River	2000	2004 mass wasting
Big River	2003	
Hollow Tree Creek	2004	
Navarro River	2003	
Greenwood Creek	2004	
Northern Russian River	2004	
Cottaneva Creek	2005	
Elk Creek	2005	

As of 2010, MRC has collected complete field data for all watershed analyses except road inventory. Table G-2 shows the expended effort during instream surveys for each watershed analysis unit. In creating the table, we summed the miles of Class-I habitat surveyed and divided by the total miles of Class-I habitat in the plan area. The table numbers describe the level of effort for surveys of LWD and instream shade, as well as for initial surveys of fish habitat; they do not include the level of survey effort for road inventory. In watershed analysis, MRC occasionally surveys Class-II and Class-III streams, but the majority of surveys are within Class-I streams. As of 2010, MRC surveyors have walked approximately 50 miles of Class-I stream habitat, making observations about potential recruitment of riparian stands, LWD quality, instream shade, and fish habitat typing.

The level of effort for other watershed analysis monitoring programs is as follows:

- Field observations of mass wasting included 25% to 45% of the landslides observed in aerial photographs over the entire watershed.
- Model efforts of surface erosion used complete road inventory data for an entire watershed.[1]

[1] Refer to specific watershed analysis reports for details on the level of effort in a particular watershed.

MRC will apply the same level of effort in future watershed analyses unless the plan area changes or the level of timber harvest deviates significantly from 30 mmbf per year.

Table G-2 Field Observation Effort

WAU	Field Survey Effort of Class I Stream as of 2010		
	Total Class I Miles in Plan Area	Class I Miles Observed	% of Class I Habitat Surveyed
Garcia River	23.1	5.7	24.6%
Albion River	34.9	2.6	7.5%
Southcoast Streams	19.0	3.5	18.5%
Cottaneva Creek	12.9	3.7	29.1%
Elk Creek	20.5	7.0	34.3%
Noyo River	37.6	3.4	9.2%
Rockport Coastal Streams	17.5	5.3	30.5%
Big River	60.6	4.2	7.0%
Hollow Tree Creek	45.7	3.5	7.6%
Navarro River	133.2	8.6	6.4%
Greenwood Creek	20.5	1.8	8.6%
Northern Russian River	8.1	0.6	7.8%
TOTAL	433.5	50.1	11.5%

G.2 Watershed Analysis Methods

Our watershed analyses follow guidelines from the Standard Methodology for Conducting Watershed Analysis (WFPB 1995). We modified these standard methods to suit the purpose of our assessments. In this subsection, we present our common methods for each watershed analysis module, along with a description of any deviations for specific watershed analysis units. In the future, we will use the unmodified standard methods (i.e., Standard Methodology for Conducting Watershed Analysis) for any re-surveys and for comparisons of data. The modules are

- Mass wasting.
- Surface and point source erosion
- Hydrology.
- Riparian function.
- Stream channel conditions
- Fish habitat.
- Amphibian distribution.
- Synthesis

G.2.1 Module: mass wasting

The primary objectives of mass wasting assessment are to

- Identify the types of mass wasting active in the basin.
- Identify the link between mass wasting and forest management.

- Identify pockets of concentrated mass wasting.
- Partition the plan area into potential zones of mass wasting and sediment delivery.

This module of the watershed analysis contains a wide range of geologic information including definitions, interpretations, and conclusions that constitute the practice of geology. The State of California regulates the practice of geology under the Business and Professions Code and the Geologist and Geophysicists Act. In order for MRC to be compliant with these statutes and regulations a professional geologist or registered certified specialty geologist, licensed in the State of California, will be in charge of this module and will sign or stamp the final document to indicate his or her responsibility.

Within the mass wasting module, we have categorized landslides as either shallow-seated or deep-seated and have modified descriptions of these categories from Cruden and Varnes (1996). In general, a landslide is shallow-seated if the slide plane is confined to regolith (soil, colluvium, and weathered bedrock). Deep-seated landslides typically have a slide plane that extends well into bedrock.

G.2.1.1 Shallow-seated landslides

The shallow-seated landslides that occur in the plan area are

- Debris slides.
- Debris flows.
- Debris torrents.

The material composition of debris slides, flows, or torrents is soil with a significant proportion of coarse material; 20–80% of the particles are larger than 2 mm. Shallow-seated landslides generally move quickly downslope and usually break apart during failure. They commonly occur

- On steep planar slopes.
- On convergent slopes.
- On oversteepened fill slopes along forest roads.
- On steep slopes adjacent to watercourses.

Slope steepness, saturation of soil, and material strength (i.e., friction angle and effective cohesion)—all affect the susceptibility of a slope to fail.

Debris slides

DEFINITION	**Debris slides** are composed of unconsolidated rock, soil, and organic material that move rapidly downhill.

Based on mass wasting inventories conducted to date, debris slides are, by far, the most common landslide in the plan area. Their landslide mass typically fails along a surface of rupture or along relatively thin zones of intense shear strain. The failure is usually by translational movement (Figure G-1) along an undulating or planar surface. While the landslide mass may deposit onto the ground surface below the area of failure, it generally does not slide more than a distance equal to the slide body's length. Upon reaching a watercourse, debris slides, by definition, do not continue downstream on their own momentum, but their debris is transported downstream by streamflow.

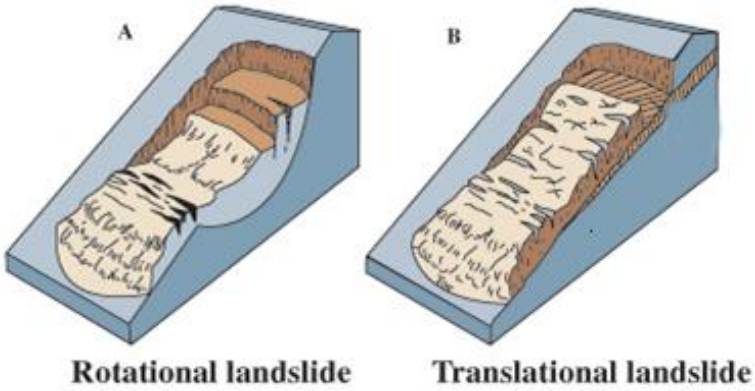

Figure G-1 Landslide Movement

A majority of the historic roads in the plan area were constructed using cut-and-fill techniques; fill generated by the cut was sidecasted rather than compacted in lifts onto a keyway or excavated trench. Most debris slides on our land originate from this loose, unkeyed, fill material. Current road building techniques, upgrades of existing historic roads, and decommissioning of outdated road alignments will reduce the total number of potential slide sites related to road fill.

Debris flow

DEFINITION	**Debris flows** are composed of saturated soil, rock, and organic material that move rapidly downhill and deposit well beyond the foot of the landslide.

A debris flow is similar to a debris slide with the exception that the landslide mass continues to *flow* downslope, below the failure and a considerable distance over the ground surface. This process requires high water content. Debris flows generally occur on both steep, planar hillslopes and confined, convergent hillslopes. Often a failure will initiate as a debris slide, but will change as it moves downslope to a debris flow. Such failures are still classified as debris flows.

Debris torrent

DEFINITION	**Debris torrents** are composed of highly saturated soil, rock, and organic material that rush downhill like a muddy river and often scour a long stretch of stream channel below.

Debris torrents are a special subset of debris flows. They have the greatest potential to destroy stream habitat and deliver large amounts of sediment. As the debris torrent moves downslope, its liquefied material increases in mass. The distinguishing characteristic of a debris torrent is that the failure *torrents* downslope into a confined channel and scours it. Debris torrents can potentially move great distances down a channel. They typically initiate in headwall swales and move down intermittent watercourses. Often a failure will start as a debris slide, but will develop into a debris torrent upon reaching a channel. Such failures are still classified as debris torrents.

G.2.1.2 Deep seated landslides

The deep-seated landslides that occur in the plan area are rockslides and earthflows.

Many of the deep-seated landslides are *dormant*, but the importance of identifying them lies in the fact that, if reactivated or accelerated, they have the potential to deliver large amounts of sediment and destroy stream habitat. Accelerated or episodic movement in some landslides is likely to occur gradually in response to seismic shaking or stochastic rainfall events. Deep-seated landslides can be very large, exceeding hundreds of acres. Making connections between deep-seated landslides and management practices can be extremely difficult.

Rockslides

DEFINITION **Rockslides** are deep-seated landslides that move a relatively intact mass of rock and overlying earth materials.

Failure may occur along an inclined plane with only translational movement or along a curved surface where the failing materials rotate about an axis. The mode of rock slide generally is not strictly rotational or translational, but involves some component of each. Failure surfaces typically develop along planes of structural weakness (bedding planes, folds, faults, etc.). Rockslides commonly create a flat or back-tilted mid-slope bench below a broad arcuate crown scarp.

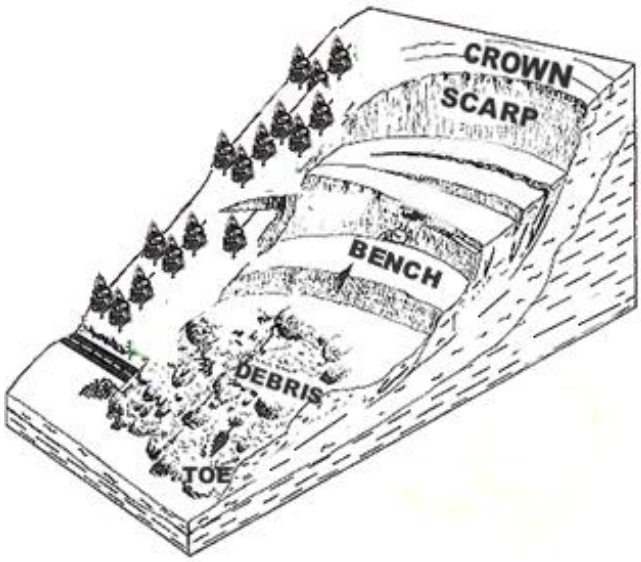

Figure G-1A Landslide Features

Generally, rockslides are not characterized by a single block failure, but rather consist of a series of nested landslide blocks which make up the rockslide complex. A prominent bench or series of benches, preserved over time, characterize the body of the rockslide. Lateral margins are typically poorly defined—likely due to the differential and infrequent movement of the rockslide blocks. Rockslides generally fail in response to triggering mechanisms, such as seismic shaking, stochastic rainfall events, or removal of buttressing support through stream channel incision. The stream itself can be the cause of chronic movement, if it periodically undercuts the toe of a rockslide.

Earthflows

DEFINITION **Earthflows** are deep-seated landslides composed of fine-grained materials and soils derived from clay-bearing rocks.

By volume, more than 80% of earthflow materials consist of particles smaller than 2 mm. Earthflows also commonly contain boulders, some very large, which move downslope in the clay matrix. The *flow* creates a landslide *complex* that can be very irregularly shaped.

Some earthflow surfaces are dominantly grassland, while others are partially or completely forested. The surface of an earthflow is characteristically hummocky with locally variable slopes

and relatively abundant gullies. The inherently weak materials within earthflows are not able to support steep slopes; therefore, slope gradients are low to moderate.

The rates of movement vary and can be accelerated by persistent high groundwater conditions. Since timber harvesting can increase the amount of subsurface water, it can also accelerate movement in an earthflow. Gully erosion from concentrated or diverted water is often a principal source of anthropogenic-created earthflows.

G.2.1.3 SHALSTAB

MRC uses SHALSTAB[2] to assist with the mapping of the hazard potential of shallow-seated landslides. William Dietrich of the University of California (Berkeley) and David Montgomery of the University of Washington (Seattle) have published a validation study of the SHALSTAB model (Dietrich and Montgomery 1998). Generally, they found that the SHALSTAB model correctly distinguishes areas more prone to shallow landslide instability. In mass wasting studies conducted in 7 basins in northern California, they concluded that a log (q/T) threshold of less than -2.8 identifies the portion of the basin within which on average 57% of the shallow landslides mapped from aerial photographs are found. However, they also point out that the performance of SHALSTAB depends strongly on the quality of the topographic data. The best readily available topographic data (10-m grid data from digitized USGS 7.5' quad maps) does not represent the fine scale topography that dictates the convergence of subsurface flow and the locations where shallow landslides are likely to occur. This lack of resolution limits the model's performance when applied to the plan area. In our watershed analysis, we assess mass wasting hazards apart from SHALSTAB as well, using aerial photographs and field reconnaissance. However, we still use SHALSTAB output as a tool to configure the landscape into terrain stability units.

G.2.1.4 Landslide inventory

When assessing mass wasting, we rely on features identified from aerial photographs and field observations. A registered geologist conducts an aerial photograph assessment of the entire watershed using as many photo sets as possible. The registered geologist then verifies a percentage of aerial photo observations with field data solely for shallow-seated landslides; deep-seated slides tend to be too large and old to verify in the field or to connect with management impacts. In collecting and storing this data, we realize that we may overlook some landslides, particularly small ones obscured by vegetation. Table G-3 gives a brief description of select parameters in our mass wasting inventory.

Table G-3 Parameters to Describe Mass Wasting

Parameters to Describe Mass Wasting	
Parameter	**Description**
Slide identification	MRC assigns each landslide a unique identification number. The ID consists of a two-letter code that denotes the planning watershed in which the slide is located and a number that indicates the USGS map section for the slide location.
TSU #	Terrain stability unit in which the landslide is located (see G.2.1.8).

[2] William Dietrich and David Montgomery describe SHALSTAB as "a physically-based digital terrain model for mapping the relative shallow slope stability potential across a landscape."

Parameters to Describe Mass Wasting	
Parameter	**Description**
Landslide type	Code denoting the type of landslide: DS - debris slide DF - debris flow DT - debris torrent RS – rockslide EF – earthflow
Certainty of identification	Code denoting the observer's level of certainty: D - definite P - probable Q - questionable
Physical characteristics	Includes average length, width, depth, and volume of individual slides; length of torrent, if present, will be noted in comments.
Sediment routing	Code denoting the type of stream the sediment was delivered to: P - perennial I - intermittent or ephemeral N - no sediment delivered
Sediment delivery	Relative percentage of the landslide volume and mass delivered to the stream.
Slope	Percent slope angle for all shallow-seated landslides observed in the field.
Age	Code denoting the estimated age of the slide: A - active (<5 years old) R - recent (5-10 years old) O - old (>10 years old)
Slope form	Code denoting the morphology of the slope where the landslide originated: C - concave D - divergent P – planar
Slide location	Code denoting the observer's interpretation of the location where the landslide originated: H - headwall swale S - steep streamside slopes I - inner gorge O - other

Parameters to Describe Mass Wasting	
Parameter	**Description**
Road association	Code denoting the association of the landslide to land-use practices: R - road S - skid trail L - landing N – none of the above I – indeterminate MRC will note details of failure (e.g., road drainage or fill construction).
Structure class	Code describing the current forest conditions (dominant species, dominant diameter, and % canopy cover) upslope of recent failures.
Soil type	Code denoting the NRCS (Natural Resources Conservation Service) mapped soil type generated from available GIS data and attributed to each slide point.
Contributing area	Categorical description of the area interpreted to concentrate surface or subsurface flow to the failure site for non-road related slide points: Small = <0.5 ac Medium = 0.5-3.0 ac Large = >3.0 ac
Aspect	Predominant cardinal direction where the hillslope failure originated.
Spring lines	Identification of spring lines from a review of USGS hydropoint and THP data that may suggest regional hydrogeologic conditions adverse to slope stability.
Bedrock structure	Geologic data identifying potentially adverse structural relationships in the watershed (e.g., regional dip slopes).
Bedrock lithology	Geologic data identifying dominant and anomalous rock types.
Toe, body, lateral scarps, and main scarp descriptions	MRC assigns categorical attributes to the various morphological features of deep-seated landslides.
Field observed	Yes or no

Landslide inventory map

MRC plots landslides identified in the field and in aerial photographs on a landslide inventory map. The map identifies all shallow-seated landslides as a plotted point at the interpreted head scarp of the failure. The interpreted perimeter (body and scarp) of a deep-seated landslide is represented as a polygon. Landslide dimensions and depths can be variable; recorded values for length, width, and depth are average dimensions. When converting landslide volumes to mass (tons), we assume a soil bulk density of 100 lbs/ft^3 (1.35 g/cm^3).

Certainty of identification

MRC assesses not only identified landslides but the certainty of the identification. Table G-4 shows the guidelines for each assessment.

Table G-4 Certainty Assessments

Definite	The analyst is certain the landslide exists.
Probable	The analyst has some doubt about the interpretation but suspects the landslide exists.
Questionable	The analyst has limited confidence in the interpretation and distrusts its accuracy.

Accuracy in identifying landslides on aerial photographs is dependent on the size of the slide, scale of the photographs, thickness of canopy, and logging history. An analyst has the highest level of confidence when mapped landslides are in areas recently logged or in areas with thin canopy. Sometimes the analyst's confidence in identifying a landslide depends on the quality and angle of the aerial photographs: (1) sun angle creates shadows which may obscure a landslide; (2) the print quality of some photos varies; and (3) small-scale photographs make identification of small landslides difficult. The certainty of identification does not factor numerically into landslide delivery volumes.

Air photo vs. ground-based analysis

Results from the landslide inventory are considered a minimum estimate of sediment production. This is because (1) landslides that were too small to identify on aerial photographs may have been missed; (2) landslide surfaces may have reactivated in subsequent years and gone unmeasured; and (3) secondary erosion by rills and gullies on slide surfaces may be difficult to see. Results from an Oregon Department of Forestry study on air photo analysis versus ground-based inventories of landslides reveal that air photo analysis alone is particularly problematic in mature forested environments. Roughly half of the landslides were detected in young forests (0-9 years old), while less than 5% were detected in mature (>100 years old) forest stands (Robison et al. 1999).

Landslide inventories based solely on air photo analysis will significantly overestimate the sediment delivery rate from recently harvested stands as compared to unharvested second growth stands. MRC employs a combination of air photo analysis and ground-based field verification in an effort to map and attribute all visible landslides over our large land base; we provide supplementary field estimates of depth and delivery percentages to more accurately reflect the actual conditions on the ground. Since the entire plan area was managed in the recent past, we have confidence in our ability to detect the majority of the sediment-delivering landslides.

Relationship of landslides and silviculture

In our initial analyses, we did not observe the effects of silvicultural techniques on rates of sediment delivery from landslides. Our reason for not doing so was that the plan area has been managed, recently and historically, by different land owners with different practices, making a landslide evaluation based on distinct silvicultures difficult if not impossible. However, as part of HCP implementation, we will classify future landsides according to the surrounding forest structure, including tree species, tree size, and the percentage of forest cover. Over the term of the HCP, this data may help us draw conclusions about the effects of silviculture on rates of sediment delivery from landslides. Meanwhile, we have based our landslide classifications—particularly those associated with roads—on certain assumptions and inferences:

- If a landslide was adjacent to a road, landing, or skid trail, we assumed that land use triggered it, either directly or indirectly.
- If a landslide appeared to be influenced by more than one practice, we inferred, based on professional judgment, the more causative one.
- If a cutslope failure did not cross the road prism, we assumed that the failure would remain perched on the road, landing, or skid trail and would not deliver to a watercourse.

G.2.1.5 Sediment input from shallow-seated landslides

MRC used estimates of sediment delivery from mapped shallow-seated landslides to produce our estimate of total sediment input from mass wasting, denoted as management-related or not. In some instances, we visited shallow-seated landslides in the field; in others, we did not. In order to extrapolate depth and percentage of sediment delivery for shallow-seated landslides not visited, we calculated the average depth and sediment delivery of landslides visited. We did not calculate delivery statistics for deep-seated landslides. Categorizing shallow-seated landslides as either road or non-road related, we determined an average depth for each category through field observations. Next we assigned an average depth, depending on category, to all landslides not observed in the field

Some of the sediment delivery from shallow-seated landslides is the result of conditions created by deep-seated landslides. A deep-seated failure, for example, may result in a debris slide or torrent which could deliver sediment. Furthermore, over-steepened scarps or toes of deep-seated landslides may have shallow failures associated with them. We have accounted for these types of circumstances by estimating sediment delivery from shallow-seated landslides regardless of their source.

G.2.1.6 Sediment input from deep-seated landslides

Gradual and catastrophic sediment delivery

Large, active, deep-seated landslides can potentially deliver large volumes of sediment over long periods of time and increase sediment load downstream of the failure. Actual delivery can occur if the toe of the slide over-steepens and subsequently falls into the creek or if the slide pushes out into the creek. It is very important not to confuse normal stream bank erosion at the toe of a slide with movement of that slide. Before making such a connection, the slide surface should be carefully explored for evidence of significant movement, such as wide ground cracks.

Sediment delivery can also occur in a catastrophic manner. In such a situation, large portions of the landslide essentially fail and move into the watercourse instantaneously. These types of deep-seated failures are relatively rare in the plan area and usually occur in response to unusual storm events or seismic ground-shaking.

Determining quantity of sediment delivery

In our watershed analyses, we did not determine the quantity of sediment delivery from deep-seated landslides. Movement of deep-seated landslides has definitely resulted, however, in sediment delivery in the plan area. Factors, such as rate of movement or depth of the slide plane, are difficult to determine without subsurface geotechnical investigations; we did not conduct such investigations in our analyses.

Sediment delivery to watercourses can occur by several processes, including surface erosion and shallow or deep-seated movement of a portion, or all, of the deep-seated landslide deposit. The

ground surface of a deep-seated landslide, like any other hillside surface, is subject to surface erosion processes, such as rain drop impact, sheetwash (overland flow), and gullies or rills. Under these conditions, we assumed the sediment delivery from surficial processes to be the same as adjacent hillside slopes not underlain by landslide deposits. Materials within a landslide are disturbed and can be somewhat weaker. However, once a soil has developed, the fact that the slope is underlain by a deep-seated landslide should make little difference in sediment delivery from erosion at the ground surface. Fresh, unprotected surfaces can become a source of sediment until the bare surface becomes covered with leaf litter, vegetation, or soil.

Clearly, movement of a portion or all of a deep-seated landslide can result in delivery of sediment to a watercourse. However, movement must be on slopes immediately adjacent to or in close proximity to a watercourse and of sufficient magnitude to push the toe of the slide into the watercourse. A deep-seated landslide that "toes out" on a slope away from a creek or that moves only a short distance downslope will generally deliver little to a watercourse. Moreover, often only a portion of a deep-seated landslide will become active, even though that portion may be quite variable in size.

Ground cracking at the head of a large, deep-seated landslide does not necessarily equate to immediate sediment delivery at the toe of the landslide. Small incremental movement of large deep-seated landslides can create void spaces within the slide mass. Though movement can be clearly indicated by the ground cracks, many times the toe may not respond or show indications of movement until some of the void space is closed. This would be particularly true in the case of very large deep-seated landslides that exhibit ground cracks only a few inches to a couple of feet wide. Compared to the entire length of the slide, the amount of movement implied by the ground crack could be very small. Even combined with the closing up or "bulking up" of the slide, ground cracking would not generate much movement, if any, at the toe of the slide. However, small incremental movement on a large deep-seated landslide over thousands of years can result in oversteepened toe slopes; these, in turn, can cause debris slides and flows. MRC will estimate such sources of sediment delivery during the inventory of shallow-seated landslides.

G.2.1.7 Characteristics of deep-seated landslides

The characteristics of deep-seated landslides received less attention in our landslide inventory than shallow-seated landslides. To investigate deep-seated landslides, we would have had to conduct subsurface analyses to estimate attributes such as depth, volume, failure date, current activity, and sediment delivery. Subsurface investigation was beyond the scope of our watershed analysis. Further assessment of deep-seated landslides will occur, however, on a site-by-site basis in the WAUs, likely during preparation of timber harvest plans and reviews.

Air reconnaissance mapping

MRC only interpreted deep-seated landslides by air reconnaissance techniques. Criteria for reconnaissance mapping includes observations of four morphologic features of deep seated landslides—toe, internal morphology, lateral flanks, main scarp—plus vegetation (after McCalpin 1984 as presented by Keaton and DeGraff 1996, p. 186, Table 9-1). The presence of tension cracks or sharply defined and topographically offset scarps are probably a more accurate indicator of recent or active landslide movement. These features, however, are rarely visible on aerial photos.

Morphologic features of deep-seated landslides

We have developed a set of 5 descriptions to classify each morphologic feature of a deep-seated landslide (Table G-5). The five descriptions are ranked in descending order from characteristics typical of active landslides, to those typical of dormant and relict landslides. One description should characterize a feature best. Nevertheless, overlap between classifications is neither unusual nor unexpected. We recognize that some deep-seated landslides may lack evidence for one or more of the observable features, but show strong evidence of other features. If there is no expression of a particular geomorphic feature (e.g., lateral flanks), the classification of that feature is considered undetermined. A deep-seated landslide associated with other deep-seated landslides may be classified as a landslide complex.

In addition to the classification of the deep-seated landslide features, there is a classification of the interpretation itself. Some landslides are obscured by vegetation, with areas that are clearly visible and areas that are not. In addition, weathering and erosion may obscure geomorphic features. The quality of aerial photographs varies; this can make interpretations difficult. Owing to these circumstances, each inference of a deep-seated landslide is classified according to the strength of the evidence as definite, probable or questionable (see Table G-4). At the THP scale, MRC expects to use field observations to reduce the uncertainty of interpretation inherent in air reconnaissance.

Table G-5 Morphologic Classification of Deep-seated Landslides

Feature	Criteria
Toe Activity	1. Steep streamside slopes with extensive unvegetated to sparsely vegetated shallow-seated landslides. Shallow-seated landslides occur on both sides of the stream channel, but more prominently on the side containing the deep-seated landslide. The stream channel in the toe region may contain coarser sediment than the adjacent channel. The stream channel may be pushed out by the toe. The toe may be eroding, exhibiting sharp topography/geomorphology. 2. Steep streamside slopes with few shallow-seated landslides ranging from unvegetated to sparsely vegetated. Shallow-seated landslides generally are distinguishable only on the streamside slope containing the deep-seated landslide. The stream channel may be pushed out by the toe. Sharp edges are becoming subdued. 3. Steep streamside slopes that are predominantly vegetated with little to no shallow-seated landslide activity. Topography/geomorphology subdued. 4. Gently sloping stream banks that are vegetated and lack shallow-seated landslide activity. Topography/geomorphology very subdued. 5. Undetermined.
Internal morphology	1. Multiple, well defined scarps and associated angular benches. Some benches may be rotated against scarps so that their surfaces slope back into the hill, causing ponded water, which can be identified by different vegetation than adjacent areas. Hummocky topography with ground cracks. Jack-strawed trees may be present. No drainage to chaotic drainage/disrupted drainage. 2. Hummocky topography with identifiable scarps and benches, but those features have been smoothed. Undrained to drained but somewhat subdued depressions may exist. Poorly established drainage. 3. Slight benches can be identified, but are subtle and not prominent. Undrained depressions have since been drained. Moderately developed drainage to established drainage but not strongly incised. Subdued depressions that are being filled. 4. Smooth topography. Body of slide typically appears to have failed as one large coherent mass, rather than broken and fragmented. Developed drainage well established, incised. Essentially only large undrained depressions are preserved and are very subdued. Could have standing water. May appear as amphitheater slope where slide deposit is mostly or all removed.

Feature	Criteria
	5. Undetermined.
Lateral Flanks	1. Sharp, well defined. Shallow-seated landslides on lateral scarps fail onto body of slide. Gullies/drainage may begin to form at boundary between lateral scarps and sides of slide deposit. Bare spots are common or partially unvegetated. 2. Sharp to somewhat subdued, rounded, and essentially continuous. Might have small breaks; gullies/drainage may be developing down lateral edges of slide body. May have shallow-seated landslide activity, but less prominent. Few bare spots. 3. Smooth, subdued, but can be discontinuous and vegetated. Drainage may begin to develop along boundary between lateral scarp and slide body. Tributaries to drainage extend onto body of slide. 4. Subtle, well subdued to indistinguishable, discontinuous. Vegetation is identical to adjacent areas. Watercourses could be well incised, may have developed along boundary between lateral scarp and slide body. Tributaries to drainage developed on slide body. 5. Undetermined.
Main Scarp	1. Sharp, continuous geomorphic expression, usually arcuate breaks in slope with bare spots to unvegetated; often has shallow-seated landslide activity. 2. Distinct, essentially continuous break in slope that may be smooth to slightly subdued in parts and sharp in others; apparent lack of shallow-seated landslide activity. Bare spots may exist, but are few. 3. Smooth, subdued, less distinct break in slope with generally similar vegetation relative to adjacent areas. Bare spots are essentially non-existent. 4. Very subtle to subdued, well vegetated, can be discontinuous and deeply incised, dissected; feature may be indistinct. 5. Undetermined.
Vegetation	1. Less dense vegetation than adjacent areas. Recent slide scarps and deposits leave many bare areas. Bare areas also due to lack of vegetative ability to root in unstable soils. Open canopy, may have jack-strawed trees; can have large openings. 2. Bare areas exist with some regrowth. Regrowth or successional patterns related to scarps and deposits. May have some openings in canopy or young broad-leaf vegetation with similar age. 3. Subtle differences from surrounding areas. Slightly less dense and different type vegetation. Essentially closed canopy; may have moderately aged to old trees. 4. Same size, type, and density as surrounding areas. 5. Undetermined.

G.2.1.8 Terrain stability units

The term *terrain stability unit* (TSU) is the preferred terminology for landslide zones. In earlier watershed analyses, MRC used the term *mass wasting map units* (MWMU). TSU and MWMU describe the same features; however, TSU is the term we will use in the HCP/NCCP and future MRC watershed analysis.

To delineate TSUs, MRC partitions the landscape into zones with similar geomorphic attributes, shallow-seated landslide potential, and sediment delivery to stream channels; in the delineation, we use a combination of aerial photograph interpretation, field investigation, and SHALSTAB output. Each TSU designation is based on land forms present; mass wasting processes; sensitivity to forest practices; mass wasting hazard; delivery potential; and forest management triggers for shallow-seated landslides.

TSUs are only meant to be general characterizations. Deep-seated landslides are shown on a TSU map in order to provide land managers with supplemental information for harvest planning and

geologic review. The landscape and geomorphic setting in any given WAU is certainly more complex than generalized TSUs depict. The TSUs are only a starting point; they may point up the need for site-specific field assessments.

G.2.1.9 MRC methods for evaluating mass wasting

Landslide terminology

MRC has been consistent in our terminology for landslide names in all the watershed analysis reports.

SHALSTAB

MRC has been consistent in our use of SHALSTAB in all the watershed analysis reports.

Landslide inventory

Table G-6 shows how the methods MRC used to evaluate mass wasting in specific WAUs differed from the standard method.

Table G-6 MRC Methods for Evaluating Mass Wasting in Specific WAUs of the Plan Area

WAU	MRC Method vs. Standard Method
Garcia River	No difference
Albion River	No difference
Noyo River	Slide location class not included; relative age classification not performed from air photo interpretation; slope form not included; deep-seated landslide morphology description not included.
Big River	No difference
Hollow Tree Creek	Slide location class not included; relative age classification not performed from air photo interpretation; slope form not included.
Navarro River	Slide location class not included; relative age classification not performed from air photo interpretation; slope form not included.
Greenwood Creek	No difference
Northern Russian River	Slide location class not included; relative age classification not performed from air photo interpretation; deep-seated landslide morphology description not included.
Elk Creek	No difference
Cottaneva Creek	No difference
Rockport Coastal Streams	Complete by 2012
Southcoast Streams	Complete by 2012

G.2.1.10 MRC methods for estimating sediment input from mass wasting

Sediment input from deep-seated landslides

MRC has not quantified sediment inputs from deep seated landslides in any of the watershed analysis reports.

Systematic description of deep-seated landslide features

MRC has been consistent in our systematic description of deep-seated landslide features in all the watershed analysis reports except for Noyo River.

Terrain stability units

In the watershed analyses for Garcia River, Big River, and Navarro River, MRC referred to terrain stability units as mass wasting map units.

Landslide inventory

Table G-7 shows how the methods MRC used in estimating sediment input in specific WAUs differed from the standard method.

Table G-7 Estimating Sediment Input from Mass Wasting in Specific WAUs of the Plan Area

WAU	MRC Methods vs. Standard Method
Garcia River	No difference
Albion River	No difference
Noyo River	Landslides not visited in field received average sediment delivery percentage from field observations, except streamside landslides assumed to have delivered 100% of its mass.
Big River	Landslides not visited in field had sediment delivery percentage interpreted from aerial photographs by the following percentage classes: 0-25%, 25-50%, 50-75%, 75-100%.
Hollow Tree Creek	No difference
Navarro River	Landslides not visited in field received average sediment delivery percentage from field observations, except streamside landslides assumed to have delivered 100% of its mass.
Greenwood Creek	Landslides not visited in field received average sediment delivery percentage from field observations.
Upper Russian River	Landslides not visited in field received average sediment delivery percentage from field observations, except streamside landslides assumed to have delivered 100% of its mass.
Cottaneva Creek	Landslides not visited in field received average sediment delivery percentage from field observations.
Elk Creek	Landslides not visited in field received average sediment delivery percentage from field observations.
Southcoast Streams	Complete by 2012
Rockport Coastal Streams	Complete by 2012

G.2.2 Module: surface and point source erosion

G.2.2.1 Standard method: road erosion

Road inventory and reporting

MRC intends to complete an inventory of all roads within each WAU, with the exception of historical and decommissioned roads, by the end of 2011. Our surveyors use a Global Positioning System (GPS) to identify, map, and inventory all major features of the road network. We have collected data to evaluate surface and point source erosion. This includes field observations on watercourse crossings, crossing structures (e.g., culverts, bridges), and landings. The road inventory provides dimensions of the road network, such as road lengths and widths, as well as road segments contributing sediment—all useful information for surface erosion modeling.

Point source erosion delivering to a watercourse

Point source erosion from a road consists of major rills or gully erosion observed in close proximity to a watercourse or evidence of sediment delivery directly into a watercourse. MRC assumes that all observed sediment delivery from surface or point source erosion occurred within the past 5 years, unless there is contradictory information. During an inventory of road features, we estimate the past volume of point source erosion for a specific feature (e.g., watercourse crossing) and use these estimates to calculate the total volume of erosion delivered from the road. Finally, we convert the volume of erosion to a weight (in tons), assuming a soil bulk density of 100 lbs/ft^3 (1.35 g/cm^3).

Point source erosion differs from controllable erosion. The former is an estimate of erosion that has already delivered to a watercourse, whereas the latter is a measure of erosion that might still deliver.

Controllable erosion

During our road inventory, MRC road crew documents observed point source erosion. This includes gully or road-fill washouts; it excludes surface erosion or sheetwash because these non-point sources are quantified in the modeling for road surface erosion. Potential erosion is called controllable erosion, a term developed by the North Coast Regional Water Quality Control Board (Order # R1-2004-0016, *Categorical Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities On Non-Federal Lands in the North Coast Region*). The source of controllable sediment discharge is a site or location, either pre-existing or created by timber harvest, lying within the project area and meeting all the following conditions:

1. Discharges sediment or has the potential to discharge sediment to state waters in violation of water quality requirements or other WDR provisions.
2. Caused or affected by human activity.
3. Responds to management measures for prevention and minimization.

Typically, controllable erosion is a measure of the fill material from a road that could erode if a road feature is left un-maintained or fails in the next 40 years (the duration of a TMDL). The amount of controllable erosion is the volume of soil that can be controlled with high design standards for road features (e.g., watercourse crossing and side-cast fill). While the North Coast Regional Water Quality Control Board considers only sites greater than 10 yd^3 as controllable erosion, MRC actually inventories even smaller volume sites and calls them controllable erosion

as well. We also conduct an analysis for controllable erosion of skid trail sites, e.g., in the Garcia WAU.

Delivery potential and treatment immediacy

Controllable erosion sites are further designated by their potential for sediment delivery, immediacy of treatment, and diversion potential. Both the sediment delivery potential and the treatment immediacy are ranked low, moderate, or high. Ranking each controllable erosion site by these variables provides a hazard or risk assessment. This, in turn, allows MRC to prioritize road improvements and erosion control based on hazard rankings. In our reporting, MRC generates a map that shows road features and their treatment immediacy (see MAP B-2 in the watershed analysis reports on file).

An important variable of potential point source erosion is the likelihood of water diverting down the road prism—called diversion potential. This is a straightforward determination. If the crossing or culvert is plugged, will the water in the crossing or culvert divert—yes or no? In the case of a watercourse crossing that is plugged, dammed, or failed, a site has a diversion potential if water could divert from the natural watercourse channel onto the road prism. Water diverted out of its natural channel would erode the road prism and potentially create high sediment delivery.

Culvert sizing

Proper sizing of culverts is an important consideration for road erosion potential. To determine if existing culverts are the appropriate size, MRC inventories the area behind each culvert from topography data in the MRC Geographic Information System (GIS). We use the regression equation for the North Coast region (Waananen and Crippen 1977) to predict 50- and 100-year peak flow. With a nomograph, or calculating chart, we determine the appropriate culvert size for 50- and 100-year peak flow magnitudes based on a headwater depth-to-pipe diameter ratio of 0.67 (Cafferata et al. 2004); the predicted size is compared to the existing size of the culvert to determine if the culvert is large enough. This analysis of culvert sizing is only a "first cut." We require a field visit to each culvert site to verify if the appropriate watershed drainage area was used and the culvert is, in fact, under-sized.

Factors influencing surface erosion

MRC did not estimate in the field the amount of surface erosion (or sheetwash) from roads; instead, we modeled the surface erosion. Our model was from the Standard Methodology for Conducting Watershed Analysis (WFPB 1995), which uses SEDMOD, an acronym for Spatially Explicit Delivery Model. In our road inventory, we collect information on most of the factors influencing surface erosion: contributing length of road erosion at watercourse crossings; the amount of road traffic (based on road type); road surface material; and width and size of road. Annual precipitation and vegetative cover are also factors in the model. Annual precipitation is derived from long-term climate records of the area; vegetation cover is assumed based on average observed conditions in the plan area. Our road inventory, however, does not provide *contributing length* for road segments adjacent to a watercourse but not associated with a culvert or crossing. Using GIS analysis, we can determine the contributing length of roads within a specified distance from a watercourse and assume certain estimates of sediment delivery (Table G-8). Our assumptions are based on sediment delivery ratios used in SEDMOD.

Table G-8 Estimates of Sediment Delivery

Distance of Road from Watercourse	Sediment Delivery to Watercourse
50 ft	100%
50-100 ft	35%
100-200 ft	10%

Assigning weights to factors

In modeling surface erosion from roads in each WAU, MRC made several general assumptions. Table G-9 shows these assumptions and, in some cases, the weights assigned to them. The purpose of *weighting* is to indicate the relative importance of evaluation factors; the higher the weight number, the more important the factor.

Table G-9 Assumptions for Surface Erosion Model

Assumptions
• Observed roads are older than 2 years and have a base erosion rate of 60 tons/ac/yr. • Width of road tread is 40% of the road prism. • Cut-and-fill slopes are 60% of the road prism (multiply road width by 1.5). • Cut-and-fill slopes have about 50% vegetation, giving a cover factor of .37. • Hauling on roads usually occurs during the drier times of year. As a result, we used the lowest annual precipitation category, i.e., <47 in. precipitation annually. In this annual precipitation category, a road with at least a 6 in. rock surface has a factor of 0.2; a native surface road has a factor of 1.

Table G-10 shows the weights specifically assigned to traffic factors.

Table G-10 Assigning Weights to Traffic Factors

Traffic Factors
• MAINLINE ROADS WITH HEAVY TRAFFIC These roads have a weight factor of 20 and are actively used and maintained for log haul traffic. • MAINLINE ROADS WITH MODERATE TRAFFIC These roads have a weight factor of 2 and are used for log haul traffic 2-3 times each decade. • SEASONAL ROADS These roads have a weight factor of 1.2 and are tributary roads which receive moderate log haul traffic 1-2 years each decade and light traffic the remainder of the time. • TEMPORARY ROADS These roads have a weight factor of 0.61 and receive moderate log haul traffic 1-2 times every 1-2 decades with little or no use in between.

Calculating sediment delivery from a road

Figure G-2 illustrates a sample calculation for determining the amount of sediment delivery from a specific road, including the assumptions behind the calculation.

EXAMPLE

Road material:	rock (0.5 factor)
Road traffic:	heavy use, mainline road (20 factor)
Road width:	16 ft. (assumption)
Contributing length:	1000 ft.
Vegetation cover:	50% on cut-and-fill slopes (0.37 factor)
Base erosion rate:	60 tons/ac/yr (assumption)

The calculations to estimate yearly surface and point source erosion from this road are:

Driving surface: 16'*1000'/43560 ft^2/ac *20 * 0.5 *60 tons/ac/yr = 220 tons/yr

Road cut/fill-slopes: 16'*1000'*1.5/43560 ft^2/ac *0.37 *60 tons/ac/yr = 12 tons/yr

Road surface erosion: 220 tons/yr (tread) +12 tons/yr (cut/fill-slope) = 232 tons/yr

Figure G-2 Sample Calculation of Sediment Delivery from a Road

Calculating sediment delivery from all roads in a WAU

MRC modeled each road in a WAU for surface erosion and summed the results in tons/yr for all roads. This sum was then divided by the number of plan area acres in the WAU (ac/mi^2) to provide a surface erosion delivery rate normalized by area (tons/mi^2/yr).

To get total surface and point source erosion from all roads in a WAU, we add the result from the surface erosion model to the total volume of point source erosion observed during the road inventory. We assume the point source erosion identified in the road inventory is representative of the past 5 years. In the total sediment delivery calculations, therefore, we divide the total point source erosion by 5. This result is then divided again by the total area of the WAU (mi^2) to provide a delivery rate normalized by area (tons/mi^2/yr).

EXAMPLE

Volume of surface erosion from model:	2000 tons/yr
Volume of point surface erosion observed:	3000 tons
Total area of WAU:	10,000 ac

The calculation to estimate the total surface and point source erosion is:

(2000 tons/yr +3000 tons/5 yr) / 10,000ac/640 ac/mi^2 = 132 tons/mi^2/yr

Figure G-3 Sample Calculation of Sediment Delivery from All Roads in a WAU

Classes of erosion hazard

With information on surface erosion, MRC assigns each road in the WAU an erosion hazard class. We determine the erosion hazard class from the amount of erosion a road has produced and the likelihood for that erosion to be delivered to a watercourse. In ranking roads for erosion

hazard, we consider: (1) levels of traffic; (2) road surface; (3) proximity of a road to a stream; (4) past point source erosion; and (5) modeled surface erosion. We classify roads as high, moderate, or low erosion hazards depending on how much sediment and soil erosion they are likely to deliver. Finally, for forester use in prioritizing road work and decommissioning roads, we produce a map for each WAU with ratings for road erosion hazards (see MAP B-1 in the watershed analysis reports on file).

G.2.2.2 Standard method: skid trail erosion

Using aerial photos of an entire watershed analysis unit, MRC determines sediment delivery from skid trails. From the photos, we interpret skid trail density (high, moderate, low) for a specific year. Combining our surface erosion modeling with field observations from past watershed analyses, we develop our estimates of sediment delivery from skid trails (Table G-11).

Table G-11 Skid Trail Density and Sediment Delivery

Skid Trail Class	Skid Trail Density (watercourse crossing/mi^2	Sediment Delivery (tons/mi^2 /yr)
High	>100	600
Moderate	50-100	400
Low	<50 or significant re-vegetation	100

For each year of photo observation, the total area in a skid trail class was multiplied by the sediment delivery rate for that density. The estimate was then divided by the number of square miles of the plan area in each CalWater planning watershed to provide a sediment rate (tons/mi^2/yr) for each planning watershed. Finally, we assumed that the skid trail class and its sediment delivery rate represented skid trail activity in the decade prior to the year of photo observations (e.g., a 1970 photo shows skid trail activity from the 1960s).

Results from South Fork Caspar Creek in the early 1970's suggest that high density tractor logging—practices used at that time—generated approximately 600 tons/mi^2/yr (Rice et. al., 1979). This is double the estimates of sediment delivery from high density skid trails used in MRC watershed analysis reports to date. As a result, in preparing Table 3-11, we doubled our sediment estimates from those in the watershed analyses. Future watershed analyses will also use higher sediment delivery rates for the various skid trail densities. In fact, the watershed analysis at Greenwood Creek, completed in 2004, used this higher sediment rate for skid trail evaluations.

G.2.2.3 MRC methods for evaluating sediment delivery from roads in specific WAUs

G.2.2.3.1 Garcia WAU

MRC methods for determining surface and point source erosion in the Garcia WAU differed from the standard method described in G.2.2.1. In the Garcia WAU, we did not use the road inventory to define parameters for the model; instead, we used a separate sampling of roads in the watershed. If we did not observe a road in the field, we assigned it the average delivery rate extrapolated from similar roads in the area. Moreover, we did not do a sizing analysis of culverts in the Garcia WAU. Table G-12 lists the parameters for the surface erosion model in the Garcia WAU.

Table G-12 Parameters for Surface Erosion from Roads in the Garcia WAU

Garcia WAU					
Road Class	**Base Erosion Rate (tons/ac/yr)**	**Cover Factor for Cut and Fill Slopes**	**Surface Material Factor for Road Tread**	**Traffic + Precipitation Factor**	**Time in Heavy Use Factor (yr)**
Mainline					
<2 yrs old	110	0.37	0.75*	24.5	5
>2 yrs old	60				
Secondary					
<2 yrs old	110	0.37	0.75*	2.3	2
>2 yrs old	60				
Temporary					
<2 yrs old	110	0.37	0.75*	1	2
>2 yrs old	60				
Abandoned	60	0.37	0.75*	0.025	0

TABLE NOTE
* Most common factor; in some cases, based on field observations of road.

G.2.2.3.2 Big River WAU

The Big River WAU did not have a complete road inventory at the time of its initial watershed analyses. MRC had data on 40% of the road network. We determined surface and point source erosion from field observations and from a model for road surface erosion.

MRC sampled roads by planning watershed, hillslope class, and traffic use (mainline or secondary). In the case of hillslopes, we designated their relative location to Class I watercourses, as follows:

- Low slopes equate to the lower 20% of a hillslope between a watercourse and a ridge.
- Mid slopes equate to the middle 20-80% portion of a hillslope between a watercourse and a ridge.
- Top slopes equate to the upper 20% of a hillslope near a ridge.

Roads adjacent to watercourses typically deliver more erosion than upper slope roads; therefore, it was useful to segregate them during sampling. We also collected observations for potential point source erosion (controllable erosion) at road sites that appeared to have an immediate need for maintenance or upgrade.

In modeling surface erosion from roads in the Big River WAU, MRC made several general assumptions (see Table G-9). MRC assigned weights to various factors. Landing areas have a factor of 0.1; these areas receive moderate to high usage only 1-2 times every 1-2 decades with little or no use in between. A road with at least a 6-inch rocked surface has a 0.2 factor; a 3-6 in. rocked surface has a 0.5 factor; a native surface road has a factor of 1.0; a paved road surface has a factor of 0.03. We also assigned weights to traffic factors for mainline roads with moderate traffic, seasonal roads, and temporary roads (see Table G-10).

To arrive at an estimate of sediment delivery for roads not observed in the field, we extrapolated data from roads observed in the field. Estimates were for both surface erosion and point source erosion. MRC did not conduct sizing analysis of culverts in the Big River WAU.

G.2.2.3.3 Noyo WAU

The surface and point source erosion estimates for the Noyo WAU followed the standard methods in G.2.2.1. In some cases the road inventory lacked contributing road length. In these cases the contributing road length was assumed to be 200 ft. Estimates for the surface erosion model were only for watercourse crossing; they did not include road segments adjacent to, but not crossing, watercourses. MRC did not conduct sizing analysis of culverts in the Noyo WAU.

G.2.2.3.4 Albion WAU

The surface and point source erosion methods differed from the standard methods in G.2.2.1. In the Albion WAU, we did not use the road inventory to provide parameters for the model; instead we conducted a separate sampling of roads in the watershed. Roads not visited in the field were assigned the average delivery rate extrapolated from similar roads in the area. Table G-13 shows the parameters for the surface erosion model in the Albion WAU. It varies from the format in Table G-12. When we modeled erosion in the Albion, we used different model coefficients based on different categories within the factors, such as road class and vegetative cover. Again, MRC did not conduct sizing analysis of culverts in the Albion WAU.

Table G-13 Parameters for Surface Erosion in the Albion WAU

Traffic/Precipitation Factor for Road Classes				
Road Class	**Active/Mainline**	**Active/Secondary**	**Light/Non-active**	**No Traffic/ Abandoned**
Factor	24.5	2.3*	1	0.025

Vegetative Cover Factor for Cut/Fill Slopes						
% Vegetative Cover	**80**	**50**	**30**	**20**	**10**	**0**
Factor	0.18	0.37*	0.53	0.63	0.77	1.0

Surface Material Factor for Road Tread			
Road Type	**n** (native surface)	**n-2** (< 2” rock)	**2** (2-6” rock)
Factor	1.0	0.75*	0.5

Delivery Factors for Tread and Cut/Fill Slopes		
Prism Section	**Tread**	**Cut and Fill Slopes**
Factor	0.95	0.55

TABLE NOTES

* Most common factor, based on field observation.

Generally, calculations begin with a base erosion rate of 60 tons/ac/yr.

G.2.2.4 MRC methods for evaluating sediment delivery from skid trails in specific WAUs

G.2.2.4.1 Garcia WAU

In estimating sediment delivery from skid trails, MRC used the density of skid trail watercourse crossings per unit area, as determined from aerial photos. Next we multiplied the number of crossings per unit area by 300 since field observations determined that 300 ft is the average skid trail delivery length per water crossing. From aerial photographs and conversations with area foresters, we then determined the harvest areas that used skid trails. We multiplied the percentage of harvest area using skid trails by the deliverable length of skid trails per unit area to

yield the total deliverable length of skid trails per time period. For a traffic factor, we selected temporary roads from Table G-10, even though, in the erosion calculations, skids trails have a narrower width than temporary roads. Because of TMDL issues in the Garcia watershed, our efforts, described above, were more intensive than the standard methods.

In the future, our non-source point erosion estimates of skid trails will be solely from aerial photographs for all watershed analyses (see G.2.2.2). Point source erosion (controllable erosion) estimates of skid trails will incorporate a field survey component to calibrate aerial photograph estimates.

G.3 Summary on Sediment Input

G.3.1.1 General method

This section combines and summarizes the sediment input results from two modules of the watershed analysis—mass wasting along with surface and point source erosion. MRC estimated sediment input for each WAU from hillslope mass wasting; road-associated mass wasting; surface and point source erosion from roads; and surface and point source erosion from skid trails. The road-associated mass wasting included the skid trail mass wasting. Future watershed analyses will summarize sediment inputs within a synthesis module.

G.3.1.2 MRC methods in specific WAUs

G.3.1.2.1 Big River WAU

Estimates for skid trail erosion are the sum of estimates for skid trail mass wasting and surface and point source erosion; we have removed the skid trail mass wasting from the road associated mass wasting.

G.3.1.2.2 Garcia WAU

For the Garcia WAU, we not only quantified sediment inputs but analyzed changes to sediment storage. We determined sediment storage in streamside terraces and in storage sites of the stream bed, such as behind woody debris dams. Terrace volumes of individual discrete terraces were calculated by measuring length, width, and depth values with pace and tape measuring techniques. Large continuous terrace volumes (usually at the mouths of sub-basins of the WAU) were calculated by averaging width and depth of the terrace and measuring length on the map. Channel storage volumes were determined by measuring the length, width, and depth of the active channel with the same techniques used on terraces. Depth is the limiting measurement in the accuracy of these techniques. For this study, the depth of terrace deposition was assumed to be the distance from the deepest scour in the active channel to the top of the terrace surface. Field evidence used to determine depth of channel storage included the depth of scour pools and the depth measured at the downstream side of debris dams. When this information was not available a channel storage depth of 1 ft was assumed to be an approximate average streambed scour depth. Since these techniques underestimate terrace and stream channel depths, storage volume was a minimum estimate.

Cumulative terrace and channel storage volume was then calculated as a sum of individual terrace and stream data collected in the field. This data was used to extrapolate storage volumes to stream reaches not visited in the field. Collected and extrapolated data was combined to calculate terrace and stream channel storage totals for each hydrologic unit. Based on field observations, the terraces in the response reaches of the hydrologic units in the WAU, with the exception of the main stem of the Garcia River, was assumed to have been created 30-40 years ago. This

assumption was based primarily on even-aged alder stands about 30-40 years old found on the terraces. Furthermore, logging debris, such as cut logs and truck tires, were observed in the terrace stratigraphy, suggesting initial terrace deposition was during the period of modern forest management in the Garcia WAU, from the 1950's to the present. The stratigraphy of the terrace deposits shows many layers of sediment ranging in thickness from 1–10 in. Each individual layer is composed of a characteristic class size. Class sizes range from sand to gravel to cobble. The cobble layers are angular in shape, suggesting they have not been transported very far and were probably derived from hillslope erosion processes. We estimated the terraces were deposited over 3-15 years and represent multiple flood and sediment transport events. Hydrologic data for the Garcia River shows numerous flood events (magnitude > 2 yr. return interval) within the last 30-40 years, that are capable of moving large sediment loads, creating terraces as the flood wave recedes.

G.3.2 Module: hydrology

G.3.2.1 Standard methods

This section provides the available peak flow data for the WAUs. MRC uses peak flow data to show the magnitude of storms and when they occurred. To estimate the recurrence interval of floods, we use the annual peak flow series. An extreme value type I distribution (Gumbel 1958) was fitted to the data to provide return intervals for different levels of streamflow.

G.3.2.2 Hydrology methods used in the WAUs

Table G-14 shows how the methods MRC used in specific WAUs differed from the general hydrology method.

Table G-14 Differences in Hydrology Methods

Differences in Hydrology Methods	
WAU	**MRC Method vs. General Method**
Garcia River	The peak flow information was taken from the Garcia River Gravel Management Plan (Philip Williams and Assoc. 1996). Hydrologic data was collected by the United States Geological Survey (USGS) gage 11467600 from 1962-1983. The gauged period of record at the Garcia River USGS gaging station was extended using a synthesis of data from a continuous gaging record for the nearby Navarro River (Philip Williams and Associates 1996).
Albion River	The Navarro River peak flow data was the only long term river flow data available in close proximity to the Albion WAU. The Navarro River peak flow data probably does not provide a direct relationship with the peak flows of the Albion River. However, for the purpose of showing the timing and magnitude of large storm events of the area, the Navarro River peak flow data is assumed to be sufficient.
Noyo River	No difference
Big River	Other than the few years of stream flow information on the South Fork Big River, there is little information on peak storm events in Big River. Therefore, the information from the Noyo River and the Navarro River is presented to give an indication of storm timing and magnitude.

Differences in Hydrology Methods	
WAU	**MRC Method vs. General Method**
Hollow Tree Creek	The only available river peak flow data close to Hollow Tree Creek came from the South Fork Eel River (at Leggett). For the purpose of showing the timing and magnitude of large storm events of the area, this peak flow data is assumed to be sufficient.
Navarro River	No difference
Greenwood Creek	The Navarro River peak flow data was the only long term river flow data available in close proximity to the Greenwood Creek WAU. The Navarro River peak flow data probably does not provide a direct relationship with the peak flows of the Greenwood Creek. However, for the purpose of showing the timing and magnitude of large storm events of the area, the Navarro River peak flow data is assumed to be sufficient.
Northern Russian River	The only available river peak flow data close to Ackerman Creek came from the Russian River. For the purpose of showing the timing and magnitude of large storm events of the area, this peak flow data is assumed to be sufficient.
Cottaneva Creek	No difference
Elk Creek	No difference
Southcoast Streams	Complete by 2012
Rockport Coastal Streams	Complete by 2012

G.3.3 Module: riparian function

Our assessment of riparian function has two components:

1. Potential of the riparian stand to recruit LWD in order to meet the current demand of LWD in stream channels.

   This component evaluates the current condition of the riparian stands for generating LWD for stream habitat or stream channel stability. To determine current instream needs, we present field observations of current LWD levels in the stream channels and the ability of a riparian stands to recruit LWD in relation to channel sensitivity to LWD.

2. Canopy closure and stream temperature.

   This component shows current canopy closure above streams and its relation to stream temperature.

G.3.3.1 General methods for LWD recruitment

In general, MRC analyzes stream channels with a gradient below 20%. When channel gradients exceed 20%, we consider them to be source channels that are not as responsive to LWD.

They can, however, be a source for downstream LWD from mass wasting processes. To determine LWD-recruitment potential, we classify stands along selected watercourse segments[3] to cover a range of stream-side stand conditions using aerial photographs and field observations. For each re-survey of a watershed unit, we apply the same level of effort described in Table G-2. We evaluate these stands for a distance of approximately 1 site-potential tree-height on both sides of the stream channel, delineating a separate stand on each side of the watercourse. To classify the riparian stands, we use the codes in Table G-15 and Table G-16.

Table G-15 Vegetation Classes

Code	Description
RW	Coast redwood constitutes >75% of the stand basal area.
RD	Combined basal area of Douglas fir and coastal redwood exceeds 75% of the stand basal area, but neither species alone is 75% of the basal area.
MH	Mixed hardwoods constitute >75% of the stand basal area, but no one hardwood species is 75% of the basal area.
CH	Mix of conifer and hardwood exceeds 75% of the stand basal area, but no one hardwood or conifer species is 75% of the basal area.
BR	Brush

Table G-16 Vegetation Size Classes

Code	DBH
1	<8.0 in.
2	8.0-15.9 in.
3	16.0-23.9 in.
4	24.0-31.9 in.
5	>32.0 in.

MRC determines a stand's size class by starting with the proportion of basal area in size class 5 and summing the percentage of basal area in each lower size class. The size class at which the sum exceeds 50% of the total basal area becomes the size class for the stand. For example, if 30% of a stand is size class 5, 10% size class 4, 15% size class 3, 25% size class 2, and 20% size class 1, then the stand, as a whole, is size class 3 because the sum of size classes 5, 4, and 3 is greater than 50%.

Table G-17 Vegetation Density

Code	Tree Canopy Cover Range
O	5-20%
L	20-40%
M	40-60%
D	60-80%
E	>80%

[3] These can be watershed analysis, focus watershed studies, or long-term channel monitoring segments. Typically, segments are delineated at ownership boundaries, gradient breaks, and tributary junctions. Usually the length of each segment is at least 20-30 times the bankfull width or anywhere from 300 to 1500 ft. The average planning watershed where MRC owns a majority of the watershed contains roughly 10–20 segments for watershed analysis and 1 long-term channel monitoring segment.

MRC determines vegetation density in the field by ocular estimation of the amount of canopy cover within the riparian stand at the sampling location. Vegetation density is not the amount of instream shade, nor is it equivalent to timber inventory data on riparian canopy. Rather, a determination of vegetation density helps us classify the potential of a riparian stand for LWD recruitment.

To classify vegetation within streamside stands, we concatenate codes for vegetation class, size class, and vegetation density. For example, RW3D designates a redwood stand with more than 50% of its basal area in trees ≥16–23.9 in. dbh and a canopy cover of 60-80%.

Table G-18 summarizes our ratings of LWD recruitment potential based on vegetation, size, and density classifications.

Table G-18 Ratings of LWD Recruitment Potential

	Size and Density Classes					
	Size Classes 1-2 (Young)		**Size Class 3 (Mature)**		**Size classes 4-5 (Old)**	
Vegetation Type	**Sparse (O, L)**	**Dense (M, D, E)**	**Sparse (O, L, M)**	**Dense (D, E)**	**Sparse (O, L)**	**Dense (M, D, E)**
RW	Low	Low	Low	Moderate	Moderate	High
RD	Low	Low	Low	Moderate	Moderate	High
CH	Low	Low	Low	Moderate	Low	High
MH	Low	Low	Low	Moderate	Low	Moderate

For all of the riparian stands in the watershed, MRC uses field observations to calibrate estimates of vegetation density from aerial photography. We may not always find a range of vegetation classes and recruitment potentials in each watershed; in some cases, for example, MRC only owns a small portion of a planning watershed. In these cases, we draw upon data collected throughout the ownership to calibrate our estimates.

LWD observed in streams

MRC inventories LWD in watercourses during the stream-channel assessment of a watershed analysis. LWD is classified as either a key piece or a functional piece, based on research on LWD in streams in the Pacific Northwest (Bilby and Ward 1989).

DEFINITION

A **key piece** is any piece of wood, meeting MRC criteria for length, diameter, and volume; MRC assumes that key pieces are stable and have the ability to retain other LWD.

Functional LWD is any piece of wood greater than 4 in. (10 cm) in diameter and at least 6 ft (2 m) in length that is within the bankfull dimensions of the channel; stumps can be functional LWD even if they are less than 6 ft in length.

We have observed in many MRC watercourses that certain pieces of LWD function as key pieces but do not meet either the diameter or length criterion for that channel size. For example, a massive stump may meet the diameter criterion of a key piece but not the length criterion. Though relatively short in length, large stumps can have enough mass to remain stable in the

channel and act as a key LWD piece; consequently, we developed a supplemental criterion of minimum volume to capture the functional importance of such LWD pieces. We determined thresholds for minimum volume by stream size and calculated the volume of a key piece based on the diameter and length criteria for a key LWD piece. We then tripled these calculated volumes to decrease the probability of classifying non-key LWD pieces as key pieces. Table G-19 summarizes the MRC requirements for key LWD. LWD must meet the criteria for both diameter and length or the criterion for volume in order to be considered a key piece.

Table G-19 Minimum Diameter, Length or Volume for Key LWD[4]

Bankfull Width (ft)	Diameter (in.)	Length (ft)		Volume Alternative* (yds^3)
0-10	13	1.5 times the channel width		1
10-20	16	1.5 times the channel width		3
20-30	18	1.5 times the channel width	or	5
30-40	21	1.5 times the channel width		8
40-60	26	1.5 times the channel width		15
60-80	31	1.5 times the channel width		25
80-100	36	1.5 times the channel width		34

TABLE NOTE
A piece of LWD counts as a key piece if it does not meet the diameter and length criteria but exceeds this minimum volume.

For temporal or spatial comparison, MRC normalizes the observed quantity of LWD; we divide the quantity by distance (e.g., number of key LWD pieces per 328 ft). To determine if a watercourse contains appropriate amounts of LWD, MRC compares the quantity of key pieces in the bankfull channel (per 328 ft) to the desired key piece targets (Table G-20).[5]

Table G-20 Targets for Key LWD Pieces in Watercourses

Bankfull Width (ft.)	Minimum Number of Key LWD Pieces Per 328 ft
<15	6.6
15-35	4.9
35-45	3.9
>45	3.3

Channel sensitivity to LWD

MRC determines channel sensitivity during a stream channel assessment in a watershed analysis. Stream channels with similar physical characteristics are typed as geomorphic units based on similarity of response to coarse or fine sediment and LWD. We categorize channel sensitivity as high, moderate, or low based on the range of stream geomorphic conditions found on MRC property.

- HIGH SENSITIVITY TO LWD

Channels with moderate-to-low confinement (Montgomery and Buffington 1993) or moderate-to-low entrenchment ratios[6] and gradients

[4] Adapted from Bilby and Ward 1989
[5] Derived from Bilby and Ward (1989) and Gregory and Davis (1992)
[6] Entrenchment ratio (floodprone width/bankfull width) is greater than 1.4, as defined by Rosgen 1994.

lower than 4% generally exhibit high response to LWD inputs. These channel types have room within canyon walls to provide some meander or floodplain interactions. This ability of the channel either to interact with a floodplain or to meander provides for a greater propensity of LWD to direct and influence water flow, which develops channel morphology and sediment scour or storage. At slope gradients below 3-4%, the water energy of the channel decreases, turning channels into response reaches (Montgomery and Buffington 1993). Water flow begins to take on a lateral component rather than a strictly vertical movement as found at higher channel gradients—typically above 2-4%; this allows LWD to have a higher influence (Montgomery and Buffington 1993). Avulsion channels and floodplains of channel migration zones (CMZ) also appear highly responsive to LWD. These zones typically have low gradients, which allow water flow to move throughout the migration zone over time. Because the channel water migrates throughout the zone, the entire migration zone needs LWD to provide potential aquatic habitat.

- MODERATE SENSITIVITY TO LWD

Channels with high confinement (Montgomery and Buffington 1993) or a high entrenchment ratio[7] and gradients typically 0-10% exhibit moderate response to LWD inputs The high confinement or entrenchment of these channels provides little opportunity for the channel to meander or develop a floodplain. Water energy remains concentrated within the confines of canyon walls or stream banks, reducing the influence of LWD. In the lower gradient watercourses (<3-4%) with high confinement or high entrenchment, LWD has a lower probability of entering the channel because it becomes suspended over the channel's narrower bankfull widths. In channels with slope gradients of 4-10%, LWD typically serves to store sediment or develop forced step-pools. Bed morphology in channels with slope gradients of 4-10% usually consists of step pools (Montgomery and Buffington 1993). The large bed-forming material of step-pools generally remains stable (Whittaker 1987; Grant et. al. 1990), decreasing the role of LWD in these channels. Channels with >10% gradient in Franciscan Mélange terrain, however, appear prone to degradation and bank erosion if the channel does not contain LWD. This characteristic makes high-gradient watercourses in this geologic formation of moderate sensitivity to LWD compared to similar channels on MRC property.

- LOW SENSITIVITY TO LWD

Channels with high-gradient transport segments and a slope gradient typically >10% (including source reaches) exhibit low response to LWD inputs—except for channels in Franciscan Mélange terrain. At about a 10% slope gradient, channel-type changes from step-pool morphology to a cascade morphology (Montgomery and Buffington 1993) that experiences less influence from LWD. Although LWD stores sediment and serves as a source for downstream LWD in these channels, downstream delivery of upstream LWD occurs only episodically and

[7] Less than 1.4, as defined by Rosgen 1994

smaller LWD stores sediment in these channels effectively. Regime channel-types, usually forced by point bar development toward the outlet of large river systems, also have low sensitivity to LWD inputs (Montgomery and Buffington 1993). Regime channels typically have relatively wide bankfull channels and low gradients. LWD plays a minor role as an organic food source and provides some scour and cover along regime channel edges; however, the size and pattern of regime channels typically make LWD stability in the channel unlikely.

To determine a stream segment's instream LWD demand, we use a table built upon the 3 factors discussed in this sub-section: LWD recruitment potential rating, key LWD, and channel LWD sensitivity rating.

Table G-21 Instream LWD Demand

Recruitment Potential Rating	Key LWD	Channel LWD Sensitivity Rating		
		Low	Moderate	High
Low	On Target	Low	Moderate	High
	Off Target	High	High	High
Moderate	On Target	Low	Moderate	Moderate
	Off Target	High	High	High
High	On Target	Low	Moderate	Moderate
	Off Target	Moderate	High	High

MRC produces a map for the WAUs (MAP D-1 in the watershed analysis reports on file) showing the LWD recruitment potential and instream LWD demand.

LWD quality rating

For each planning watershed with an analyzed stream segment, MRC determines an LWD quality rating. The LWD quality rating depends on

- The percentage of watercourse segments with low or moderate LWD demand.
- The percentage of watercourse segments (based on stream length) with an appropriate number of key LWD pieces.

Appendix S, *Targets for LWD and Effective Shade* (Table S-2) provides LWD quality ratings. In defining ratings for LWD conditions in watercourses, MRC assumed that streams and watersheds are dynamic. LWD loadings are variable. It is unrealistic to set a goal that 100% of stream segments will be on target for LWD demand. However, if less than 50% of the watercourses have low or moderate LWD demand, we conclude there is an LWD deficiency.

MRC wants to ensure that enough key LWD exists at both small (i.e., stream segment) and large (i.e., planning watershed) spatial scales. To do so, we consider key LWD, as opposed to all LWD or functional LWD, in determining both instream LWD demand and overall LWD condition

G.3.3.2 MRC methods for evaluating LWD recruitment in specific watershed analysis

Table G-22 shows how the methods MRC used to evaluate LWD recruitment in specific WAUs differed from the general method.

Table G-22 MRC Methods for Evaluating LWD Recruitment in the Plan Area

WAU	MRC Method vs. General Method
Garcia River	No difference
Albion River	No difference
Noyo River	No LWD quality rating developed in the watershed analysis report; however the rating was developed and presented in Section 3.0 of this HCP/NCCP. No minimum size requirement was used for functional LWD.
Big River	No difference
Hollow Tree Creek	No difference
Navarro River	No difference
Greenwood Creek	Additional LWD input information collected during the LWD surveys (see Table G-23).
Northern Russian River	No difference
Cottaneva Creek	No difference
Elk Creek	No difference
Southcoast Streams	Complete by 2012
Rockport Coastal Streams	Complete by 2012

Table G-23 shows the recommended classifications of instream LWD for use in future watershed analysis efforts. MRC identified LWD characteristics during our stream surveys for the Greenwood WAU.

Table G-23 Instream LWD Characteristics

Instream LWD Characteristics		
Category	**LWD Attribute**	**Description**
LWD species	Redwood	• Coast redwood
	Fir	• Douglas fir, hemlock, grand fir, nutmeg, spruce, or pine
	Alder	• Red or white alder
	Hardwood	• All other hardwoods (oak, bay laurel, maple, etc.)
	Unknown	• Cannot identify species
LWD dimensions	Length	Total exposed length including portion outside bankfull channel **NOTE** Any portion buried in streambed cannot be measured.
	Diameter	Diameter at center of LWD piece. **NOTE** The center of a piece of LWD is not always in the stream channel.
	Bankfull portion	Percent of length of LWD within bankfull channel
Association with other LWD	Debris accumulation	> 3 but < 10 functional LWD pieces in contact with each other
	Debris jam	≥ 10 functional LWD pieces in contact with each other

Instream LWD Characteristics		
Category	**LWD Attribute**	**Description**
Decay class (Robison and Beschta 1990a)	Decay class 1	Bark intact, twigs present, texture intact, round shape, original wood color
	Decay class 2	Bark intact, twigs absent, texture intact, round shape, original wood color
	Decay class 3	Trace of bark, twigs absent, texture smooth with some surface abrasion, round shape, original wood color or darkening
	Decay class 4	Bark absent, twigs absent, texture with surface abrasion, some holes and openings, round to oval shape, dark wood coloring
	Decay class 5	Bark absent, twigs absent, texture is vesicular with many holes and openings, round to oval shape, dark wood coloring
Special characteristics	Buried	Part of LWD is buried in the stream bed or banks.
	Rootwad	LWD has rootwad attached.
	Alive	LWD is alive.
Location	Station (ft)	Location of the center of each LWD piece within the longitudinal profile (i.e., station or distance along the longitudinal profile)
Input process **NOTE** Identify only one process per LWD piece—the dominant input process.	Windthrow	Entire tree uprooted and recruited by wind
	Wind fragmentation	Portion of tree broken and recruited by wind
	Bank erosion	Tree or LWD that was delivered from erosion of the bank
	Mass wasting	LWD delivered from a mass wasting event(s)
	Logging associated	LWD placed or delivered from past harvest activities (e.g., LWD from a Humboldt crossing) **NOTE** Only use this designation if harvesting processes (road building, yarding, or tree falling) deliver the LWD into the channel.
	Restoration	LWD placed as part of a restoration effort
	Unknown	Cannot identify the input process

G.3.3.3 Standard methods for instream canopy and shade

MRC estimates canopy closure over watercourses from aerial photos and field observations. Table G-24 shows the canopy closure classes. Using field observations, we calibrate estimates of instream canopy for all watercourses in the watershed. We may not observe all of the canopy closure classes in each watershed; in some cases, for example, MRC only owns a small portion of a planning watershed. In these cases, we draw upon data collected throughout the ownership to calibrate our estimates.

Table G-24 Estimated Levels of Canopy Closure from Aerial Photographs

Stream and Bank Visibility	Canopy Closure
Stream surface not visible	>90% canopy closure
Stream surface visible or visible in patches	70-90% canopy closure
Stream visible but banks are not visible	40-70% canopy closure
Stream surface and banks partially visible	20-40% canopy closure
Stream surface and banks visible	<20% canopy closure

Prior to 2006, MRC monitored canopy closure over select stream channels. In most instances, we used a spherical densiometer, although we did occasional estimates with a solar pathfinder based

on the August sun path line. All of our observations of instream canopy since 2006 have been exclusively with a solar pathfinder. A solar pathfinder provides a better estimate of canopy by taking into account aspect and topography. It measures watercourse shade resulting from both topography and canopy, whereas the spherical densiometer usually only measures shade from vegetation. We will rectify data collected with a spherical densiometer so that it is comparable with data from a solar pathfinder. In all cases, we estimate at approximately 1-3 evenly spaced intervals along a channel sample segment, typically a length of 20–30 bankfull widths. Calculating an average of all the readings for the channel segment gives the estimated canopy closure for the entire segment.

MRC monitored stream temperature in Class I and select Class II watercourses in the WAU. Monitoring occurs during the summer months when the water temperatures are highest. The stream temperature recorders were typically placed in shallow pools (less than 2 ft in depth) directly downstream of riffles—sections in a stream where water breaks over rocks or other obstructions (Figure G-4).

Figure G-4 Pools, Riffles, and Temperature Recorder

We calculate maximum and mean daily temperatures for each temperature monitoring site and year. For maximum weekly average temperatures (MWATs) and maximum weekly maximum temperatures (MWMTs), we use a 7-day average of the mean and maximum daily stream temperatures. Figure G-5 depicts the typical placement of stream temperature monitoring probes (purple stars) and channel segment assignments (numbered 1-9) for a hypothetical watershed.

Instream effective shade rating

MRC assesses conditions for instream effective shade based on 2 factors: stream temperature and stream canopy cover. A stream is on-target for effective shade if stream temperatures at that location are below 15°C, even if canopy cover is deficient. We take measurements of instream canopy at discrete points rather than continuously throughout surveyed stream segments. Next we apply an average canopy value to that segment. In the future, we will base targets for effective shade on the number of segments surveyed since we assume that canopy cover will likely increase evenly across our land, except in those areas receiving restoration treatments.

Moreover, MRC assumed that the amount of natural canopy closure is a function of the width of the stream, i.e., larger streams will naturally have lower levels of canopy closure and smaller streams will naturally have higher levels of canopy closure. We used an EPA-based assessment canopy closure as a function of bankfull width (see Figure G-6, Figure G-7, and Figure G-8, taken from the USEPA 2000).

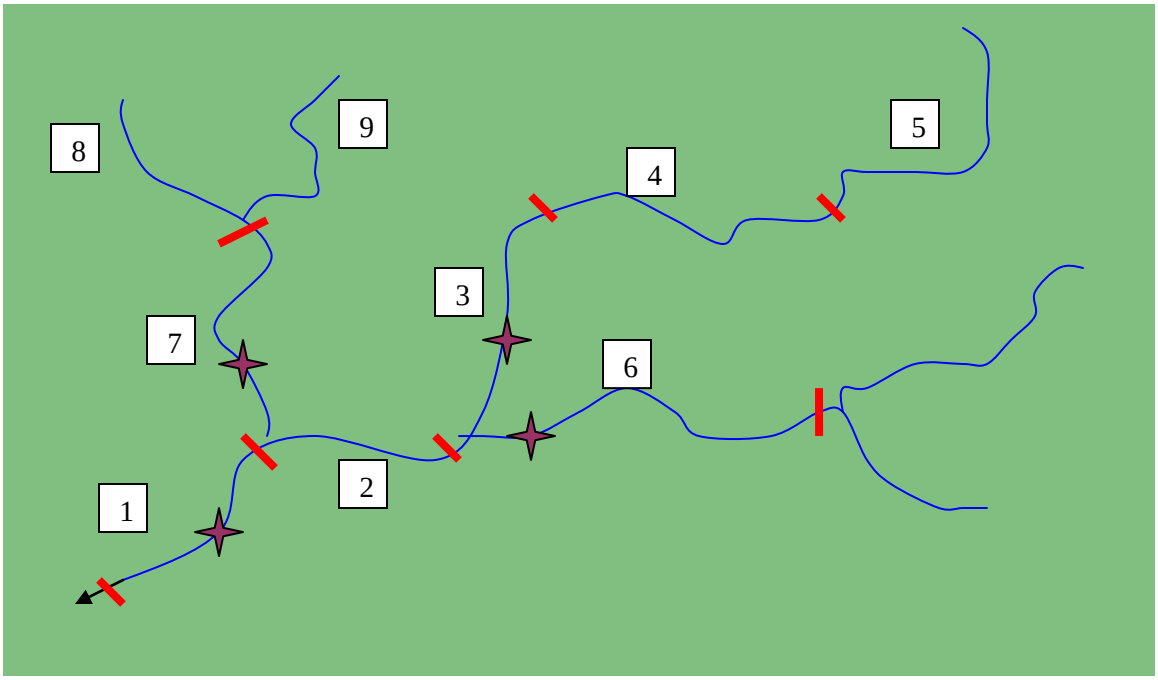

Figure G-5 Typical Stream Temperature Monitoring and Segment Locations

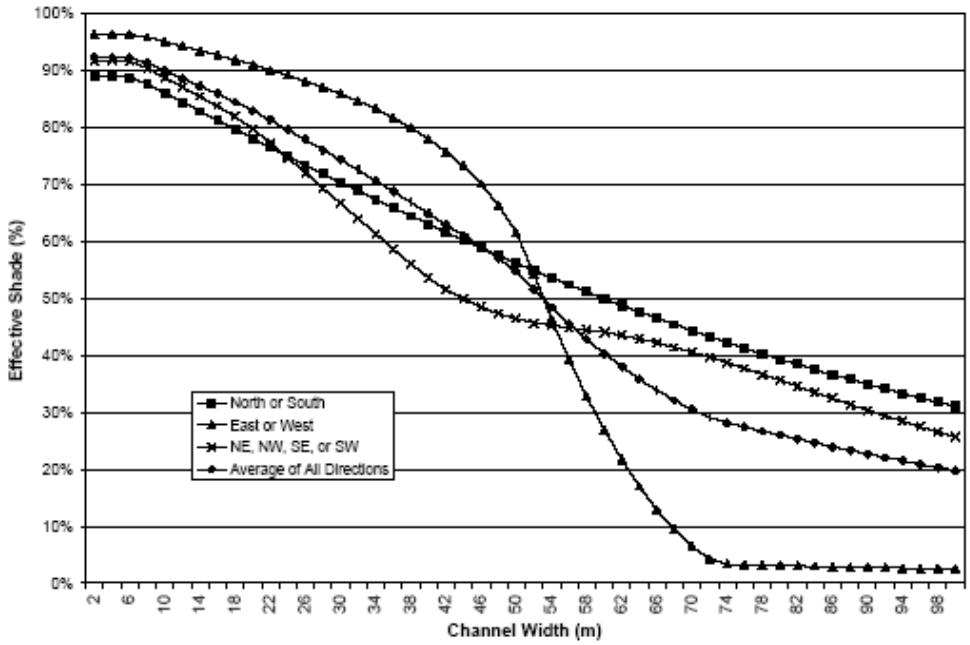

Figure G-6 Effective Shade vs. Channel Width (Redwood)

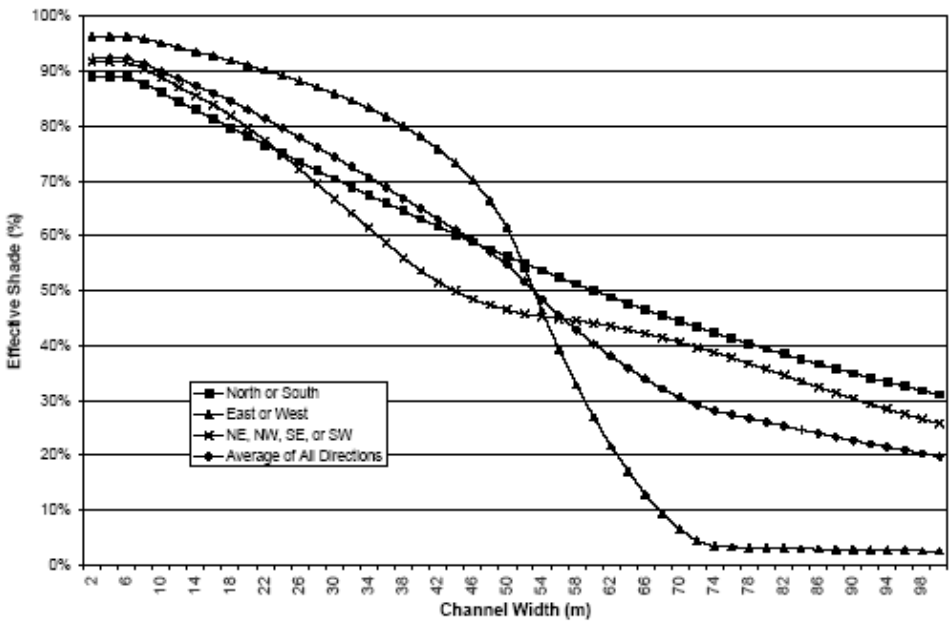

Figure G-7 Effective Shade vs. Channel Width (Douglas Fir/Hardwood-Conifer)

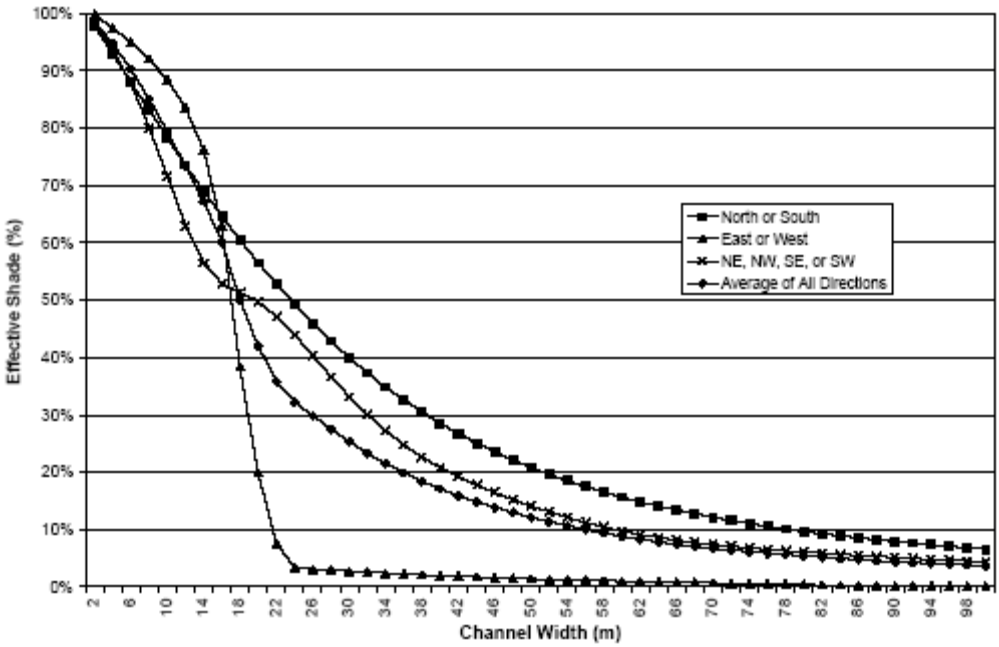

Figure G-8 Effective Shade vs. Channel Width, (Oak Woodland)

The North Coast Regional Water Quality Control Board (NCRWQCB) originally developed the graphs in Figures G-6 through G-8 for the EPA Navarro TMDL. The basis of the graphs were GIS models of effective shade under current (impaired) conditions and under future site-potential conditions predicted to achieve desired temperature targets. Figures G-7 and G-8 depict future site-potential shade conditions over a stream, versus bankfull width. However, MRC is using these curves to determine achievable levels of canopy cover based on segment width. Clearly,

smaller streams will achieve more canopy than larger streams. MRC also includes stream temperature data, where available, in the analysis of effective shade.

Looking closer at Figures G-6 through G-8, we can see that the amount of canopy closure for a 30-ft wide stream (roughly 10 m) is approximately 90% (averaged across all directions) for a redwood forest and less for a mixed hardwood forest and oak woodland. MRC chose 90% canopy cover for this channel size as the most conservative value; however, we recognize that other types of habitat may not achieve this target. For a 100-ft stream (30 m), the effective shade (or canopy closure) in coniferous-hardwood forest (Figures G-6 and G-7) drops to around 70%; for oak woodland, effective shade drops to about 40% (Figure G-8). As a result, we use a conservative canopy cover value of 40% for all channels between 100 and 150 ft. Table G-25 summarizes the target canopy cover values by bankfull width that MRC uses to assess riparian stand conditions. We did not choose values for mid-point canopy cover (from Figures G-6 through G-8) for the bankfull widths indicated in Table G-25 since the wider streams would not achieve the higher target; in addition, temperature is also a component in determining the overall rating for effective shade.

Table G-25 Canopy Cover as a Function of Bankfull Width

Rating	Bankfull Width (ft) of Watercourse Segment	Percent Canopy Closure
ON TARGET	< 30	> 90
ON TARGET	30–100	> 70
ON TARGET	100–150	> 40

The process of determining effective shade for each watercourse segment is as follows:

1. What is the maximum weekly average temperature (MWAT) for the watercourse segment?

    a. If the MWAT value for the watercourse segment (averaged over the past 3 seasons) is below 15°C, conclude that current shade conditions provide "on-target" effective shade.
    b. If the MWAT value for the watercourse segment is above 15°C, proceed to Step 2.
    c. If no temperature data is available for the watercourse segment, assume that the segment does not meet the temperature target and proceed to Step 2.
2. Does the segment[4], based on bankfull width, meet the average canopy requirement (see Table G-25)?

The number of stream segments (not weighted by stream length) that meet their requirements for stream temperature or canopy cover is the basis for the assessment of effective shade in a planning watershed, as shown in Table G-26.

Table G-26 Rating Effective Shade by Planning Watershed

ON TARGET	More than 80% of surveyed watercourse segments within the planning watershed have on-target effective shade.
MARGINAL	60-80% of surveyed watercourses segments within the planning watershed have on-target effective shade or at least 70% canopy.
DEFICIENT	Less than 60% of surveyed watercourses segments within the planning watershed have on-target effective shade or <70% canopy.

G.3.3.4 MRC methods for evaluating stream canopy in specific WAUs

Table G-27 shows how the MRC method for evaluating stream canopy in specific WAUs differs from the general method.

Table G-27 MRC Methods for Evaluating Stream Canopy in the Plan Area

WAU	MRC Method vs. General Method
Garcia River	No difference
Albion River	Only 3 canopy closure classes were interpreted from aerial photographs: >70%, 40-70%, <40%.
Noyo River	Only 3 canopy closure classes were interpreted from aerial photographs: >70%, 40-70%, <40%. No shade quality rating was developed in the watershed analysis; however, it was developed was Table 3-9.
Big River	No difference
Hollow Tree Creek	Only 4 canopy closure classes were interpreted from aerial photographs: >90%, 70-90%, 40-70%, <40%.
Navarro River	Only 4 canopy closure classes were interpreted from aerial photographs: >90%, 70-90%, 40-70%, <40%.
Greenwood Creek	No difference
Northern Russian River	No difference
Cottaneva Creek	No difference
Elk Creek	No difference
Southcoast Streams	Complete by 2012
Rockport Coastal Streams	Complete by 2012

G.3.4 Module: stream channel condition

G.3.4.1 General method

The methods of the stream channel assessment are designed to identify channel segments that are likely to respond similarly to changes in sediment or wood and group them into distinct geomorphic units. These geomorphic units enable an interpretation of habitat-forming processes dependent on similar geomorphic and channel morphology conditions. The channels are also

evaluated for current condition to provide baseline information for the evaluation of channel conditions over time.

Initial stream segment delineation from GIS
GIS analysis partitions the stream channel network for the WAU into stream segments based on 3 classes of channel confinement and several classes of channel gradient. These classifications are based on channel classifications prepared from digital terrain data in our GIS. The slope classes used for delineation are 0-3%, 3-7%, 7-12%, and 12-20%. Channel confinement is classified as confined, moderately confined, and unconfined. Confined channels have a valley-to-channel width ratio of <2, moderately confined channels have a valley-to-channel width ratio of <4, and unconfined channels have a valley to channel width ratio of >4.

MRC delineates channel segments for observations or analysis based on ownership boundaries, gradient breaks, tributary junctions or change in channel confinement. Usually the length of each segment is a minimum 20-30 times the bankfull width or anywhere from 300 to 1500 ft. The average planning watershed (where MRC owns a majority of the watershed) contains roughly 10–20 segments for watershed analysis and 1 long-term channel monitoring segment. The channel segments are numbered with a 2-letter code, corresponding to the planning watershed the channel segment is located, followed by a unique number (1 through n for each planning watershed). The delineated stream segments are shown on MAP E-1 in the watershed analysis reports on file.

Field measurements and observations
Selection of field sites for stream channel observations are based on gathering a sub-sample of response (0-3% gradient) and transport (3-20% gradient) channels from each planning watershed of the WAU. No attention is focused on the source reaches (>20% gradient); this is covered in the mass wasting analysis. Conducting a survey of the entire WAU is too labor-intensive. Our first priority in determining segments for field observation is to ensure that sampling occurs at (or upstream of) all stream temperature monitoring sites. MRC selects segments based on our ownership within each planning watershed (i.e., the larger the ownership the more segments selected) with equal emphasis given to response and transport segments.

After viewing the entire segment, the hydrologist chooses a location for a representative cross-section. At this location, the hydrologist measures bankfull width, bankfull maximum depth, bankfull average depth, floodprone depth, floodprone width, and channel bankfull width-to-depth ratio. Regional curves aid the hydrologist in estimating bankfull channel dimensions (Dunne and Leopold 1978). These curves provide information on channel dimensions (average depth, width, and cross-sectional area) based on drainage area size. The secondary diameters of 50 randomly selected pebbles at the cross section determine the D50 (median particle size) of the streambed. The hydrologist interprets streambed sediment characteristics from observations of gravel bars, channel aggradation or degradation and particle size of the stream bed material, classifying morphology types based on Montgomery and Buffington (1993) and Rosgen (1994). Flood plain interaction for the segment (continuous, discontinuous, inactive, none) and characteristics of channel roughness permit further interpretation of channel morphology. The hydrologist inventories LWD functioning in the channel and observes the number and type of pools (LWD forced, bank forced, boulder forced, free formed). Watershed analysis reports summarize all these field observations.

Stream geomorphic units
Channel segments were grouped into geomorphic units by similar attributes of channel condition, position in the drainage network, gradient class, and confinement class. The intent of the

geomorphic units are to stratify channel segments of each WAU into units which respond similarly to the input factors of coarse and fine sediment, as well as LWD. These geomorphic units can then be interpreted to have similar habitat-forming processes.

Interpretations related to sediment supply, transport capacity, and LWD response were the basis for sensitivity of geomorphic units to coarse sediment, fine sediment, and LWD inputs. These interpretations were based primarily on existing conditions observed in the stream channels of the WAU.

Long-term stream monitoring sites
To monitor stream channel morphology conditions and stream sediment characteristics related to fish habitat, MRC established long-term stream channel monitoring segments in the initial watershed analysis for each WAU. We select channel segments within response channels (3% gradient), near the outlet of the stream or river that is representative of a range of channel conditions across the plan area; the selected segments should have reasonable access for surveys. As of 2010, there were a total of 40 long-term channel monitoring segments located across the plan area, with each segment averaging approximately 1000 ft in length. MRC will increase the total number of long-term channel monitoring segments to 60, with the goal of monitoring all of them every 6 years (i.e., 10 segments per year).

Table G-28 Monitoring Long-term Channel Segments

Long-term Channel Monitoring Segments		
WAU	Planning Watershed	Segments
Hollow Tree Creek	Middle Hollow Tree	2
	Upper Hollow Tree	2
Rockport Coastal Creeks	Juan Creek	1
Cottaneva Creek	Cottaneva	1
Noyo River	North Fork Noyo	2
	Hayworth	3
	Middle Fork Noyo	2
Albion River	Lower Albion	1
	Middle Albion	2
	South Fork Albion	2
Big River	East Branch Big River	1
	Daugherty Creek	1
	South Fork Big River	1
	Big River (near Two Log Creek)	1
Northern Russian River	Upper Ackerman Creek	1
	Lower Ackerman Creek	1
Navarro River	John Smith Creek	1
	Little North Fork Navarro	2
	Lower South Branch Navarro	1
	Upper South Branch Navarro	1
	Lower Navarro	1
	Flynn Creek	1
	Middle Navarro	1
Greenwood Creek	Upper Greenwood	1

Long-term Channel Monitoring Segments		
WAU	Planning Watershed	Segments
	Lower Greenwood	1
Elk Creek	Upper Elk	1
	Lower Elk	1
Garcia River	South Fork Garcia	2
	Rolling Brook	1
Southcoast Streams	Mallo Pass Creek	1
Segments to be added to current set		20
	Total	60

Along these segments, we conduct longitudinal profile and cross section surveys, and measure streambed size distribution. We also measure the fraction of pool volumes filled with fine sediment (V*) and permeability of spawning gravels (Appendix H). An MRC hydrologist will re-survey these long-term segments and monitor them over time to provide insight into long term trends in channel morphology, sediment transport, presence of LWD, and fish habitat conditions.

The stream monitoring segments are typically 20-30 bankfull channel widths in length. Permanent benchmarks (PBMs) are placed at the upstream and downstream ends of the monitoring segment. The PBMs are monumented with a re-bar pin concreted into the ground or nails hammered into the base of large trees.

The longitudinal profile is a survey of the thalweg, the deepest point of the channel, excluding any detached or "dead end" scours or side channels. At every visually apparent change in thalweg location or depth, the station along the channel and the elevation is recorded. In the absence of visually apparent changes, thalweg measurements are taken every 15-20 ft along the channel. Further each LWD piece of functional size or greater is recorded[8] along with its dimensions and attributes (Table G-23).

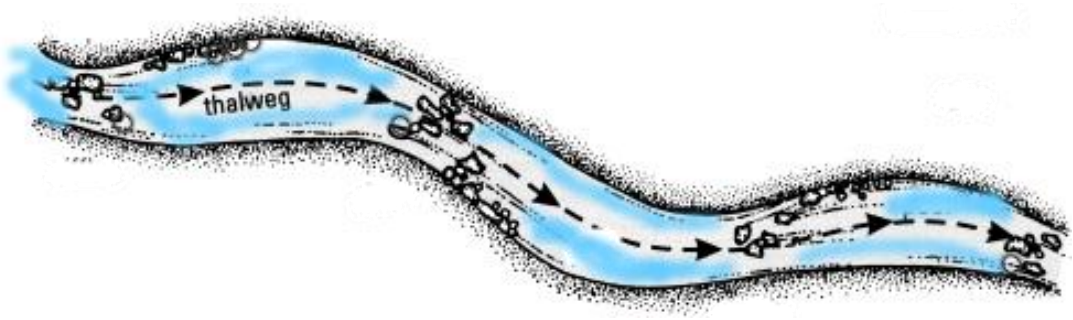

Figure G-9 Thalweg

A profile graph of the channel's thalweg is created from the longitudinal survey. MRC used a computer program (Longpro 2) developed by the United States Geological Survey for Redwood National Park to analyze the profiles. This program converted the surveys into standardized data sets with uniform 5-foot spacing between points and determined the residual water depth of each point. The residual water depth is the depth of water in pools of the channel segment defined by the riffle crest height at the outlet of the pool. No minimum pool depth is specified. The distribution, mean, and standard deviation of the residual water depths for the longitudinal profile

[8] Up until 2003, long term channel monitoring observations did not include LWD or its characteristics; however, after 2003, all long term channel monitoring included LWD information.

segment are calculated. This provides the ability to statistically evaluate changes in the residual water depths from the thalweg profile over time.

Along the longitudinal profile, we survey 3-5 channel cross sections (i.e., locations permanently monumented). The cross sections are located along relatively straight reaches in the monitoring segment. We survey cross sections from above the floodprone depth of the channel and create a graph of the cross section. At each cross section, we measure 100 randomly selected pebbles to determine the particle size distribution and median particle size (D50).

The fraction of pool volume filled with fine sediment (or V*) can be used to evaluate and monitor channel condition and to identify and quantify effects of discrete sediment sources (Hilton and Lisle 1993). Fine sediment thickness is measured by driving a graduated metal probe into a fine-grained deposit until the underlying coarser substrate is felt. Ten to 20 pools are needed to estimate V^*_w (the weighted mean value of V* for a reach), depending on acceptable error and variability between pools. MRC will follow protocols outlined in Hilton and Lisle (1993).

Permeability and bulk gravel samples
MRC collected steam gravel permeability and bulk gravel samples in the long-term monitoring segments in the WAUs to provide an index of spawning gravel quality within the monitoring segments. The stream gravel permeability was measured using a 1-inch diameter standpipe similar to the standpipe discussed in Terhune (1958) and Barnard and McBain (1994) with the exception that our standpipe is smaller in diameter. We used the smaller diameter standpipe because we hypothesize that it creates fewer disturbances to the stream gravel when inserted. Bulk stream gravel samples were taken with a 12-inch diameter sampler as described in Platts et al. (1983).

An electric pump was used to create the water suction in the standpipe for the permeability measurements. The permeability measurements were taken at a depth of 25 cm, near the maximum depth of coho salmon and steelhead spawning. From a power analysis it was determined that 26 measurements per segment were needed to predict within 20% accuracy.[9/1] The measurements were evenly distributed among all pool tail-outs in the segments; any additional measurements were taken in tail-outs behind the deepest pools. The measurement location in each tail-out was randomly selected from an evenly selected 12-point grid in the tail-out. At each measurement location, permeability repetitions were taken until the permeability readings no longer were increasing.

The median permeability measurement for each permeability site in the monitoring segment was used as representative of the site. To characterize the entire monitoring segment the natural log of the geometric mean of the median permeability measurements was determined. The natural log of the permeability was used based on a relationship between permeability and survival-to-emergence developed from data in Tagart (1976) and McCuddin (1977).[10/2] This relationship equates the natural log of permeability to fry survival ($r^2 = 0.85$, $p<10^{-7}$). This index needs further improvements, but is currently all we have for interpreting permeability information and biological implications. This relationship is:

$$\text{Survival} = -0.82530 + 0.14882 * \ln \text{permeability}$$

[9/1-2] Peter Baker (Senior Mathematician, Stillwater Sciences, Berkeley, CA) relayed to Chris Surfleet (MRC) in August 2000 the information about sample sizes necessary to evaluate the effects of permeability on egg survival of coho salmon and steelhead.

It is important to understand that the use of this survival relationship is only an index of spawning gravel quality in the segment. The permeability measurements were taken in randomly selected pool tail-outs and are not indicative of where a salmon may select to spawn. Furthermore, spawning salmon have been shown to improve permeability in gravel where redds are developed (see Appendix H). Therefore the survival percentage developed is only indicative of the quality of potential spawning habitat and not as an absolute number.

Prior to 2006, MRC collected bulk gravel samples in each long-term channel monitoring segment. Bulk gravel samples were taken in each of the 4 randomly selected pool tail-outs. The gravel sample was taken directly over the permeability site that is closest to the thalweg of the channel. After the bulk gravel samples were collected, the gravel was dried and sieved through 7 different size-class screens (50.8, 25.4, 12.5, 6.3, 4.75, 2.36, 0.85 mm). The weight of each gravel size class was determined for each of the bulk gravel samples using a commercial quality scale.

From the sieved bulk gravel samples, the percent of fine particles less than 0.85 mm and 9.5 mm was determined. The survival index for steelhead trout and Chinook salmon was calculated from the bulk gravel samples using the method described in Tappel and Bjorn (1983).

MRC will conduct bulk gravel sampling as part of focus watershed studies.

G.3.4.2 MRC method for evaluating stream channel condition in specific WAUs

For all watershed analysis units, the development of stream geomorphic units and long-term channel monitoring segments has been consistently applied. The only differences between the various watershed analyses have been the field observations taken. Generally, the stream channel field surveys have had similar observations. The subtle differences in the observations really do not warrant discussion as they do not affect the interpretations of channel conditions or the geomorphic units. However, we did mention a few of them below to disclose potential shortcomings. For example, in the Albion WAU (Table G-29), a few of the instream channel observations such as floodplain connectivity, bankfull width, and bankfull depth were different.

Table G-29 shows how the MRC method for evaluating stream channel conditions in specific WAUs differs from the general method.

Table G-29 MRC Method for Evaluating Stream Channel Conditions in the Plan Area

MRC Method for Evaluating Stream Channel Conditions in the Plan Area	
WAU	**MRC Method vs. General Method**
Garcia	The bankfull width and depth were collected without use of a regional curve.
Albion	A few of the instream channel observations such as floodplain connectivity, the bankfull width and depth (without use of a regional curve), and lack of residual pool depths were different.
Noyo	The bankfull width and depth were collected without use of a regional curve.
Big River	No difference
Hollow Tree	The bankfull width and depth were collected without use of a regional curve.

MRC Method for Evaluating Stream Channel Conditions in the Plan Area	
WAU	**MRC Method vs. General Method**
Navarro	No difference
Greenwood	No difference
Northern Russian	No difference
Cottaneva Creek	No difference
Elk Creek	No difference
Southcoast Streams	Complete by 2012
Rockport Coastal Streams	Complete by 2012

G.3.5 Module: fish habitat

MRC will analyze fish habitat only during initial watershed analyses. Subsequently, we will rely upon long-term channel monitoring observations, focus watershed studies, and data from CDFG. The remainder of this sub-section describes the original MRC surveys for fish habitat.

G.3.5.1 General method

The survey used to evaluate the habitat condition of each WAU was conducted during low flow conditions using methods modified from the California Salmonid Stream Restoration Manual (Flosi et al. 1998). Stream segments were created based on stream gradient and channel confinement. Fish habitat conditions were determined by sampling representative stream segments throughout the watershed. Factors that determined fish habitat assessment locations included fish presence, accessibility, and stream channel type (response, transport or, source reach). Since high gradient streams were likely to be non-fish bearing, survey efforts were concentrated on low gradient reaches of the stream network. The fish habitat assessments were conducted in the same locations as the stream channel observations (with few exceptions).

A distance of 20-30 bankfull widths determined the survey length to ensure that approximately two meander bends of the stream channel were observed. Data collected during the fish habitat and stream channel surveys provided information on: pool, riffle, and flatwater frequency; pool spacing; spawning gravel quantity and quality; over-wintering substrate; shelter complexity; and LWD frequency, condition, and future recruitment.

The quality of fish habitat was evaluated for each life stage of the anadromous salmonid: spawning, summer rearing, and over-wintering. Table G-30 displays the targets used for rating measured habitat parameters. These indices are based on scientific literature (Bilby and Ward 1989; Bisson et al. 1987; Bjornn and Reiser 1991; CDFG 1998b; Montgomery et al. 1995; WFPB 1995) and professional judgment. Spawning habitat conditions are evaluated on the basis of gravel availability and quality (gravel sizes, sub-surface fines, embeddedness), as well as for preferred spawning areas located at the tail-outs of pools. Summer rearing habitat conditions are evaluated on the size, depth, and availability of pools along with the complexity and quantity of cover (particularly LWD). Over-wintering habitat is evaluated on the size, depth, and availability of pools, the proportion of habitat units with cobble or boulder-dominated substrate, and the quantity of cover.

Habitat data is combined into indices of habitat quality for the different life stages of anadromous salmonid. Measured fish habitat parameters were weighted and given a numeric scale to develop

a quality rating for individual life history stages. Parameters were divided into subsets that correspond with individual life history stages (spawning, summer rearing, and over-wintering habitat). Parameters were scored as follows: 1 (poor), 2 (fair), and 3 (good). Figure G-10 shows the parameter codes and calculation for habitat quality.

Spawning Habitat
E (0.25) + **F** (0.25) + **G** (0.25) + **H** (0.25)

Summer Rearing Habitat
A (0.20) + **B** (0.15) + **C** (0.15) + **D** (0.15) + **F** (0.15) + **I** (0.20)

Over-wintering Habitat
A (0.20) + **B** (0.15) + **C** (0.15) + **D** (0.10) + **I** (0.20) + **J** (0.20)

The overall score is rated as follows:
1.00 - 1.66 = Deficient
1.67 - 2.33 = Marginal
2.34 - 3.00 = On Target

Figure G-10 Weights and Ratings for Habitat Quality

Table G-30 Fish Habitat Condition Indices for Measured Parameters

Fish Habitat Condition Indices for Measured Parameters				
Fish Habitat Parameter	**Feature**	**Fish Habitat Quality**		
		Deficient	**Marginal**	**On Target**
Percent pool (by length) (A)	Anadromous salmonid streams	<25%	25-50%	>50%
Pool spacing (reach length/bankfull/#pools) (B)	Anadromous salmonid streams	≥6.0	3.0–5.9	≤2.9
Shelter rating (shelter value x% of habitat covered) (C)	Pools	<60	60–120	>120
% of pools that are ≥3 ft residual depth (D)	Pools	<25%	25–50%	>50%
Spawning gravel quantity (% of surface area) (E)	Pool tail-outs	<1.5%	1.5–3%	>3%
% embeddedness (F)	Pool tail-outs	>50%	25–50%	<25%
Subsurface fines (L-P watershed analysis manual) (H)	Pool tail-outs	2.31–3.0	1.61–2.3	1.0–1.6
Gravel quality rating (L-P watershed analysis manual) (H)	Pool tail-outs	2.31–3.0	1.61–2.3	1.0–1.6

Fish Habitat Condition Indices for Measured Parameters				
Fish Habitat Parameter	**Feature**	**Fish Habitat Quality**		
		Deficient	**Marginal**	**On Target**
Key LWD + rootwads/328 ft of stream (I)	Streams < 40 ft BFW	<4.0	4.0–6.5	>6.6
	Streams ≥ 40 ft BFW	<3.0	3.0–3.8	>3.9
Substrate for over-wintering (J)	All habitat types	<20% Units cobble or boulder dominated	20–40% Units cobble or boulder dominated	>40% Units cobble or boulder dominated

Distribution of anadromous salmonids

Apart from watershed analysis, MRC has a separate program to monitor the distribution of anadromous salmonids (M§13.6.1.1-2). The results from this program are then used in watershed analysis reports. The location of the distribution survey is indicated on a map (MAP F-1) along with the actual and potential distribution of anadromous salmonids. Actual distribution is based on data, potential distribution on the interpretation of a fishery biologist. The latter is typically only done for larger watercourses.

G.3.5.2 MRC methods for evaluating fish habitat in specific watershed analysis

Table G-31 shows how the MRC method for evaluating fish habitat in specific WAUs differs from the general method.

Table G-31 MRC Methods for Evaluating Fish Habitat in Specific WAUs

MRC Methods for Evaluating Fish Habitat in Specific WAUs	
WAU	**MRC Method vs. General Method**
Garcia	• 2 sets of observations of permeability and bulk samples (1997 and 2000) were presented. The 1997 permeability and bulk sample observations differ in methods. In 1997, samples were taken inside and outside of abandoned redds throughout the watershed. • Only an interpretation of potential anadromous salmonid distribution is shown, compared to a separate presentation of known and potential anadromous salmonid distribution.
Albion	• 2 sets of observations of permeability and bulk samples (1998 and 2000) were presented. The 1998 permeability and bulk sample observations differ in methods. In 1998, only 12 permeability samples were taken per long-term monitoring segment. • Only an interpretation of potential anadromous salmonid distribution is shown, compared to a separate presentation of known and potential anadromous salmonid distribution.
Noyo	• The 1998 permeability and bulk sample observations reported used only 12 permeability samples per long-term monitoring segment. • The fish distribution maps are presented as 2 maps. MAP F-1 is the potential distribution for anadromous salmonid and non-salmonid species. MAP F-2 shows the potential distribution of coho salmon and steelhead spawning, over-wintering, and rearing habitat.

MRC Methods for Evaluating Fish Habitat in Specific WAUs	
WAU	**MRC Method vs. General Method**
Big River	No difference
Hollow Tree	No difference
Navarro	Only an interpretation of potential steelhead distribution is shown, compared to a separate presentation of known and potential distribution.
Greenwood	• Fish habitat typing was conducted for entire stream segments (not just the 20-30 bankfull widths). • Habitat data was not analyzed using the weighted scoring procedures described. Habitat data was qualitatively described for the different life stages without scoring the variables.
Northern Russian	No difference
Cottaneva Creek	No difference
Elk Creek	No difference
Southcoast Streams	Complete by 2012
Rockport Coastal Streams	Complete by 2012

G.3.6 Module: amphibian distribution

As part of our watershed analysis, MRC has completed surveys for amphibian distribution in the following WAUs: Greenwood, Elk, Cottaneva, Alder, Rockport Coastal Streams, and South Coast Streams. We have described the methods for monitoring amphibian distribution under HCP/NCCP implementation in M§13.6.2.1-1 (red-legged frog monitoring) and M§13.6.3.1-2 (coastal tailed frog monitoring).

Appendix H

Stream Gravel Permeability

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H. STREAM GRAVEL PERMEABILITY

H.1 Introduction

Timber harvest and related forest management practices (e.g., road construction) may increase the delivery of fine sediments to stream channels. Some of these sediments may be deposited in the channel bed, filling pools and infiltrating the bed surface (Moring 1982). Numerous studies have demonstrated that the deposition of fine sediment in spawning riffles reduces reproductive success of anadromous salmonid (Harrison 1923, Hobbs 1937, Wickett 1954, Shelton 1955, McNeil 1966, Cooper 1965, Shelton and Pollock 1966, Philips et al. 1975, Hausle and Coble 1976, Koski 1981, Lotspeich and Everest 1981, Shirazi and Seim 1981, Stowell et al. 1983, Chapman and McLeod 1987, Tappel and Bjornn 1983).

This appendix discusses permeability as a monitoring tool to evaluate the spawning quality of stream gravel. Monitoring permeability in combination with hillslope yields reasonably accurate results about the response of spawning gravel to sediment inputs. For instance, monitoring hillslope identifies sources of sediment input to stream channels. Monitoring gravel permeability assesses changes in the quality of spawning gravel relevant to sediment supply and transport.

H.2 Background[1]

H.2.1 Gravel quality and intra-gravel flow

In all alluvial channels, flow moves both above the bed and through the bed and banks. Surface and sub-surface flow are not distinct but are constantly interchanging. This interchange is driven by hydraulic head and limited by substrate permeability (Darcy 1856, Pollard 1955, McNeil 1966). Hydraulic head (or the slope of the flow) is determined by flow magnitude and channel morphology. Substrate permeability (or the capacity of the substrate to transmit water) is a function of particle compaction, arrangement, and size.[2] Permeability rates increase with decreasing proportion of fine sediment; rates measured by Barnard and McBain (1994) in pea gravel were 59,000 cm/hr. Mixtures with increasing proportions of sand added to the pea gravel showed decreasing permeability rates—from 32,000 cm/hr to 7000 cm/hr. Permeability rates in sand alone were 200 cm/hr.[3]

MRC compared the percent of particles less than 0.85 mm in the bed with the log of permeability and found a significant statistical relationship; however, there was a high amount of variability, as discussed later. Permeability is not only dependent on composition of the gravel, but also the degree of packing of the gravel substrate. Therefore, it is hypothesized that the remaining variability can be explained by the degree of gravel packing (McBain and Trush 2000).

Conditions of intra-gravel flow are often described by "apparent velocity," which is defined as the rate of seepage through bed material, expressed as the volume of liquid flowing per unit time through a cross section. Because cross sectional area includes both the particles and the voids (pore spaces), apparent velocity is slower than the actual (pore) velocity of water flowing through the voids (Pollard 1955). Apparent velocity is the product of hydraulic head and substrate permeability (Darcy's law). Spawning redds of anadromous salmonid are usually constructed in

[1] This background information is primarily from a document developed by Stillwater Sciences and McBain & Trush (1997).

[2] In our HCP/NCCP, permeability is the measurement of a related quantity more properly called *hydraulic conductivity*. The term *permeability* has become standard in the fisheries literature.

[3] Email from S. McBain (McBain & Trush, Arcata, CA) to Sharon Kramer (Stillwater Sciences, Arcata, CA) on December 4, 2006.

channel locations with adequate hydraulic head to drive intragravel flow. In addition, bed topography created by the female's excavation of the spawning redd often enhances intragravel flow. Pyper (1956, as cited in Cooper 1965) used dyes to identify intra-gravel flow paths through a level gravel surface and a surface similar to a new spawning redd; this demonstrated the enhancement of intra-gravel flow caused by the topography of the redd.

Permeability is not uniform at all depths in the gravel profile. Flow through subsurface gravel layers, therefore, is governed by not only the permeability of that layer itself, but also by the permeability of the gravel layers above it (Milhous 1982). Upper layers of relatively impermeable gravel will prevent flow from entering deeper gravel layers, even if these deeper layers are highly permeable.

H.2.2 Gravel quality and survival-to-emergence of anadromous salmonid

Gravel quality is a key factor in the successful incubation and emergence of anadromous salmonid eggs and fry. Researchers have long recognized the relationship between the amount of fine sediment deposited in spawning riffles and successful incubation and emergence (Harrison 1923, Hobbs 1937). Excessive fine sediment in spawning gravel reduces spawning success through two mechanisms: (1) reduction of intra-gravel flow and (2) entombment of emerging fry. The intrusion of fine sediment into gravel interstices reduces intra-gravel flow by reducing gravel permeability (Cooper 1965, Lotspeich and Everest 1981, McNeil 1966, Platts et al. 1979). This results in reduced rates of delivery of oxygen to and removal of metabolic wastes (carbon dioxide and ammonia) from the egg and alevin (Coble 1961, Silver et al. 1963, McNeil 1966, Wickett 1958) (Figure 3). Fine sediments in the gravel interstices can also physically impair the fry's ability to emerge through the gravel layer, trapping (or entombing) them within the gravel (Philips et al. 1975, Hausle and Coble 1976).

H.2.2.1 Literature review

Research on survival-to-emergence of anadromous salmonid has focused primarily on the relationships and interrelationships between oxygen delivery, apparent velocity, permeability, substrate composition, and survival.

Oxygen delivery

Oxygen delivery to the eggs and alevins is a function of dissolved oxygen concentration in the intra-gravel water and apparent velocity (McNeil 1966). Delivery of dissolved oxygen to the egg pocket is the major factor affecting survival-to-emergence that is impacted by the deposition of fines in the spawning substrate. Several studies have correlated reduced dissolved oxygen levels with mortality; impaired or abnormal development; delayed hatching and emergence; and reduced fry size at emergence in sockeye, pink, chum, Chinook salmon, coho salmon, and steelhead trout (Wickett 1954, Alderdice et al. 1958, Coble 1961, Silver et al. 1963, McNeil 1966, Cooper 1965, Shumway et al. 1964, Koski 1981). McNeil (1966) documented egg and larval mortality of 60–90% in pink and chum salmon in association with low dissolved oxygen concentrations during and after the spawning period in 3 southeastern Alaska streams. From dissolved oxygen concentrations measured in redds in a constructed streambed, Koski (1981) noted significant reduction in survival-to-emergence at dissolved oxygen concentration less than 3 mg/L. Shumway et al. (1964) reared coho salmon and steelhead trout from fertilization to hatching in a range of dissolved oxygen concentrations (2.5 - 11.5 mg/L at 10°C) and found that the fry and embryos raised at low-to-intermediate oxygen concentrations hatched later and were smaller at the time of hatching than those raised at near-air saturation levels. Silver et al. (1963) and Cooper (1965) found that low dissolved oxygen concentrations were related to mortality and

reduced size in embryos of Chinook salmon and steelhead trout as well as mortality in eggs and larvae of sockeye and pink salmon.

Apparent velocity

Apparent velocity is a key determinant in delivery of dissolved oxygen to an egg pocket. Coble (1961) and Silver et al. (1963) demonstrated that dissolved oxygen concentration is directly related to apparent velocity. In field studies in the Alsea River basin (Oregon), Coble (1961) related apparent velocity to survival-to-emergence in steelhead. He documented a strong correlation between dissolved oxygen concentration and apparent velocity and concluded that oxygen delivery is the major contribution of optimum apparent velocities. Silver et al. (1963) reared steelhead trout and Chinook salmon from fertilization to hatching in different dissolved oxygen concentrations and apparent velocities and found that low dissolved oxygen concentration resulted in mortality; low dissolved oxygen or low apparent velocity resulted in smaller and weaker sac fry. Shumway et al. (1964) reared coho salmon and steelhead trout from fertilization to hatching in a range of dissolved oxygen concentrations (2.5 - 11.5 mg/L at 10°C) and apparent velocities (3 to 750 cm/hr). They found that reduced apparent velocity resulted in reduced size at hatching at all oxygen concentration levels. This effect was nearly as pronounced at high as at low oxygen concentrations, implying that the role of apparent velocity in removing metabolic wastes may limit egg and larval development. Pyper (1956, as cited in Cooper 1965) also found a positive relationship between apparent velocity and survival-to-emergence in sockeye salmon.

Permeability

Several researchers have correlated permeability to the deposition of fine sediment in the gravel substrate and to survival-to-emergence. McNeil (1966) concluded that the resistance to flow caused by the presence of fine particles in the salmon spawning beds governs potential to produce healthy fry. Cooper (1965) showed that fine sediment greatly reduced permeability, resulting in reduced fluid flow and reduced rate of survival-to-emergence in pink and sockeye salmon. Using Cooper's (1965) test flume data, Platts et al. (1979) quantified the relationship between geometric mean diameter and percent fines in the substrate and substrate permeability. Of the two comparisons (percent fines and geometric mean diameter), they found the strongest correlation was with percent fines (<2 mm). The geometric mean diameters of substrates used in this analysis ranged from 13 mm to 69 mm. Percent fines ranged from 0.2 to 7.9. McNeil and Ahnell (1964) also developed a relationship between percent fines (<0.833 mm) and permeability in streams in Alaska.

Few studies have related permeability directly to survival-to-emergence. Wickett (1958) related the percent survival-to-emergence of pink and chum salmon fry to permeability in a controlled flow section of Nile Creek on Vancouver Island, British Columbia. In this study, dead eggs of chum salmon were found in heavily silted parts of the gravel bed where dissolved oxygen concentrations were below the critical concentration for incubation. After silt was removed from the gravel, dissolved oxygen concentration increased to satisfactory levels, which persisted for a year.

Chapman and McLeod (1987) calculated permeability for McCuddin's (1977) survival-to-emergence data for Chinook salmon and developed a significant positive relationship between permeability and survival-to-emergence (although with wide scatter around the regression line). Using Tagart (1984) and Koski (1981) data for natural coho salmon redds, Chapman and McLeod (1987) identified a similar relationship for coho salmon (although, once again, with wide scatter about the regression line). Peter Baker developed a relationship combining Tagart (1984) and

McCuddin's (1977) data.[4] Figure H-1 shows the relationship between survival-to-emergence of Chinook salmon (McCuddin 1977) (+) and coho salmon (Tagart 1976) (o) along with the permeability of the incubation substrate.

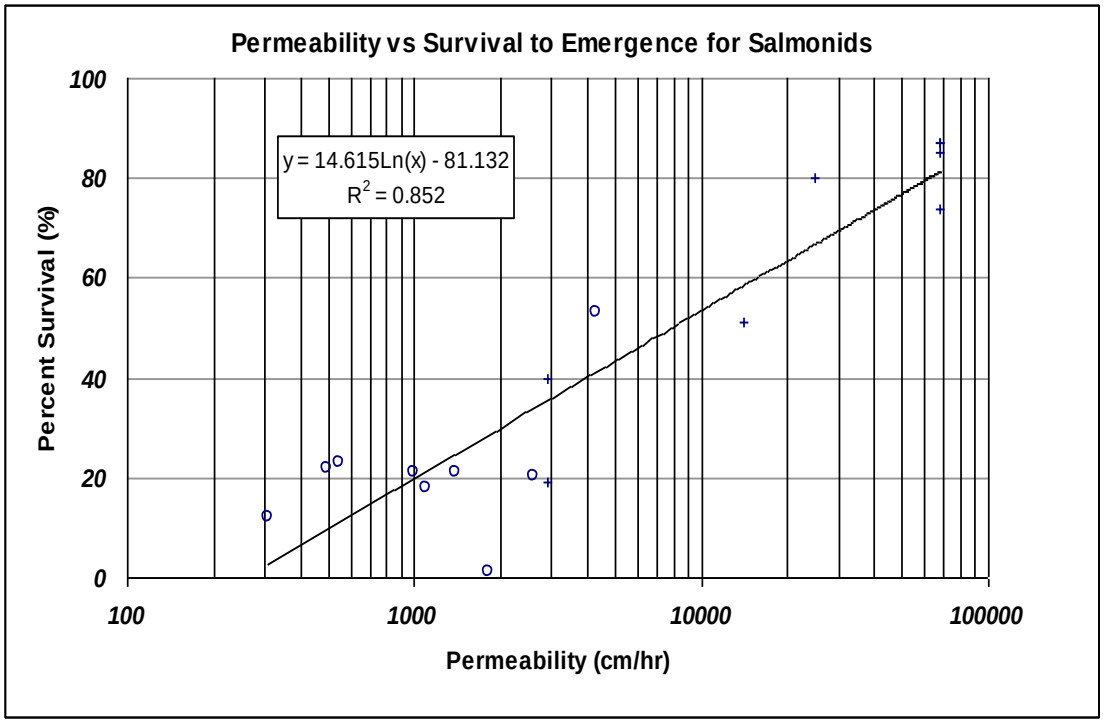


Figure H-1 Permeability vs. Survival-to-Emergence of Chinook Salmon and Coho Salmon

Gravel composition

Many researchers have developed relationships between the amount of fine sediment in spawning gravel and survival-to-emergence. However, the meaning of "fine" sediment has not been standardized; researchers generally have developed correlations based on arbitrary definitions. Cut-offs for fine sediment found in the literature include sediment less than 0.833 mm, 0.85 mm, 1 mm, 2 mm, 3.3 mm, 6 mm, and 6.35 mm (McNeil and Ahnell 1964, Tagart 1976, Lisle and Eads 1991, Koski 1981, Weaver and Fraley 1993, Bjornn et al. 1977, Kondolf et al. 1993).

Several researchers have developed correlations between gravel composition and survival-to-emergence. In Big Beef Creek near Seattle, Washington, Koski (1981) found that a high percentage of sand (<3.3 mm) was positively related to earlier emergence, increased frequency of pre-maturity (i.e., emerged alevin), and reduced survival-to-emergence in chum salmon. Koski (1981) noted that each 1% increase in sand volume reduced survival-to-emergence by 1.26%. Similarly, Shelton and Pollock (1966) sampled substrate composition in the Abernathy incubation channel on a tributary to the Columbia River in Washington where over 70 tons of fine sediment had been deposited in the channel over a two year period. They found that egg survival was inversely related to volume of the gravel interstices occupied by fine sediment. In cutthroat trout, Weaver and Fraley (1993) also found a significant inverse correlation between survival-to-

[4] Peter Baker (Senior Mathematician, Stillwater Sciences, Berkeley, CA) relayed to Chris Surfleet (MRC) in August 2000 the information about sample sizes necessary to evaluate the effects of permeability on egg survival of coho and steelhead.

emergence and percent fines (< 6.35 mm). In their study, emergence ranged from 70% at 0% fines to 4% at 50% fines. Tappel and Bjornn (1983) related emergence to percentage of particles <0.85 mm and <9.5 mm. These particle sizes exhibited the strongest correlation to emergence.

Sowden and Power (1985) evaluated relationships between dissolved oxygen concentration, apparent velocity, gravel composition, and survival of pre-emergent embryos in a groundwater-fed stream. While they found that survival strongly depended on dissolved oxygen content and apparent velocity, they found no relationship between dissolved oxygen concentration or embryo survival and measures of substrate size. In addition, there was only a limited relationship between apparent velocity and substrate composition. These findings imply that measures of habitat quality based solely on substrate composition may not be suitable for groundwater-fed streams.

Several indices have been developed to describe gravel composition and relate composition to survival-to-emergence. Commonly applied indices include percent fines, geometric mean diameter, and the fredle index. Young et al. (1991) evaluated the performance of 15 gravel composition indices in predicting survival-to-emergence under laboratory conditions and 3 gravel composition indices in evaluating changes in substrate composition caused by spawning activity and by deposition of sediment into former redds. They found that different measures of the geometric mean particle size accounted for the greatest proportion of the variation in survival-to-emergence in laboratory tests. However, the percentage of substrate less than 0.85 mm in diameter best described changes in substrate composition observed in the field. From these results, they concluded that a single measure of substrate composition may be inadequate to both assess potential survival-to-emergence in a substrate and detect changes in substrate composition caused by land use.

Many researchers have related survival to percent fines in the spawning gravel. Tappel and Bjornn (1983) developed a model to predict survival-to-emergence in Chinook salmon and steelhead trout based on the volume of fines <0.85 mm and <9.5 mm. These two points were chosen because they closely approximate the regression of cumulative particle size distribution of particles <25.4 mm. They related the effects of these two groups of particle size on survival-to-emergence in laboratory conditions.

Everest et al. (1981) cautioned against the use of percent fines alone as an indicator of gravel quality or a predictor of potential survival-to-emergence because it ignores the textural composition of remaining particles which can have a mitigating effect on survival. For example, two samples with an average diameter of 10 mm and 25 mm may contain 20% by weight of fine particles <1 mm. However, the pore spaces of the 10-mm sample would be more completely filled with the fine sediment than the 25-mm sample and, therefore, would have a lower permeability. The indices of percent fines do not recognize this difference in gravel structure. Chapman and McLeod (1987) similarly criticized the Tappel-Bjornn method for not accounting for the effects of particles larger than 25.4 mm on the gravel structure.

Platts et al. (1979) and Shirazi and Seim (1981) proposed use of the geometric mean diameter (D_g) as an index of gravel quality. The geometric mean diameter is a measure of the central tendency of the particle sizes comprising the substrate. Shirazi and Seim (1981) calculate the geometric mean as follows:

$$D_g = (D_{84} \times D_{16})^{1/} \text{ where:}$$

D_g is the geometric mean diameter
D_{84} is the particle size at which 84% of the sample is smaller, and
D_{16} is the particle size at which 16% of the sample is smaller.[5]

Shirazi and Seim (1981) correlated D_g with survival-to-emergence for a combined data set which includes coho salmon, cutthroat, sockeye, and steelhead (Figure H-1).[6] To address species-specific relationships influenced by egg size, they normalized D_g to egg diameter (D_e) and obtained a better fit. However, lumping species which require different particle size distributions for spawning may be inappropriate.

Use of the D_g index has advantages over the use of percent fines in that

- It is a conventional statistical measure used by several disciplines to describe sediment composition.
- It relates to the permeability and porosity of bed sediments and to embryo survival as well as or better than percent fines.
- It is estimated from the total sediment composition (Everest et al. 1981).

However, D_g can be a poor descriptor of gravel quality because gravel containing very different amounts of fine sediment can have the same D_g (Lotspeich and Everest 1981) (Figure H-2).

Lotspeich and Everest (1981) proposed the fredle index (Fr) as an alternative to D_g. This index uses a measure of the ratio of central tendency of the particle size in a sample (D_g) to the dispersion of particle sizes to characterize substrate suitability for spawning salmonids. This index provides a measure of pore size and permeability, both of which increase as the index number increases. However, it was fitted to data from Philips et al. (1975), which included only emergence and did not include egg mortality. Therefore, while the fredle index may be a good descriptor of gravel quality, the preliminary relationship between fredle index and emergence does not represent survival-to-emergence.

Other researchers focused on the emergence stage only (i.e., entombment) and did not address the effects of fine sediment on egg incubation and alevin development. These researchers placed alevins into experimental gravel mixtures and observed their ability to emerge through the gravel. Hausle and Coble (1976) buried brook trout alevins in laboratory troughs containing 0-25% sand (<2 mm) and determined that sand in excess of 20% of the total substrate weight slowed or prevented emergence. Philips et al. (1975) placed coho salmon and steelhead alevins into several gravel mixtures containing 0–70% fine sediment (1-3 mm) and found that coho salmon emergence ranged from 96% in the control mixture to 8 % in the 70% sand mixture. Emergence in steelhead trout ranged from 94% to 18%, respectively.

H.2.3 Effects of timber harvest on gravel quality

Several researchers have documented increased delivery of fine sediment to stream channels after timber harvest and road construction with consequent deposition in spawning gravel (Moring 1982, Shirazi et al. 1981, Stowell et al. 1983). Moring (1982) monitored changes in gravel permeability over 4 years and again at 7 years in 3 Oregon watersheds. One watershed was 82% clear-cut without riparian buffers (Needle Branch); 1 was 25% clear-cut but had 30-m wide riparian buffers (Deer Creek); and 1 was uncut (Flynn Creek). Average permeability in Needle

[5] Some researchers also use the pair D_{75} and D_{25}.
[6] They combined survival-to-emergence data with the emergence-only data of Philips et al. (1975).

Branch decreased markedly after the basin was clear-cut, dropping from a pre-harvest average of 4900 cm/hr to an average of 1100 cm/hr in the first year after harvest. Average permeability then remained relatively constant but depressed relative to initial conditions at 2400 cm/hr over the next 6 years. Average permeability in Flynn Creek and Deer Creek remained fairly stable throughout the study.

Similarly, Cederholm et al. (1981) documented increased sediment yields and reduced survival-to-emergence in coho salmon in watersheds with extensive logging roads in Clearwater Creek in the Olympic Mountains, Washington. These researchers found that significant amounts of fine sediment (< 0.85 mm diameter) were delivered from tributary basins with many roads. The highest accumulation of fine sediment in stream channels occurred in basins where road area exceeded 2.5% of the basin. Road density of 2.5 km/km^2 produced sediment at 2.6 to 4.3 times the natural rate for the drainage basin. The increased sediment was correlated with reduced survival-to-emergence when the percentage of fines exceeded natural levels. There was a rapid decrease in survival-to-emergence with each 1% increase in the volume of fine sediment above natural levels.

H.2.4 Selection of parameters to monitor

Monitoring the effects of increased sediment delivery to stream channels caused by timber harvest can be accomplished through several methods. The preferred method would

- Monitor sediment-related factors known to directly affect spawning success of anadromous salmonid.
- Monitor factors directly related to increased sediment delivery.
- Be cost-effective and time-effective.

Dissolved oxygen delivery, apparent velocity, gravel permeability, and gravel composition are all sediment-related factors known to affect spawning success of anadromous salmonid. However, many of these factors are difficult to directly relate to increased sediment delivery because they are also affected by other variables (such as hydraulic head or water temperature). Others are difficult to measure due to cost or lack of technology. Of these variables, only permeability can be directly related to increased sediment delivery and measured effectively in cost and time.

H.2.4.1 Dissolved oxygen

Dissolved oxygen is the key parameter governing survival-to-emergence. Dissolved oxygen can be measured quickly and accurately using a standpipe and dissolved oxygen meter. It can be, therefore, a useful monitoring parameter. However, dissolved oxygen is affected by a number of variables not directly related to fine sediments, including streamflow magnitude, temperature, and biological oxygen demand. Dissolved oxygen concentration cannot be directly related only to increased sediment delivery; it is not a sufficient monitoring parameter to detect the impacts of fine sediment resulting from timber harvest or related management actions.

H.2.4.2 Apparent velocity

Coble (1961), Silver et al. (1963), and Milhous (1982) all related apparent velocity to survival-to-emergence. However, because apparent velocity is a function of permeability and hydraulic head, it is not a direct measure of the effects timber harvest and forest management which, although they may affect permeability, would not affect hydraulic head. Apparent velocity, therefore, is confounded by flow magnitude (hydraulic head), which can result in changes in apparent velocity without any change in gravel permeability.

In addition, accurate and precise measurement of apparent velocity is difficult to obtain in the field. Apparent velocity can be measured directly by meters (Blanchfield and Ridgeway 1996) or through dye dilution or ion adsorption techniques (Terhune 1958, Clayton et al. 1996), or it can be calculated from measurements of flow length, hydraulic head, and permeability (Milhous 1982). Meters provide the quickest measurements; however, these instruments are costly. Moreover, they do not measure apparent velocity over a sufficient range to describe conditions in gravel substrates. Grost et al. (1991) demonstrated that the dye dilution technique is not sufficiently precise to provide a good assessment of apparent velocity. While apparent velocity can be calculated as a function of hydraulic head, hydraulic head over the short horizontal distance of a redd is difficult to accurately measure. It requires the installation of a piezometer at the upstream and downstream end. Grost et al. (1989) concluded that mini-piezometers yield poor apparent velocity estimates.

H.2.4.3 Gravel composition

Gravel composition has been extensively correlated to survival-to-emergence in the laboratory and to some extent in the field. Several indices of gravel composition (D_g, the fredle index, the Tappel-Bjornn index and other indices of percent fines) have been developed. Assessment of gravel composition directly describes changes in fine sediment deposition in the spawning substrates over time, which is a potential impact of timber harvest. However, this measure only indirectly describes the potential impact to salmonids (reduced gravel permeability and intra-gravel flow). In addition, quantitative sampling and analysis of gravel composition are labor intensive and, therefore, expensive. They require as much as 6 hours for a 2-person crew to obtain and process one sample. Complete sampling, processing, and data analysis can require several months. Further, the amount of variability in gravel composition samples requires a high number of samples to accurately predict results. In the Garcia River, McBain and Trush (2000) found that it would require 37 samples to accurately categorize the percent of fine sediment in a stream reach within 2% and 148 samples within 1%. This kind of sampling is highly intrusive, and, therefore, inappropriate for monitoring conditions during the spawning and incubation seasons.

H.2.4.4 Permeability

Gravel permeability and gravel composition are most directly related to fine sediment accumulation in the spawning riffles. Permeability is a property of the gravel itself, independent of streamflow conditions or bed slope. Dissolved oxygen delivery and apparent velocity, on the other hand, are affected by factors not necessarily related to sediment accumulation, such as water temperature, biological oxygen demand, and flow magnitude. Gravel composition and permeability, therefore, are the best parameters to assess gravel quality.

Permeability is a more direct measure, however, of the quality of the incubation environment, whereas gravel composition provides only an indirect measure of flow and oxygen delivery conditions in the redd. Gravel quality indices, such as percent fines, geometric mean, and the Fredle index are the most common independent variables related to egg-to-fry emergence success (e.g., Phillips et al. 1975, Tappel and Bjornn 1983). This approach assumes that as percent fine sediment increases, intra-gravel water flow decreases, oxygen supply decreases, metabolic waste removal decreases, and fry access to the water column decreases. A preferable approach would be one that bypasses the indirect measure of gravel quality and measures the variables directly affecting egg survival. Chapman and McLeod (1987), in their development of fine sediment criteria in the Rocky Mountain region, identified permeability as a useful tool for correlating fine sediment with survival as well as assessing the intrusion of fines into the gravel substrate.

Gravel permeability can be measured in the field rapidly and cost-effectively, at perhaps 10% of the cost of bulk sampling, using a standpipe (Terhune 1958, Barnard and McBain 1994 2000). The ease and rapidity of standpipe sampling makes permeability a simple, inexpensive, and accurate measure of gravel quality, thereby allowing the assessment of a much larger area at less cost than traditional bulk sampling methods. Unlike assessment of gravel composition, permeability measurements require no laboratory analysis or processing. Young et al. (1991) reported wide variation among measurements from different technicians, but their measurements were only taken for 5 to 10 seconds and used a handheld pump, not an electronic pump as MRC uses. Furthermore, permeability measurements are not as intrusive as other monitoring methods causing little disturbance to the stream substrate.

In summary, permeability is the only descriptor of gravel quality that

- Is known to directly affect spawning success of anadromous salmonid.
- Is directly related to increased sediment delivery.
- Can be measured effectively in terms of cost and time.

As such, the assessment of substrate permeability provides a powerful tool for monitoring the effects of increased sediment delivery on spawning and incubation conditions of anadromous salmonid.

H.3 Development of a Permeability Monitoring Protocol for MRC

MRC will be using permeability observations within stream monitoring segments. To determine the adequate number of samples to characterize the spawning gravel within a stream segment, MRC performed a power analysis based on observations we made across the plan area. Our science staff took the permeability measurements in the pool tail-out or riffle crest, the location where the majority of anadromous salmonid spawning occurs within the plan area.

H.3.1 Determining adequate sample size

Peter Baker, a biologist and statistician with Stillwater Sciences (Berkeley, CA), developed a simple predictive model of survival-to-emergence from the limited data available in the literature. This model is based on the data of Tagart (1976) and McCuddin (1977). Tagart (1976) evaluated survival-to-emergence for coho salmon by trapping 19 natural redds over 2 seasons in 8 tributaries of the Clearwater River, Washington. McCuddin (1977) examined survival-to-emergence in Chinook salmon and steelhead in artificial redds constructed in experimental troughs. The model fitted to this data is shown in Figure H-2. The fitted model was:

$$\text{Survival} = -0.82530 + 0.14882 * \textit{ln}\ \text{Permeability}\ (r^2 = 0.85,\ p<10^{-7}).$$

The number of samples required is based on the desired power to detect changes in permeability or predicted survival-to-emergence. Measurements were conducted in several coastal drainages in Mendocino County, CA. Permeability was measured in 4 randomly selected pool tail-outs of a stream monitoring segment. At each pool tail-out 3 permeability measurements were taken, with 3 measurements positioned at the ¼, ½ and ¾ mark of the wetted channel. The permeability measurements were taken at a depth of 25 cm. A total of 261 permeability measurements were taken. Table H-1 shows the distribution of these permeability observations for determination of adequate sample numbers.

Table H-1 Distribution of Permeability Observations

Drainage Basin	Number of Monitoring Segments	Total Number of Permeability Samples
Albion River	4	45
Navarro River	8	87
Elk Creek	2	27
Noyo River	6	57
Hollow Tree Creek	5	45

To determine the number of samples needed to adequately detect differences in permeabilities within and among pool tail-outs, Peter Baker conducted power analyses using the simple predictive model constructed from the Tagart (1976) and McCuddin (1977) data. The power analysis was designed to determine the number of samples needed to adequately detect differences in permeabilities between sites, or changes in permeability over time using 2-sample homoscedastic t-tests. The analysis was based on the assumption that sample *ln* permeabilities within a riffle or tailout unit were normally distributed, and that the distributions for different riffles and facies[7] units have the same variance. That is, the model was:

$$ln \text{ permeability} \sim N(m_r, \sigma).$$

In this equation, m_r is the mean *ln* permeability of the riffle/facies unit from which the sample is drawn and σ is the common standard deviation. Conventional criteria of 95% confidence and 80% power and minimum detectable differences in survival-to-emergence of 10%, 20%, and 40% were selected for the power analysis. The number of permeability observations needed for the power analysis relative to the percent of detectable survival-to-emergence are 101 (10%), 26 (20%), and 7 (40%). MRC has chosen as its threshold of concern 20% change in survival-to emergence. Therefore, we will need to take at least 26 samples per stream segment. The estimated permeability at the 20% survival-to-emergence level is approximately 1000 cm/hr (see Figure H-1). Thus, 26 samples per stream segment should allow for estimates of permeability within ±1000 cm/hr, which is 10% of the MRC instream objective for permeability of 10,000 cm/hr.

H.3.2 Location of permeability measurements in the stream segment

It has been determined that 26 permeability measurements will reliably detect a 20% change in the survival-to-emergence for salmonids. The locations of these permeability measurements need to represent the conditions within the stream channel segment. One option is to place permeability measurements at locations where salmonids have spawned previously. This provides information on permeability where salmonids spawn. However, it is not a good indication of stream gravel response to increased sediment inputs. This is because spawning salmon are somewhat selective where they spawn, choosing best substrate and channel locations. Also, the spawning salmonids clean and modify the gravel where they create redds influencing the permeability observations.

To adequately assess instream sediments influences on stream gravel quality for spawning, one should distribute the permeability observations throughout the stream segment, at locations where there is gravel suitable for spawning, but randomly select the locations so that observations are not biased. The location where the majority of spawning gravel is found and the majority of

[7] Facies units are any morphological unit of a stream (e.g., pool, riffle, run, glide).

spawning occurs for coho salmon and steelhead trout is in the pool tail-outs. The monitoring segments MRC will use for permeability observations are approximately 20-30 channel widths in length. This typically corresponds with 5-10 pool tail-outs. By taking a similar number of permeability observations in each pool tail-out across the monitoring segment, we will not bias the permeability observations. In each individual pool tail-out, we will randomly select the location of the permeability measurement to ensure that our observations are not biased toward higher or lower quality gravels within the pool tail-out. This method, in small watercourses, could result in some samples which are not independent.

H.3.3 Site readings to represent permeability

When a permeability measurement is taken at a spot (or site) in the stream, the first few permeability readings typically are lower than the later readings. We attribute this to flushing of fine sediment or organic particles in the streambed in close proximity to the stand pipe. This is supported by the fact that water brought up during the initial permeability readings typically is muddy and clears as subsequent readings are taken. The number of permeability readings to represent a particular site has not been standardized but flushing of the finest particles close to the standpipe should be considered.

A common technique for readings of permeability at a site is to take permeability readings until they reach an observed asymptote or no longer increase in value. Depending on the location, this typically takes 3-8 readings. MRC has observed an average of between 4-5 observations from our data collection efforts. Another technique is to take 1 reading and consider it representative of the site. Both techniques have their advantages and disadvantages. We have chosen a technique that provides a mix of the 2 techniques, taking 5 measurements and using the median reading as the representative permeability of the site. Taking only 1 reading may not capture the variability of permeability at a site. Taking readings until permeability values no longer increase or reach an asymptote can be subjective. By taking 5 observations then stopping, we capture the variability of readings and the initial increase in readings without any subjectivity in the number of readings.

H.3.4 Permeability monitoring protocol

To determine stream gravel quality, MRC will measure gravel permeability within pool tail-outs of the long term channel monitoring reaches, using a 1 in. diameter stand-pipe and an electric pump to create the water suction. We will take 26 permeability measurements in each monitoring segment at a depth of 25 cm. This is the maximum depth at which coho salmon and steelhead spawn. The measurements will be evenly distributed among all pool tail-outs in the segments, with any additional measurements taken in tail-outs behind the deepest pools. The measurement location in each tail-out will be randomly selected from a 12-point grid (3 points wide and 4 points long) in the tail-out.

At each measurement location, 5 permeability repetitions will be taken with the median of these observations representing the permeability of the measurement location. To characterize the entire monitoring segment, we will use the geometric mean of the 26 median permeability measurements and determine the natural log (see H.3.1):

$$\text{Survival} = -0.82530 + 0.14882 * \ln \text{permeability}$$

It is important to emphasize that the use of this survival relationship is only an index of spawning gravel quality in the segment. The permeability measurements are taken randomly in pool tail-outs and are not indicative of where a salmon may select to spawn. Therefore, the survival

percentage developed is only indicative of the quality of potential spawning habitat and not as an absolute number.

H.4 Fine sediment Composition and Stream Gravel Permeability

Permeability was compared to substrate composition from data collected in coastal drainages of Mendocino County, CA during the summers of 1998 and 1999. In addition, at each pool tail-out sampled for permeability, one bulk gravel sample was collected at the permeability measurement site closest to the thalweg of the channel, yielding 85 bulk samples that could be related to permeability. Bulk samples were taken using a 12 in. diameter steel cylinder as described in Platts et al. (1983). The cylinder was centered over the location of the permeability measurement and driven into the bed to a depth of 30 cm. For the comparison, only the substrate from the 18–30 cm depth was used. All samples were dried, sieved (using 50, 25, 12.5, 6.3, 4.75, 2.36, and 0.85 mm sieves), and weighed, with the resulting percentage by weight of each size class determined. Particles larger than 50 mm were not included in the particle distribution, as we were concerned with the distribution of small-sized particles.

Table H-2 Distribution of Permeability and Bulk Gravel Samples

Drainage Basin	Number of Monitoring Segments	Total Number of Permeability Samples	Total Number of Bulk Samples
Albion River	4	45	16
Navarro River	8	87	30
Elk Creek	2	27	6
Noyo River	6	57	18
Hollow Tree Creek	5	45	15

From this data-set, the relationship between permeability and percent of size class particles was examined. The best relationship was found between the log of permeability and percent of particles less than 0.85 mm. This relationship was found to be statistically significant; however, a high amount of variability is not explained by the relationship ($r^2 = 0.278$). McBain and Trush (2000) made similar observations in the Garcia River. They found that the percent of particles <0.85 mm provided the best correlation with permeability ($r^2 = 0.25$). Another study by Graham Matthews and Associates (2001) along the Trinity River found a similar relationship with the percent <0.85 mm particles ($r^2 = 0.35$).

The McBain and Trush (2000) study found that the relationship improved when 2 size classes, 32 mm and 0.5 mm, were used in a multiple regression ($r^2 = 0.45$). However, the MRC data-set did not show this improved correlation between 2 size classes. Another study by Graham Matthews and Associates did not test 2 size classes. They found that when the mean permeability for multiple sites and observations were compared to the percent <0.85 mm particles, the relationship improved significantly ($r^2 = 0.77$). However, when 2 samples were removed that had a high proportion of large grain materials, the relationship between permeability and percent of particles <0.85 mm became stronger ($r^2 = 0.98$). These observations suggest that the frame work of gravel sizes in the matrix is a strong determinate for permeability, but the proportion of fine particles in the matrix is a statistically significant predictor (with high variability) of permeability.

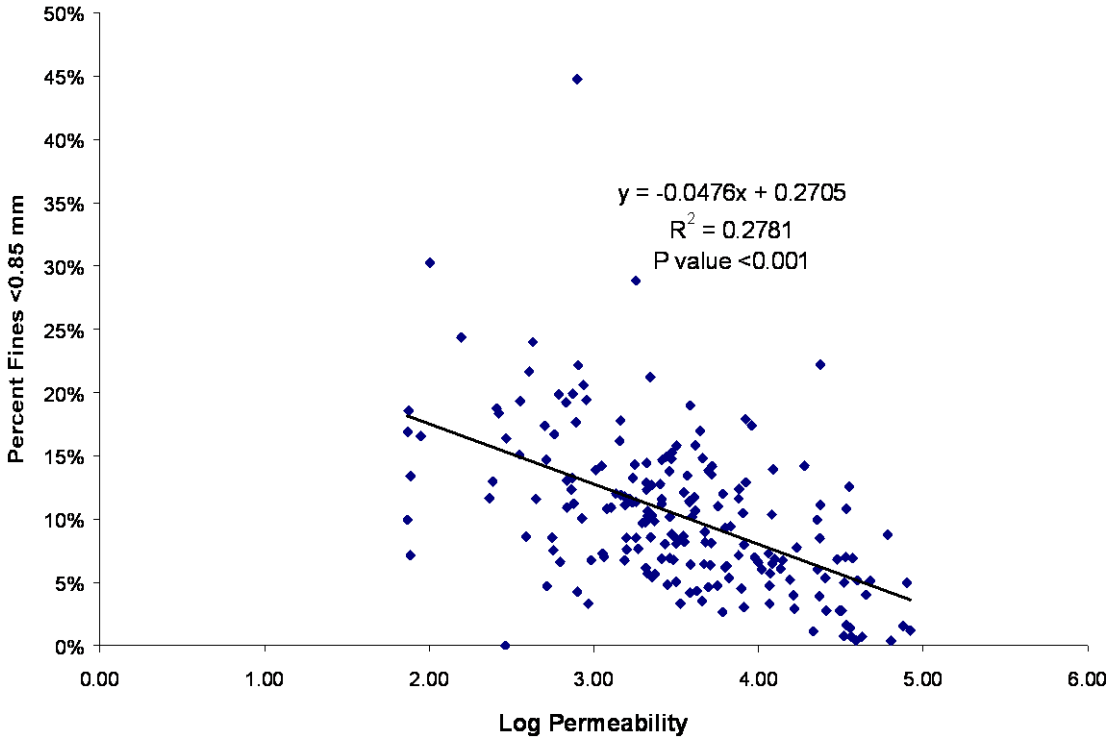


Figure H-2 Log Permeability vs. Percent Particles <0.85 Millimeters

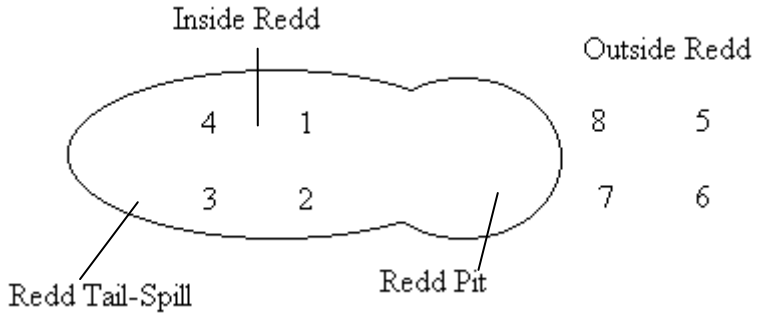
H.5 Effects of Anadromous Salmonid Redds on Permeability

To attempt to determine the difference in permeability between stream gravels that have been built into a redd by spawning salmonids versus non-redd areas, MRC analyzed 2 separate field trials. The first data-set was collected in 1997 on the mainstem and select tributaries of the Garcia River (Stillwater Sciences and McBain & Trush 1997). The second data-set was collected in 1999 on mainstems and select tributaries of the Albion River and the North Fork Navarro River (MRC 1999).

The permeability measurements were taken using the equipment and methods outlined in Barnard and McBain (1994). A 1.5 in. diameter standpipe was used to make the permeability measurements for the Garcia River data-set and 1 in. diameter standpipe was used to make the permeability measurements for the Albion and North Fork Navarro Rivers data-set. For the Garcia River data-set, a hand pump was used to create the appropriate pressure head in the standpipe while the Albion and North Fork Navarro Rivers data-set used an electric pump.

For the Garcia River data-set, permeability measurements were taken during low-flow conditions at identified redd sites following hatching of anadromous salmonid eggs (in this case during the summer season). The standpipe was driven into the gravels 25 cm below the streambed surface. Each time the standpipe was inserted into the gravels, researchers took 4 separate permeability measurements . This was repeated 4 times both inside and outside the redd (Figure H-3). The mean of the permeability measurements inside the redd and outside the redd (non-redd) were reported as permeability values for the respective sites.

Figure H-3 Sampling Locations for Permeability and Bulk Gravel Samples



1 - Permeability measurement

A total of 15 redd sites and 15 non-redd sites were sampled. Of these sites, 3 of the redd and non-redd sites were excluded from the analysis. The 3 sites excluded were all located in the same tributary of the Garcia River, Mill Creek. The sites were excluded due to poor substrate conditions (i.e., angular rocks suggesting substrate that had been deposited from streamside sources rather than fluvial sources) and lack of defined pool tail-outs, making it difficult for the sampling protocol to be followed.

The Albion River and North Fork Navarro River permeability samples were taken when streamflow was low enough for personnel to safely sample permeability following hatching of anadromous salmonid eggs (in this case May). Identified redds had 2 permeability measurements taken in the redd tail-out at a depth of 25 cm, with the mean of the 2 permeability readings used to characterize the redd. To characterize the non-redd permeability, researchers took 3 measurements across the pool tail-out in which the redd was located (in an area assumed not influenced by redd development) at a depth of 25 cm. The mean of 3 non-redd permeability measurements was used to characterize the non-redd permeability. A total of 9 redd sites and 9 non-redd sites were sampled in the Albion and North Fork Navarro Rivers.

Figures H-4, H-5, and H-6 show a plot of the Garcia River data set and the Albion and North Fork Navarro River data set. Linear regression indicates a strong relationship between redd and non-redd ln permeability. The ln permeability of redd sites are observed to be 2.6% more permeable than the non-redd sites in the Garcia River data-set ($r^2 = 0.4857$, $p<0.0001$) The ln permeability of redds are observed to be 3.3% more permeable than the non-redd ln permeability measurements in the Albion and North Fork Navarro River data set ($r^2 = 0.62$, $p<0.0001$).

Figure H-4 Redd vs. Non-Redd Permeability for the Garcia River, 1997

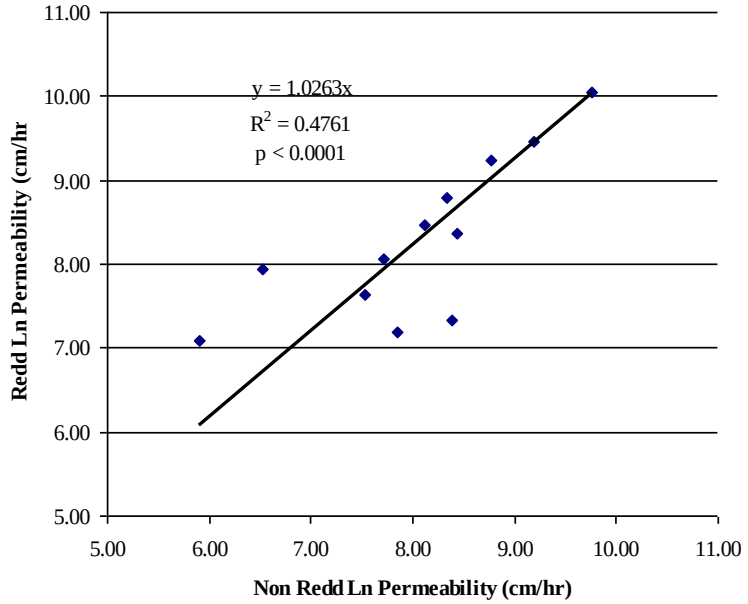
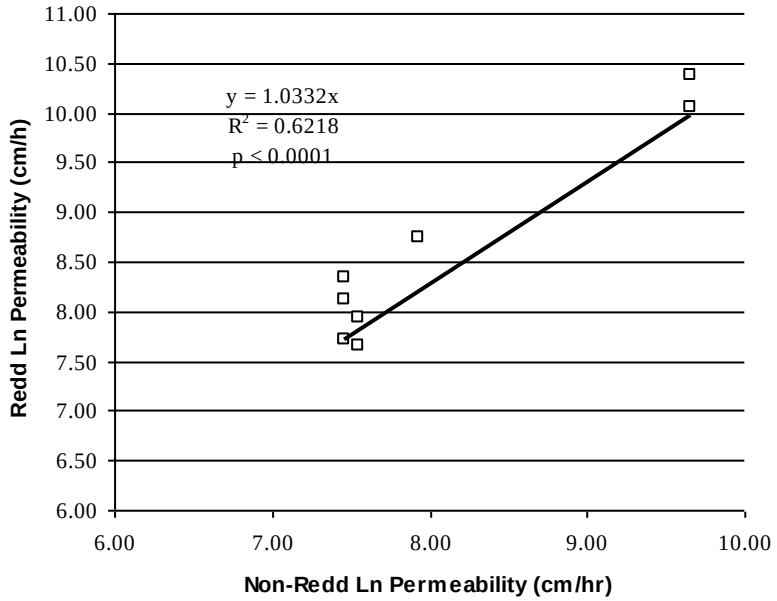
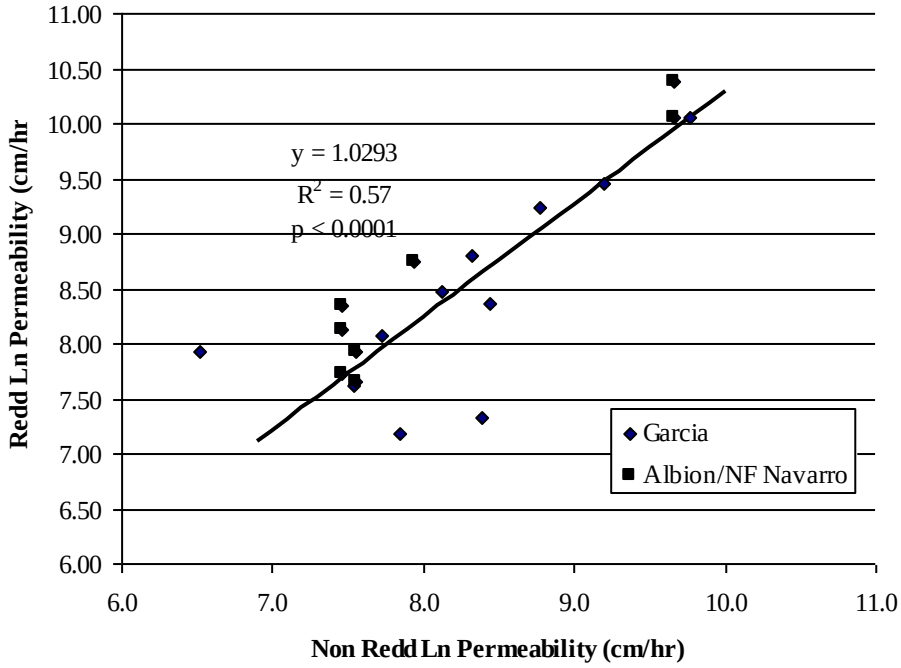


Figure H-5 Redd vs. Non-Redd Ln Permeability for the Albion and North Fork Navarro



When the Garcia River and Albion/North Fork Navarro Rivers data-sets for redd vs. non-redd permeability are combined, similar results are observed. The combined data-sets show a significant relationship between the ln of permeability in redd sites compared to non-redd sites, with redd sites having higher values (Figure H-6)($r^2 = 0.57$, $p<0.0001$).

Figure H-6 Redd vs. Non-Redd Ln Permeability - Garcia, Albion, and N. Fork Navarro



Redd sites were observed to be more permeable than stream substrate adjacent to redds (i.e., non-redd sites). This is an expected response to redd construction of anadromous salmonid. When a redd is constructed, fine particles are cleaned from the site creating a more porous and thus permeable substrate (Kondolf et al. 1993). Furthermore, the shape and location of a redd can create hydraulic conditions conducive to increased permeability (Pyper 1956, as cited in Cooper 1965).

The Garcia River and Albion/North Fork Navarro River data sets showed similar relationships. Both had significant relationships for stream substrate permeability between the ln of permeability for redds and non-redds, with redd sites being more permeable than non-redd sites. The Albion/North Fork Navarro data set showed a higher percentage difference (77%) for redd to non-redd permeability (using actual values not ln) than the Garcia River data-set which showed a 30% increase. Collectively,[8] the redd versus non-redd data showed redd permeability 53% greater than non-redd permeability. Based on this information and the assumption that salmonids choose the best habitat for spawning, MRC selects all potential spawning areas in a monitoring reach and samples within the tailouts of these pools to obtain the most accurate estimate of potential spawning habitat.

[8] Garcia, Albion, and North Fork Navarro data

Appendix I

Peak Flow Predictions

Contents

I. PEAK FLOW PREDICTIONS **I-1**

I. PEAK FLOW PREDICTIONS

MRC modeled potential changes in peak flows resulting from timber harvest (section 3.3.12). Appendix I provides the equation for peak flow predictions for those wanting this level of detail.

$$E(r) = \exp\{[1+B_2(t-1)]c[B_4+B_5\ln(y_c)+B_6\ln(w)]\}$$

Where:

r	ratio between the observed peak flow and the expected flow, without a logging effect in a watershed as the result of a storm
B_2	logging recovery coefficient (-0.0771)
t	number of summers since logging
c	proportion of the watershed logged (for partial harvest this is the portion of canopy removed)
B_4	constant (1.1030)
B_5	storm size coefficient (-0.0963)
y_c	expected mean peak discharge of control watersheds in Caspar Creek to a storm having the same return period as the storm being estimated ($m^3s^{-1}ha^{-1}$)
B_6	watershed wetness coefficient (-0.2343)
w	watershed wetness index

The above model predicts the increase in peak flow compared to a control watershed flow (y_c). For the purposes of analysis, we used the mean storm flow of the Hen and Ive stations in Caspar Creek as the control in the equation. This represents a 2-year event (0.0073 $m^3s^{-1}ha^{-1}$). A 2-year return interval peak flow event was selected because it is typically greater than the bankfull discharge, yet small enough to be sensitive to forest harvest effects. The equation was developed from analysis on clear-cut harvests in Caspar Creek and is likely a conservative estimate when applied toward selective harvest practices.

The peak flow equation was applied to the plan area at the CalWater planning watershed scale for current canopy conditions. The CalWater planning watershed scale, approximately 3000-5000 ac in size, was chosen because this is the scale at which cumulative effects are typically analyzed in timber harvest plans. The equation for peak flow prediction (Lewis et al. 2001) was developed for watersheds of approximately 1150 ac and smaller. We did not think it was appropriate to use the equation much beyond the CalWater planning watershed scale, as this is already 3 to 5 times larger than the North Fork Caspar Creek watershed. Observations of peak flows in much larger basins (>50 km^2) have not shown increases in peak flows proportional to smaller basins (Beschta et al. 2000).

The use of the equation is very sensitive to the wetness index (w). Values of wetness index observed at Caspar for a 2-year event range from approximately 50 for dry conditions to 600 for the wettest conditions in the middle of winter. The average watershed wetness index for a 2-year event was observed as 304 (Lisle et. al. 2000). For the purposes of this analysis, the average wetness index value of 304 was used. Some limited analysis, using the 50 and 600 wetness index values, was performed to provide a range of peak flow increases. For the proportion of watershed logged (c value in the peak-flow equation), we use 100% canopy minus the amount of canopy in the watershed. For the time since logging (t) we use 1. Canopy retention on land not owned by MRC is, of course, unknown. Therefore, any estimates of peak-flow increase are for effects in the plan area.

Appendix J

CLFA Checklist and Landslide Form

Contents

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J. CLFA CHECKLIST AND LANDSLIDE FORM

J.1 CLFA Checklist

The CLFA checklist (1999) presents guidelines for determining when it is advisable to consult with a licensed geologist during THP preparation.

Registered Professional Foresters (RPF) should address the following questions during THP preparation:[1]

1. Are there unstable areas located within or adjacent to the proposed THP area?

2. Were unstable areas identified on available geologic, landslide, and watershed maps, aerial photos, or previous THPs in the vicinity of the plan area?

3. Were unstable areas observed in the field? Features associated with unstable areas may include:
    - Hill slopes greater than 65%, including inner gorge areas
    - Loose, unconsolidated soils
    - U-shaped swales
    - Irregular topography
        - Scarps
        - Benches
        - Hummocky ground
        - Surface cracks
    - Vegetative indicators
        - Leaning trees
        - Hydrophytes
        - Isolated patches of homogeneous vegetation
    - Disorganized drainage
        - Sag ponds
        - Seeps
        - Diverted watercourse
    - Road cut-bank failure
    - Road or landing fill failure
4. If unstable areas were identified in the THP area, proposed timber operations on, adjacent to, upslope, or downslope of these features may have the potential to affect slope stability through:
    - Displacement of soil
    - Division or concentration of drainage
    - Reduction in interception or transpiration
    - Reduction in root strength

    The following are examples of timber operations that could produce these effects:
    - Timber cutting
    - Construction and maintenance of

[1] The CLFA encourages foresters to review California Division of Mines and Geology Note 50, *Factors Affecting Landslides in Forested Terrain*.

        - Roads
        - Stream crossings
        - Skid trails
        - Beds for felling trees (layouts)
        - Fire breaks
    - Mechanical site preparation
    - Prescribed burning

5. If proposed timber operations have a reasonable potential to affect slope stability, and there is a potential for materials from landslides or unstable areas to affect public safety, water quality, fish habitat or other environmental resources, then a California licensed geologist with experience and expertise in slope stability should be consulted to assess slope stability and assist with designing mitigation measures**.**

J.2 Landslide Form

Incidental Landslide Observation Form

Name: _____ Date: _____

UTM Location: N _____ E_____
(If no UTM Location is available, attach a map with the slide location noted)

Failure Date:_____
(Approximated to the nearest month or year)

Is this a reactivation of a previous landslide:

Yes	No	Unknown

(Circle one.)

Landslide Type

Shallow Seated			Deep-Seated	
Debris Slide	Debris Flow	Debris Torrent	Rockslide	Earthflow

(circle one)

Dimensions

Length	Width	Depth

(Approximate average dimensions in feet)

If the landslide is a debris flow or torrent, state approximate run-out length:

Sediment Delivery Estimate

Delivery Percent	0%-25%	25%-50%	50%-75%	75%-100%
Receiving Waters	Perennial	Intermittent	Ephemeral	

(Circle one in each row.)

Additional Physical Attributes

Hillslope Gradient (%) _____

Mgmt. Assoc.	Road	Skid Trail	Landing	Neither	Indeterminate
Slide Location	Headwall Swale	Steep Streamside	Inner Gorge	Neither	Indeterminate
Slope Form	Concave	Divergent	Planar	Indeterminate	

(Circle one in each row.)

Additional Comments/Observations (e.g. soil, bedrock, groundwater, or vegetation conditions)

Appendix K

Northern Spotted Owl Data and Protocol

Contents

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K. NORTHERN SPOTTED OWL DATA AND PROTOCOL

K.1 Baseline Data

Table K-1 shows the baseline or historic productivity for northern spotted owls on covered lands or within 1000 ft of covered-land boundaries. MRC has only included in the baseline calculations spotted owls that we considered *active.* Prior to making our calculations, we sent information on *abandoned* owl territories to USFWS and CDFG; the agencies agreed that MRC should not include these territories in baseline calculations. Chapter 10 (10.3.1.2.2) has more detailed information on calculating baseline or historic productivity.

Table K-1 presents the baseline data for spotted owl productivity on MRC land from 1989 to 2007. Following are the codes that appear in Table K-1 under the annual columns for *Survey Years*:

Code	Definition
-	Year before territory is located or occupied
A	Territory was not monitored (although night-time surveying may have occurred)
U	Outcome unknown
X	Spotted owls absent from territory
0	Spotted owls present, no fledglings
1	One fledgling produced
2	Two fledglings produced

Table K-1 Baseline Report for NSO Productivity on MRC Covered Lands

ALBION																						
DFGID	Survey Years																		Total Production (minimum)	Years Data	Mean Annual Production (minimum)	Productivity Level
	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07				
MD063	-	U	U	U	U	U	1	X	U	U	U	1	A	X	0	A	X	X	2	7	0.29	4
MD064	1	0	2	U	1	0	A	A	U	1	U	0	1	1	2	0	0	U	9	12	0.75	2
MD065	0	1	U	0	2	A	1	1	U	0	U	2	U	1	1	0	0	0	9	12	0.75	2
MD129	U	2	U	U	2	0	1	0	0	2	0	2	X	U	1	1	U	U	11	12	0.92	1
MD168	-	1	0	0	2	0	U	2	0	U	U	U	U	1	2	1	0	2	11	12	0.92	1
MD170	-	0	0	0	0	0	A	0	A	A	U	U	U	X	2	U	U	U	2	8	0.25	5
MD236	-	U	U	U	U	U	U	U	A	A	U	2	U	0	2	U	2	U	6	4	1.50	1
MD241	-	-	-	U	U	A	A	0	0	0	1	0	2	U	2	0	1	U	6	9	0.67	4
MD286	-	U	U	A	2	U	2	0	0	U	2	2	U	0	0	U	1	U	9	9	1.00	1
MD295	-	-	1	2	U	A	A	U	X	1	2	1	X	U	X	U	0	U	7	9	0.78	2
MD299	-	-	U	0	U	0	U	X	X	U	U	U	U	X	0	U	0	U	0	7	0.00	3
MD321	U	A	U	U	U	U	1	2	2	0	U	2	A	A	A	A	A	U	7	5	1.40	4
MD369	-	-	0	0	0	1	X	X	A	A	A	X	U	X	X	U	X	X	1	11	0.09	2
MD439	-	-	-	U	U	A	A	U	X	A	0	0	U	U	2	2	U	U	4	5	0.80	2
MD497	-	-	-	-	-	-	U	X	A	U	U	0	U	X	U	X	X	U	0	5	0.00	3
MD544	-	-	-	-	-	-	-	-	U	U	U	A	A	A	A	A	A	A	0	0	0.00	4
MD562	-	-	-	-	-	-	-	-	-	-	U	0	0	U	0	0	0	U	0	5	0.00	3
MD563	-	-	-	-	-	-	-	-	-	-	U	U	U	0	0	0	1	U	1	4	0.25	2
MD577	-	-	0	X	A	A	A	U	A	A	A	A	U	U	A	A	U	U	0	2	0.00	4
MD595	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	2	0.00	3
TOTALS																						
20	1	4	3	2	9	1	6	5	2	4	5	12	3	3	14	4	5	2	85	140	0.61	

TABLE NOTE

- NSO = northern spotted owl
- The term "NEW" denotes a territory located by MRC biologists but not yet given a "MENdocino" identification number by CDFG biologists. Once a territory receives this, its tag will change from "NEW" to its designated "MEN" number.

BIG RIVER																							
DFGID	Survey Years																			Total Production (minimum)	Years Data	Mean Annual Production (minimum)	Productivity Level
	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07				
MD060	U	U	U	U	X	X	X	X	U	A	X	X	U	A	A	X	A	A	U	0	7	0.00	5
MD062	1	1	U	U	U	2	U	U	2	1	1	2	2	A	U	2	A	A	U	14	9	1.56	4
MD067	U	1	0	1	X	2	U	X	0	U	0	A	2	2	U	U	0	X	0	8	13	0.62	2
MD068	U	1	1	U	1	0	U	2	U	U	X	X	X	U	U	U	U	U	U	5	8	0.63	2
MD069	1	1	1	2	1	0	U	0	U	U	0	U	2	1	U	1	U	0	0	10	13	0.77	2
MD070	U	U	U	A	A	A	A	A	1	X	X	X	X	X	A	A	X	X	U	1	8	0.13	2
MD071	U	0	0	X	0	0	U	1	2	U	0	U	1	U	U	U	U	U	0	4	10	0.40	2
MD072	-	0	1	0	U	1	2	U	A	U	U	U	X	X	U	X	U	A	U	4	8	0.50	2
MD076	0	0	2	U	U	0	A	A	U	U	0	2	0	1	0	0	U	X	X	5	12	0.42	2
MD079	-	0	2	0	0	0	0	1	U	U	U	X	X	0	U	2	U	U	U	5	11	0.45	2
MD080	U	0	0	2	U	U	A	A	A	A	X	U	X	0	X	X	U	U	X	2	9	0.22	2
MD239	-	-	-	0	U	X	A	U	A	A	A	1	1	2	U	1	A	X	A	5	7	0.71	5
MD301	U	U	0	0	1	2	0	1	A	A	A	A	0	A	X	1	0	U	0	5	11	0.45	2
MD358	-	-	-	U	A	A	A	A	A	A	A	1	2	U	1	2	U	1	0	7	6	1.17	1
MD438	-	-	-	0	U	2	U	U	0	0	0	U	2	U	U	0	1	U	0	5	9	0.56	2
MD477	-	X	A	A	A	A	U	A	U	U	X	A	A	A	A	A	A	A	A	0	2	0.00	4
MD490	-	-	-	-	-	-	U	U	A	U	X	X	X	A	U	U	U	U	0	0	4	0.00	3
TOTALS																							
17	2	4	7	5	3	9	2	5	5	1	1	6	12	6	1	9	1	1	0	80	147	0.54	

GARCIA																							
DFGID	Survey Years																			Total Production (minimum)	Years Data	Mean Annual Production (minimum)	Productivity Level
	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07				
MD102	U	A	A	A	A	A	A	A	A	A	X	1	U	U	A	X	U	X	X	1	5	0.20	4
MD130	U	A	U	A	A	A	A	A	A	A	U	2	U	U	X	X	U	U	U	2	3	0.67	2
MD207	-	U	U	U	U	A	A	A	A	U	A	U	A	A	A	A	A	U	U	0	0	0.00	5
MD208	-	U	U	U	U	A	A	U	X	A	A	A	A	A	A	A	A	A	X	0	2	0.00	4
MD213	-	-	U	U	A	A	A	A	U	U	U	X	U	U	U	2	0	U	U	2	3	0.67	2
MD214	-	-	U	U	A	U	X	X	U	U	U	A	A	X	U	X	X	A	U	0	5	0.00	5
MD383	-	-	-	-	U	U	A	A	U	A	A	1	U	0	0	0	2	U	U	3	5	0.60	2
MD386	-	-	-	-	U	A	A	U	A	A	U	U	A	U	U	X	U	U	X	0	2	0.00	5
MD447	-	-	-	U	A	A	A	A	0	A	A	A	A	A	A	X	U	X	X	0	4	0.00	3
MD512	-	U	A	A	A	A	A	U	A	A	X	U	X	U	X	A	U	X	U	0	4	0.00	3
MD542	-	-	-	-	-	-	-	-	-	-	-	-	-	2	U	1	2	U	0	5	4	1.25	5
MD573	-	-	-	U	A	A	A	A	A	A	A	A	2	X	X	1	U	X	U	3	5	0.60	5
MD593	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	2	U	U	2	1	2.00	5
NEW017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	U	X	X	U	0	3	0.00	3
TOTALS																							
14	0	0	0	0	0	0	0	0	0	0	0	4	2	2	0	4	6	0	0	18	46	0.39	

NAVARRO EAST																							
DFGID	**Survey Years**																			**Total Production (minimum)**	**Years Data**	**Mean Annual Production (minimum)**	**Productivity Level**
	89	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**				
MD025	U	0	1	1	1	A	0	U	1	A	A	A	U	U	X	X	U	0	U	4	9	0.44	2
MD045	U	0	U	X	X	A	A	A	A	A	X	X	U	A	A	A	U	X	X	0	7	0.00	3
MD047	0	2	U	U	1	0	0	X	U	A	U	U	U	U	1	2	0	U	2	8	10	0.80	2
MD077	U	0	U	U	A	A	X	X	A	A	A	A	U	A	U	2	U	U	U	2	4	0.50	2
MD078	1	2	1	2	0	U	0	0	1	0	U	X	U	0	U	1	0	0	0	8	15	0.53	2
MD103	U	2	1	2	0	X	A	X	X	A	X	X	U	U	U	X	U	X	U	5	11	0.45	2
MD138	U	0	0	1	U	2	0	1	1	X	A	U	U	U	X	X	X	X	U	5	12	0.42	2
MD160	-	-	1	0	0	2	U	U	U	U	U	U	U	0	U	3	X	U	U	6	7	0.86	1
MD161	-	-	1	U	X	X	A	A	A	A	A	U	A	X	U	U	U	X	X	1	6	0.17	5
MD173	-	U	X	A	A	X	A	A	A	A	X	A	U	A	A	A	U	U	U	0	3	0.00	3
MD441	-	-	-	-	2	U	A	A	A	X	A	U	U	X	U	1	2	0	0	5	7	0.71	2
MD445	-	-	-	-	-	2	U	U	1	U	U	U	U	U	U	X	0	U	U	3	4	0.75	2
MD455	-	-	-	-	U	U	X	A	X	A	U	U	A	A	U	X	A	A	U	0	3	0.00	5
MD511	-	-	U	U	A	A	A	U	U	A	A	U	U	X	X	X	U	U	U	0	3	0.00	3
MD545	-	-	-	-	-	-	-	-	-	-	-	U	U	U	U	U	A	A	A	0	0	0.00	4
MD565	-	-	-	-	-	-	-	-	-	-	-	U	U	U	U	X	U	A	U	0	1	0.00	4
MD566	-	-	-	-	-	-	-	-	-	-	-	U	U	U	X	U	0	U	U	0	2	0.00	3
NEW015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	3	4	0.75	2
NEW025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	U	U	0	0	0.00	3
NEW026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	U	U	0	0	0.00	3
NEW029	-	-	-	U	A	A	A	A	A	A	A	A	U	A	X	X	X	A	U	0	3	0.00	4
TOTALS																							
21	1	6	5	6	4	6	0	1	4	0	0	0	1	11	3	0	2	0	2	50	111	0.45	

NAVARRO WEST																							
DFGID	**Survey Years**																			**Total Production (minimum)**	**Years Data**	**Mean Annual Production (minimum)**	**Productivity Level**
	89	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**				
MD022	1	1	0	U	U	A	A	A	A	A	A	U	1	U	0	U	0	2	U	5	7	0.71	2
MD023	2	0	0	2	0	2	U	0	0	2	0	0	2	0	U	1	2	U	0	13	16	0.81	1
MD024	1	1	U	0	0	X	U	X	X	A	A	U	0	1	U	0	0	0	U	3	12	0.25	2
MD053	0	2	1	2	0	U	A	1	2	A	U	U	1	0	U	X	U	X	U	9	11	0.82	1
MD066	2	0	2	1	1	U	1	A	2	U	0	0	U	2	U	2	2	U	1	16	13	1,23	1
MD125	-	0	2	1	1	1	1	A	A	A	A	U	2	2	0	2	2	U	U	14	11	1.27	1
MD126	-	0	1	0	X	U	A	A	A	A	A	A	A	X	X	X	X	U	2	3	9	0.33	2
MD127	-	U	2	2	0	A	A	X	U	A	A	U	2	2	U	0	1	U	1	10	9	1.11	1
MD141	-	0	U	U	X	A	X	A	A	A	A	X	A	A	A	A	A	U	U	0	4	0.00	5
MD178	-	-	U	2	U	A	1	U	U	U	A	U	U	0	U	2	1	0	1	7	7	1.00	1
MD222	-	-	U	A	A	A	A	A	A	A	X	A	A	A	A	A	A	A	U	0	1	0.00	5
MD442	-	-	-	2	0	2	U	X	U	U	U	U	0	2	U	1	2	0	2	11	10	1,10	1
MD443	-	-	-	0	0	1	0	U	A	A	A	A	U	X	X	X	U	2	U	3	8	0.38	2
MD444	-	-	-	-	1	1	1	A	A	A	A	U	2	U	U	2	0	0	0	7	8	0.88	1
MD489	-	-	-	-	-	-	0	U	A	2	0	2	0	1	U	2	1	U	U	8	8	1.00	1
MD518	-	-	-	-	-	-	-	0	2	0	2	0	2	0	U	X	U	U	2	8	9	0.89	1
MD521	-	-	-	-	-	-	-	-	U	A	U	U	U	U	X	X	U	X	U	0	3	0.00	5
MD534	-	-	-	-	-	-	-	-	-	0	U	1	0	1	U	2	U	0	U	4	6	0.67	2
MD549	-	-	-	-	-	-	-	-	-	-	-	U	1	0	U	X	U	1	U	2	4	0.50	2
MD552	-	-	-	-	-	-	-	-	-	-	-	U	U	U	X	U	1	U	U	1	2	0.50	2
MD575	-	-	-	-	-	-	-	-	0	A	A	A	U	U	U	2	U	1	U	3	3	1.00	1
MD594	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	0	U	0	1	0.00	3
NEW002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	X	U	U	U	0	1	0.00	3
NEW030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	U	U	0	0	0.00	3
TOTALS																							
24	6	4	8	12	3	7	4	1	6	4	2	3	13	11	0	16	12	6	9	127	163	0.78	

NOYO																							
DFGID	**Survey Years**																			**Total Production (minimum)**	**Years Data**	**Mean Annual Production (minimum)**	**Productivity Level**
	89	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**				
MD104	U	1	U	0	0	1	1	1	0	0	X	0	U	U	0	0	U	0	0	4	14	0.29	2
MD120	U	0	0	U	U	U	X	X	X	A	X	A	U	U	X	X	U	U	U	0	8	0.00	3
MD121	U	2	1	1	U	U	A	1	X	A	U	A	1	U	U	U	U	U	X	6	7	0.86	1
MD122	U	U	0	2	U	U	U	U	U	U	0	2	2	A	A	A	0	A	A	6	6	1.00	4
MD123	-	0	1	U	0	1	U	0	X	A	A	A	A	X	U	A	X	U	U	2	8	0.25	2
MD176	-	1	A	A	U	1	0	U	X	U	U	0	U	U	U	2	1	0	U	5	8	0.63	2
MD305	U	A	U	A	A	U	0	0	U	A	A	A	1	U	U	U	1	U	0	2	5	0.40	2
MD375	U	U	U	A	1	1	0	U	U	U	U	2	U	2	0	0	0	X	U	6	9	0.67	2
MD415	-	-	-	U	0	2	U	U	0	U	0	0	U	U	U	X	X	U	U	2	7	0.29	2
MD437	-	-	-	-	U	0	U	A	A	A	A	A	1	U	0	0	1	0	0	2	7	0.29	2
MD466	-	-	-	-	-	0	X	A	A	A	A	U	U	U	U	U	X	U	U	0	3	0.00	3
MD488	U	A	A	A	A	A	U	U	A	0	A	U	U	X	A	X	A	X	X	0	5	0.00	5
MD508	-	-	U	A	A	A	A	A	A	A	A	U	U	X	U	0	U	U	0	0	3	0.00	5
MD574	-	-	-	-	-	-	-	-	-	-	-	-	2	1	0	0	1	0	0	4	7	0.57	5
MD578	-	-	-	-	-	-	-	-	-	-	-	-	-	U	0	2	X	U	U	2	3	0.67	2
NEW020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	U	U	0	1	0.00	3
TOTALS																							
16	0	4	2	3	1	6	1	2	0	0	0	4	7	3	0	4	4	0	0	41	101	0.41	

ROCKPORT																							
DFGID	Survey Years																			Total Production (minimum)	Years Data	Mean Annual Production (minimum)	Productivity Level
	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07				
MD098	U	0	0	2	0	2	0	0	1	A	A	U	U	U	U	U	1	U	U	6	9	0.67	4
MD107	U	0	0	1	U	U	0	0	X	X	X	U	X	U	U	A	2	U	U	3	10	0.30	2
MD108	U	0	2	U	0	U	A	U	A	A	U	U	U	U	U	U	1	U	X	3	5	0.60	2
MD109	U	0	2	1	0	2	0	2	U	1	A	U	U	U	U	X	U	X	U	8	10	0.80	2
MD134	U	U	U	0	2	0	0	U	U	2	U	0	0	2	U	X	1	U	0	7	11	0.64	2
MD144	U	0	0	0	U	2	0	U	U	X	A	A	U	A	X	A	X	U	U	2	8	0.25	5
MD169	-	-	0	2	U	0	0	X	X	U	0	U	U	U	U	U	0	U	0	2	9	0.22	2
MD227	-	-	U	U	U	A	A	A	A	A	U	2	U	U	A	A	X	U	U	2	2	1.00	4
MD296	-	-	-	U	U	A	A	A	U	X	A	A	U	A	A	A	U	A	U	0	1	0.00	4
MD297	-	-	-	U	U	A	A	A	A	X	A	A	U	A	A	A	A	A	U	0	1	0.00	4
MD381	-	-	-	-	U	U	0	1	U	U	A	U	U	U	U	1	2	0	0	4	6	0.67	2
MD428	-	-	-	-	U	2	0	U	U	0	U	U	U	0	U	X	1	U	U	3	6	0.50	2
MD429	-	-	U	U	0	0	1	U	A	U	U	0	U	U	X	U	U	U	U	1	5	0.20	2
MD431	-	-	-	2	U	U	U	U	X	U	U	U	0	0	U	U	2	X	U	4	6	0.67	2
MD432	-	-	-	-	U	X	0	U	U	U	U	0	0	U	X	U	U	X	U	0	6	0.00	3
MD433	-	-	-	0	X	A	A	X	A	A	A	A	U	X	U	A	U	U	U	0	4	0.00	5
MD434	-	-	-	0	U	U	A	A	A	U	X	A	X	X	U	X	1	U	0	1	7	0.14	2
MD435	-	-	-	U	A	X	A	A	A	A	A	A	X	A	X	X	A	X	U	0	5	0.00	3
MD436	-	-	-	-	0	U	A	U	A	A	U	U	1	0	U	U	X	U	U	1	4	0.25	2
MD481	-	-	-	-	0	0	0	A	0	A	A	U	2	U	1	U	1	U	0	4	8	0.50	2
MD513	-	-	-	U	A	A	A	U	U	A	A	U	0	2	U	0	0	U	0	2	5	0.40	2
MD514	-	-	-	-	-	-	-	U	X	U	A	A	U	U	X	X	X	U	U	0	4	0.00	3
MD576	-	-	-	-	-	-	-	-	-	-	-	-	U	X	X	X	X	A	U	-	4	0.00	3
NEW023	-	-	-	-	-	U	A	A	A	A	A	A	A	A	A	X	X	X	U	0	3	0.00	3
NEW024	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	X	X	0	2	0.00	3
NEW028	-	-	-	-	-	-	-	-	-	-	-	-	U	X	X	X	X	U	U	0	4	0.00	3
NEW033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	X	0	1	0.00	4
TOTALS																							
27	0	0	4	8	2	8	1	3	1	3	0	2	3	4	1	1	12	0	0	53	146	0.36	

SOUTH COAST																						
DFGID	**Survey Years**																		**Total Production (minimum)**	**Years Data**	**Mean Annual Production (minimum)**	**Productivity Level**
	90	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**				
MD089	0	1	U	U	U	U	X	A	U	U	U	U	0	X	1	U	U	U	2	6	0.33	2
MD090	0	1	X	X	U	U	X	X	A	A	U	U	X	X	X	U	X	U	1	10	0.10	2
MD143	U	A	A	A	2	A	A	A	U	0	U	U	2	X	2	U	U	U	6	5	1.20	1
MD162	-	-	-	U	U	0	1	U	U	A	U	X	U	U	U	U	1	U	2	4	0.50	2
MD182	-	-	-	-	U	A	A	U	A	2	U	1	0	U	0	1	U	U	4	5	0.80	2
MD183	-	0	2	U	1	A	U	1	A	1	U	U	2	X	2	0	U	U	9	9	1.00	1
MD199	-	0	U	U	2	A	1	2	U	A	U	2	U	U	2	1	1	0	11	9	1.22	5
MD200	-	U	A	0	2	A	U	2	A	A	A	A	U	A	2	2	2	U	10	6	1.67	1
MD201	-	U	U	U	U	A	A	U	A	U	U	1	U	U	X	U	U	U	1	2	0.50	2
MD220	-	2	2	0	2	A	A	U	A	A	A	U	U	U	2	U	U	U	8	5	1.60	1
MD221	-	U	U	U	1	U	1	U	U	U	U	A	A	A	A	U	U	A	2	2	1.00	4
MD260	-	U	A	U	A	A	U	A	U	A	U	U	U	A	A	U	X	X	0	2	0.00	3
MD261	U	A	A	2	2	U	0	0	U	U	U	U	0	1	2	U	X	U	7	8	0.88	1
MD288	-	U	U	U	1	0	A	A	U	A	X	U	U	U	1	2	2	0	6	7	0.86	5
MD289	-	U	A	A	0	0	2	A	U	A	U	U	2	U	2	2	0	0	8	8	1.00	1
MD382	-	-	-	U	A	A	A	A	A	A	A	U	U	U	2	U	U	U	2	1	2.00	1
MD384	-	-	-	U	U	A	A	A	A	A	A	U	1	1	U	U	X	0	2	4	0.50	4
MD385	-	-	-	0	A	A	1	X	U	U	U	X	U	1	U	U	0	0	2	7	0.29	2
MD387	-	-	-	U	A	U	U	U	A	1	U	0	2	U	U	2	2	0	7	6	1.17	1
MD396	-	U	1	U	U	U	A	A	A	A	A	A	U	U	X	A	U	A	1	2	0.50	4
MD522	-	-	-	-	-	U	A	1	0	X	U	X	X	A	X	X	U	X	1	8	0.13	2
MD543	-	-	-	-	-	-	-	-	-	U	U	X	U	U	2	U	U	U	2	2	1.00	1
MD569	-	-	-	-	-	-	-	-	-	-	-	U	X	U	3	X	U	0	3	4	0.75	2
MD570	-	-	-	-	-	-	-	-	-		U	1	1	0	1	0	0	U	3	6	0.50	2
MD571	-	-	-	-	-	-	-	-	-	-	2	U	X	U	X	U	U	U	2	3	0.67	2
MD572	-	-	-	-	-	-	-	-	-	-	U	A	X	U	U	U	U	A	0	1	0.00	4
NEW12	-	-	-	-	-	-	-	-	-	-	-	-	-	U	2	2	U	U	4	2	2.00	1
NEW035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	U	0	0	0.00	3
TOTALS																						
28	0	4	5	2	13	0	6	6	0	4	2	5	10	3	26	12	8	0	106	134	0.79	

UKIAH																						
DFGID	Survey Years																		Total Production (minimum)	Years Data	Mean Annual Production (minimum)	Productivity Level
	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
TOTALS																						
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	

K.2 Protection levels

Table K-2 shows the protection levels for each known spotted owl territory at the start of the HCP/NCCP. The table is in alphabetical order by inventory block; within inventory block the territories are in numerical order.

Table K-2 Owl Territories by MRC Inventory Block

Owl Territories by MRC Inventory Block			
DFGID	**Mean Annual Production**	**Productivity Level**	**Protection Level**
ALBION			
MD063	0.29	4A	Moderate
MD064	0.75	2	Moderate
MD065	0.75	2	Moderate
MD129	0.92	1	High
MD168	0.92	1	High
MD170	0.25	5	Moderate
MD236	1.50	1	High
MD241	0.67	4A	Moderate
MD286	1.00	1	High
MD295	0.78	2	Moderate
MD299	0.00	3	Limited
MD321	1.40	4A	Moderate
MD369	0.09	2	Moderate
MD439	0.80	2	Moderate
MD497	0.00	3	Limited
MD544	0.00	4B	Limited
MD562	0.00	3	Limited
MD563	0.25	2	Moderate
MD577	0.00	4B	Limited
MD595	0.00	3	Limited
BIG RIVER			
MD060	0.00	5	Moderate
MD062	1.56	4A	Moderate
MD067	0.62	2	Moderate
MD068	0.63	2	Moderate
MD069	0.77	2	Moderate
MD070	0.13	2	Moderate
MD071	0.40	2	Moderate
MD072	0.50	2	Moderate
MD076	0.42	2	Moderate
MD079	0.45	2	Moderate

Owl Territories by MRC Inventory Block			
DFGID	**Mean Annual Production**	**Productivity Level**	**Protection Level**
MD080	0.22	2	Moderate
MD239	0.71	5	Moderate
MD301	0.45	2	Moderate
MD358	1.17	1	High
MD438	0.56	2	Moderate
MD477	0.00	4B	Limited
MD490	0.00	3	Limited
GARCIA			
MD102	0.20	4A	Moderate
MD130	0.67	2	Moderate
MD207	0.00	5	Moderate
MD208	0.00	4B	Limited
MD213	0.67	2	Moderate
MD214	0.00	5	Moderate
MD383	0.60	2	Moderate
MD386	0.00	5	Moderate
MD447	0.00	3	Limited
MD512	0.00	3	Limited
MD542	1.25	5	Moderate
MD573	0.60	5	Moderate
MD593	2.00	5	Moderate
NEW017	0.00	3	Limited
NAVARRO EAST			
MD025	0.44	2	Moderate
MD045	0.00	3	Limited
MD047	0.80	2	Moderate
MD077	0.50	2	Moderate
MD078	0.53	2	Moderate
MD103	0.45	2	Moderate
MD138	0.42	2	Moderate
MD160	0.86	1	High
MD161	0.17	5	Moderate
MD173	0.00	3	Limited
MD441	0.71	2	Moderate
MD445	0.75	2	Moderate
MD455	0.00	5	Moderate
MD511	0.00	3	Limited

Owl Territories by MRC Inventory Block			
DFGID	**Mean Annual Production**	**Productivity Level**	**Protection Level**
MD545	0.00	4A	Moderate
MD565	0.00	4A	Moderate
MD566	0.00	3	Limited
NEW015	0.75	2	Moderate
NEW025	0.00	3	Limited
NEW026	0.00	3	Limited
NEW029	0.00	4A	Moderate
NAVARRO WEST			
MD022	0.71	2	Moderate
MD023	0.81	1	Moderate
MD024	0.25	2	Moderate
MD053	0.82	1	High
MD066	1.23	1	High
MD125	1.27	1	High
MD126	0.33	2	Moderate
MD127	1.11	1	High
MD141	0.00	5	Moderate
MD178	1.00	1	High
MD222	0.00	5	Moderate
MD442	1.10	1	High
MD443	0.38	2	Moderate
MD444	0.88	1	High
MD489	1.00	1	High
MD518	0.89	1	High
MD521	0.00	5	Moderate
MD534	0.67	2	Moderate
MD549	0.50	2	Moderate
MD552	0.50	2	Moderate
MD575	1.00	1	High
NEW002	0.00	3	Limited
NEW030	0.00	3	Limited
NEW031	0.00	3	Limited
NOYO			
MD104	0.29	2	Moderate
MD120	0.00	3	Limited
MD121	0.86	1	High
MD122	1.00	4A	Moderate

Owl Territories by MRC Inventory Block			
DFGID	**Mean Annual Production**	**Productivity Level**	**Protection Level**
MD123	0.25	2	Moderate
MD176	0.63	2	Moderate
MD305	0.40	2	Moderate
MD375	0.67	2	Moderate
MD415	0.29	2	Moderate
MD437	0.29	2	Moderate
MD466	0.00	3	Limited
MD488	0.00	5	Moderate
MD508	0.00	5	Moderate
MD574	0.57	5	Moderate
MD578	0.67	2	Moderate
NEW020	0.00	3	Limited
ROCKPORT			
MD098	0.67	4A	Moderate
MD107	0.30	2	Moderate
MD108	0.60	2	Moderate
MD109	0.80	2	Moderate
MD134	0.64	2	Moderate
MD144	0.25	5	Moderate
MD169	0.22	2	Moderate
MD227	1.00	4A	Moderate
MD296	0.00	4B	Limited
MD297	0.00	4A	Moderate
MD381	0.67	2	Moderate
MD428	0.50	2	Moderate
MD429	0.20	2	Moderate
MD431	0.67	2	Moderate
MD432	0.00	3	Limited
MD433	0.00	5	Moderate
MD434	0.14	2	Moderate
MD435	0.00	3	Limited
MD436	0.25	2	Moderate
MD481	0.50	2	Moderate
MD513	0.40	2	Moderate
MD514	0.00	3	Limited
MD576	0.00	3	Limited
NEW023	0.00	3	Limited

Owl Territories by MRC Inventory Block			
DFGID	**Mean Annual Production**	**Productivity Level**	**Protection Level**
NEW024	0.00	3	Limited
NEW028	0.00	3	Limited
NEW033	0.00	4B	Limited
SOUTH COAST			
MD089	0.33	2	Moderate
MD090	0.10	2	Moderate
MD143	1.20	1	High
MD162	0.50	2	Moderate
MD182	0.80	2	Moderate
MD183	1.00	1	High
MD199	1.22	5	Moderate
MD200	1.67	1	High
MD201	0.50	2	Moderate
MD220	1.60	1	High
MD221	1.00	4A	Moderate
MD260	0.00	3	Limited
MD261	0.88	1	High
MD288	0.86	5	Moderate
MD289	1.00	1	High
MD382	2.00	1	High
MD384	0.50	4A	Moderate
MD385	0.29	2	Moderate
MD387	1.17	1	High
MD396	0.50	4A	Moderate
MD522	0.13	2	Moderate
MD543	1.00	1	High
MD569	0.75	2	Moderate
MD570	0.50	2	Moderate
MD571	0.67	2	Moderate
MD572	0.00	4B	Limited
NEW012	2.00	1	High
NEW035	0.00	3	Limited

K.3 Nest site report

K.3.1 Introduction

In the literature, nesting habitat for northern spotted owls is associated with late seral and old growth forests (LaHaye and Gutiérrez 1999, USFWS 1994b); multi-tiered structure (LaHaye and

Gutiérrez 1999, Pious and Ambrose 1994); greater tree basal area (LaHaye and Gutiérrez 1999, Thome et al. 1999); and canopy cover (USFWS 1994b, Pious and Ambrose 1994). Evidence from the coastal redwood zone of northwestern California suggests that northern spotted owls exist in relatively high densities and nest in substantially younger stands on managed timberlands than has been commonly reported throughout their range (Diller and Thome 1999, Thome et al. 1999). This may be due to fast regeneration of redwood forests; cool coastal climate; and smaller home ranges with high amounts of edge. The prevalence of woodrats as primary prey species may also be a factor (Thome et al. 1999, Zabel et al. 1995, Folliard et al. 2000).

Studies examining nest site selection have found that nest tree diameter is often larger and canopy height greater than random trees (Buchanan et al. 1993, Thome et al. 1999, Pious and Ambrose 1994). Moreover, nest structures in the form of deformities, debris accumulations, or structures constructed by other mammal or avian species are common within nest sites (Buchanan et al. 1993).

There is no extensive information on northern spotted owl nest sites or nest stands for the plan area. This, in itself, limits the development of sound management strategies. MRC initiated a study to compare nest site use with nest site availability; describe important nest site characteristics unique to this part of the redwood region; and empirically define nesting habitat. All of this information impacts our conservation measures for northern spotted owls. In this appendix, we have provided preliminary results for 79 northern spotted owl nest sites and random sites. We chose only to use data through 2003 to extrapolate and validate our nest site habitat typing detailed in Chapter 10 (see 10.3.1.8). This is also the study that we will be use in validation monitoring to assess the definition of nesting/roosting habitat (see 13.9.1.3). Because our project is ongoing, we have only included a small subset of the collected variables.

K.3.2 MRC methods for nest site evaluation

Between 2001 and 2005, MRC measured 79 nest trees of northern spotted from different territories. We collected data on tree species; dbh; height; height-to-crown base (htcb); age; condition; nest type; nest height; nest aspect; percent slope; slope aspect, and canopy cover. In addition, we measured nest sites centered on the nest tree using a nested plot design. We collected specific metrics in 0.12, 0.25, and 0.50 acre plots (see Figure K-1). This ensured that we would have an increased chance of detecting metrics too large or infrequent in small plots. To allow for comparison with other potential nest tree plots which MRC did not use, we measured 79 random plots situated at a random azimuth (see Figure K-2).

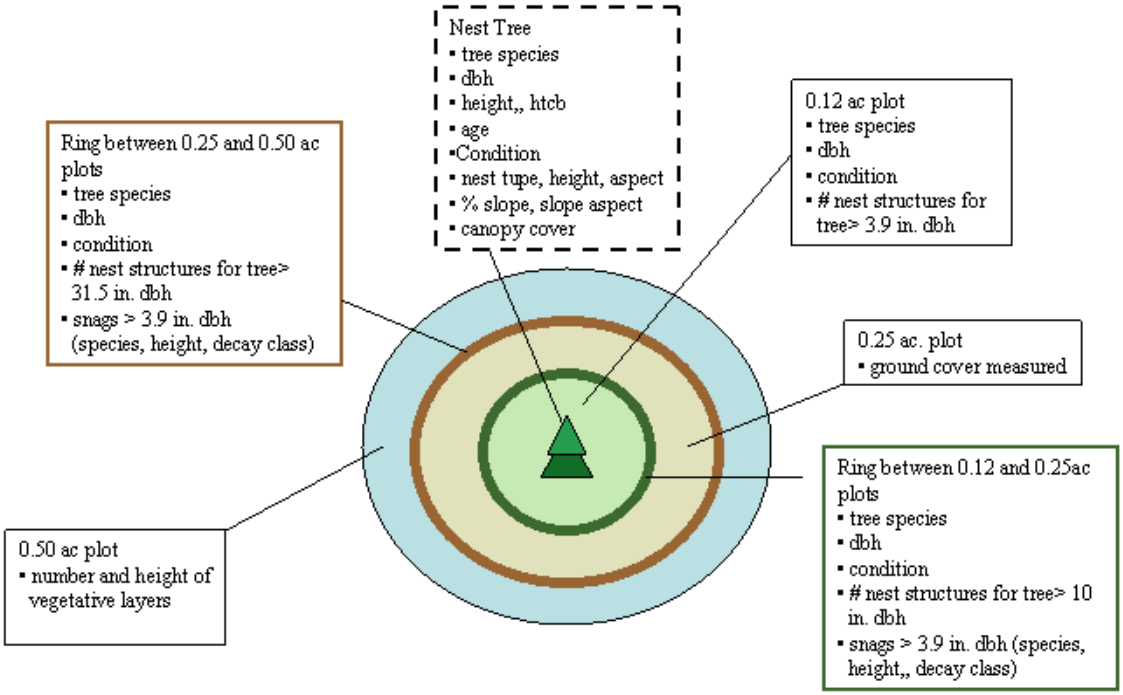

Figure K-1 Nest Plot Design

Table K-3 shows which trees MRC measured in the plots.

Table K-3 Measuring Height and HTCB of Trees

Acre Plot	Trees Measured	DBH
0.12	Every tree	> 3.9 in.
0.12 – 0.25	Every other tree	> 10 in.
0.25 – 0.50	Every other tree	> 32 in.

The height was measured for all snags as well. Canopy cover was measured with a spherical densiometer. Four densiometer measurements (one in each cardinal direction) were taken at the edge of the 0.12 acre plot and at 6.6 ft away from the nest/random tree. Ground cover was measured using the line-intercept method where two transects (north/south and east/west) were situated along the diameter of the 0.25 acre plot. Basal area was measured using a 20-factor prism on the north edge of the 0.12 acre plot.

A random plot was also located within suitable habitat for nesting northern spotted owls; the plot was centered on a tree that could hypothetically contain a northern spotted owl nest (i.e., ≥ 11 in. dbh). MRC selected a random tree at a fixed distance of 328 ft from the edge of the 0.50 acre nest tree plot (see Figure K-2). Choosing this distance ensured that trees in the nest plot did not have the capacity to influence measurements in the random plot. To determine an azimuth to travel to the selected tree, we use a random number generator, selecting numbers from 0-360. In Figure K-2, the dotted lines at 328 ft from the edge of the nest plot indicate other random azimuths that might have been chosen. In other words, the azimuths were not always due west. MRC centered a new nest plot around this random tree and collected the same data as for the nest tree plot.

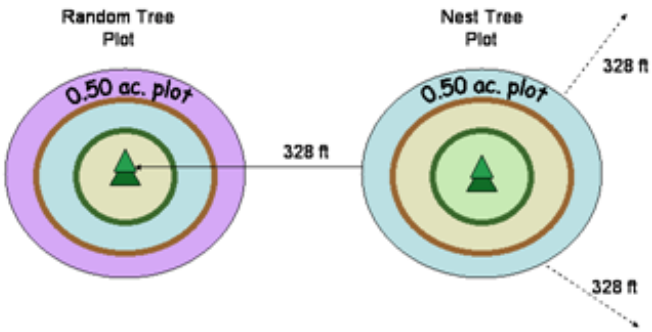

Figure K-2 Random Plot

K.3.3 Comparison of nest tree and random tree

K.3.3.1 Nest tree

MRC located nests in 5 species of trees: redwood (n = 59), tanoak (n = 9), Douglas-fir (n = 8), grand fir (n = 2), and red alder (n = 1). This is consistent with previous findings in this area (Pious and Ambrose 1994) but contrary to LaHaye and Gutiérrez (1999) who commonly found nests in redwood and Douglas-fir. Nest types were primarily platforms—debris accumulations (n = 35), or stick nests (n = 24). However, some nests were also in cavities (n = 14), while others were unidentifiable (n = 6). We did not find any nests in snags. Dbh was the only characteristic that differed in comparisons between nest and random trees ($P < 0.001$). The larger dbh nest trees may provide deformities and larger nest structures required by northern spotted owls (Pious and Ambrose 1994, LaHaye and Gutiérrez 1999, Irwin et al. 2000). Table K-4 shows a comparison of nest and random tree characteristics for 2001 thru 2005. Since our data did not display a normal distribution, we used the Mann-Whitney U-Test for statistical comparison.

Table K-4 Nest and Random Tree Characteristics

Measurements of 79 Nest Trees on MRC Land from 2001-2005		
Parameter	**Nest Mean (SE)**	**Random Mean (SE)**
Tree dbh (in.)	40.13 (2.81)[a]	22.41 (1.51)
Height (ft)	108.08 (5.67)	92.87 (4.72)
Height-to-live-crown-base (ft)	58.54 (3.08)	47.84 (4.28)
Slope (%)	53.23 (3.91)	46.72 (2.35)
Slope aspect (0-360^0)	178.90 (12.0)	193.9 (11.90)
Canopy cover (%)	90.84 (0.67)	88.71 (1.72)
Nest height (ft)	63.04 (2.90)	NA
Nest aspect (0-360^0)	183.6 (12.60)	NA

TABLE NOTES

[a] Significantly different from random using nonparametric Mann-Whitney U-Test ($P < 0.001$)

K.3.3.2 Nest site

Consistent with other studies (LaHaye and Gutiérrez 1999, Thome et al. 1999), basal area (ft^2/0.12 acre plot) was greater in nest sites than random sites ($P < 0.005$). We also found greater redwood basal area ($P < 0.10$), conifer basal area ($P < 0.05$), and snag basal area ($P < 0.10$) in our nest sites compared to random sites. Some researchers have found differences in canopy closure and number of snags between nest and random sites (Pious and Ambrose 1994, LaHaye and Gutiérrez 1999, USFWS 1994b). MRC did not ($P > 0.05$), perhaps because spherical densiometers are insensitive to changes in canopy, especially when canopy is relatively dense (Cook et al. 1995). While there may have been a similar number of snags between nest and random sites, the snags in our nest sites were generally larger, leading to a higher basal area of snags in the nest site. Table K-4 shows a comparison of nest and random plot characteristics in a 0.12 ac plot for 79 spotted owl nest and random sites between 2001 and 2005.

Table K-5 Nest and Random Plot Characteristics

Parameter	Nest Mean (SE)	Random Mean (SE)
Total basal area - ft^2/ plot	32.65 (2.40)[a]	22.90 (1.67)
Redwood basal area - ft^2/ plot	19.58 (2.57)[b]	11.93 (1.41)
Douglas-fir basal area - ft^2/ plot	5.87 (0.79)	4.81 (0.849)
Tanoak basal area - ft^2/ plot	5.30 (0.58)	4.37 (0.57)
Conifer basal area - ft^2/ plot	26.36 (2.67)[c]	17.05 (1.77)
Hardwood basal area - ft^2/ plot	6.29 (0.61)	5.85 (0.62)
Snag basal area - ft^2/ plot	2.13 (0.62)[b]	0.70 (0.13)
Number of snags	2.38 (0.32)	1.70 (0.28)
Number of nest structures	0.22 (0.06)	0.11 (0.04)
Number of redwood trees	9.62 (1.07)	8.37 (0.77)
Number of Douglas-fir trees	3.82 (0.59)	3.28 (0.51)
Number of tanoak trees	13.00 (1.41)	9.19 (1.05)
Number of conifer trees	14.29 (1.18)	12.03 (0.97)
Number of hardwood trees	14.42 (1.41)	10.96 (1.08)

TABLE NOTES

[a/b/c] Significantly different from random using nonparametric Mann-Whitney U-Test:

a = ($P < 0.005$)
b = ($P < 0.10$)
c = ($P < 0.05$)

K.4 Regional analysis of northern spotted owls

Impacts of reduced owl territories

MRC completed this regional analysis to ensure that a potential 30% reduction in northern spotted owl territories would not result in non-interacting and isolated northern spotted owl territories. Recent research indicates that banded male northern spotted owls will disperse a median distance of 9 miles (14.6 km) and banded female northern spotted owls will disperse a median distance of 15.2 miles (24.5 km) (Forsman et al. 2002). In order to follow a precautionary principle, we chose to use 9 miles as a cut-off threshold to assess if territories became excessively **isolated**.

We conducted our analysis using all known owl territories in the 2007 CDFG Northern Spotted Owl Database for Mendocino County. While the results are a quantitative measure of how well the northern spotted owl population is distributed, they also illustrate the impact of reducing spotted owl territories by 30%. To simulate such a reduction in territories, we removed 30% of known northern spotted owl territories (n = 220) from our analysis.

Since we do not have pertinent reproductive information on spotted owls outside MRC forest lands, we used a random number generator for territory removal. To better understand the range of possible outcomes, we completed 50 iterations of random territory removals, a figure that is likely to account for all possible incidental take scenarios. The nearest-neighbor distance was obtained for each territory during iteration. After 50 iterations, we selected the minimum and maximum nearest-neighbor distances. Through this data, we could determine which territories were most isolated, and, if necessary, select an alternate conservation scheme. We could also examine the overall effect in distribution of northern spotted owls with a 30% reduction in the number of existing territories.

Results of regional analysis

The mean maximum distance to the nearest owl territory was 6.33 miles. Of the 50 iterations, 95% found that spotted owl territories were no more than 7.78 miles from their nearest neighbor. We concluded that it is unlikely that potentially taking 30% of northern spotted owls from the region would cause their populations in Mendocino County to become further isolated.

Table K-6 Nearest Neighbor Analysis

Mendocino County		
Calculations	**Nearest Neighbor Distance (miles)**	
	Minimum	**Maximum**
Mean	0.13	6.33
Standard error	0.02	0.08
Range	0.03 – 0.46	4.38 – 7.78

K.5 Protocols

K.5.1 Surveying

K.5.1.1 Source and purpose of MRC protocol

MRC developed the following protocol based on the USFWS protocol from 1992, including some widely-accepted changes used by the wildlife agencies. Using the latest scientific data on owls and site-specific knowledge, we modified the protocol to better fit our land and harvesting methods. When implemented, the MRC protocol should

1. Provide adequate coverage and assessment of an area for the presence of spotted owls.
2. Ensure a high probability of locating resident spotted owls and identifying owl territories that may be affected by a proposed management activity, such as timber harvesting, modification of habitat, or noise disturbance.
3. Minimize the potential for unauthorized incidental take.
4. Determine nesting and reproductive success (number of fledged young) of northern spotted owl territories within covered lands.
5. Identify areas with barred owls and other potential avian predators or competitors.

USFWS released a new owl protocol in 2010 in response to increased barred owl detections, recent data analyses, professional opinions of researchers and managers, and concerns about the effectiveness of owl surveys.

The protocol for our HCP/NCCP derives from many meetings and discussions with USFWS and CDFG as well as from the 1992 USFWS-endorsed spotted owl survey protocol. MRC has a long survey history for the plan area dating back to 1990; this gives us abundant information about our spotted owl population. In addition, we will monitor, as part of HCP/NCCP implementation, all productive owl territories in the plan area on a 5-year rotating basis. In order to address the major concerns of the 2010 USFWS protocol, we have updated our own protocol to include provisions for locating barred owls and determining the possible reasons for the abandonment of spotted owl territories. Moreover, if USFWS changes its spotted owl protocol in the future, MRC and the wildlife agencies will reach agreement on any subsequent changes required in our HCP/NCCP protocol. The intent of a change in protocol would be to maintain at least as high a probability of detection as the 2010 USFWS protocol.

MRC will adapt this protocol over time to maintain high detectability levels of northern spotted owls. The wildlife agencies must approve all changes.

K.5.1.2 Activities requiring surveys

Table K-6 indicates all covered activities[1] that require surveys for spotted owl territories. The subsection immediately following the table clarifies the assessment area for each required survey.

Table K-7 Covered Activities Requiring NSO Surveys

Covered Activities Requiring NSO Surveys		
Covered Activity	**Survey?**	**Comments**
• Commercial harvesting operations	Generally	Needs survey unless there is no suitable NSO habitat within 0.7 miles of boundaries, inclusive of the harvesting operation, and no known activity center within ½ mile.
• Vegetation management		
▪ Planting	No	
▪ Manual brush removal	Generally not	Needs survey only for operations using mechanized equipment; see requirements below.
▪ Chainsaw work	Generally not	• Needs survey only if work will result in reduction of NSO habitat during non-breeding season. • Needs survey during breeding season only if conducted within 0.5 mile of a known activity center and off a mainline road. • No requirement for a survey if simply using a chainsaw to clear roads for access.
• Heavy equipment	Generally not	Needs survey only if completed during breeding

[1] The wildlife agencies do not require surveys for activities conducted on roads mapped as mainline haul routes in Appendix B, *HCP/NCCP Atlas*, MAPS 14A-C.

Covered Activities Requiring NSO Surveys		
Covered Activity	**Survey?**	**Comments**
		season within 0.5 miles of known NSO activity centers and off a mainline road.
• Prescribed burning	Generally not	Needs survey only if work will result in reduction of NSO habitat or burning during breeding season.
• Slash pile burning	No	
• Roads and landings	Generally	Needs survey unless roads are mainline haul routes and landings are directly on mainline roads.
• Rock pits, quarries, surface mining	Yes	Needs survey unless rock pits, quarries, or surface mining occurs on mainline roads
• Data collection for monitoring	No	
• Habitat improvement/creation	Yes	
• Grandfathered THPs	Yes	

K.5.1.3 Extent of survey area

- If disturbance only[2] is proposed
  - The survey will extend to 0.5 miles beyond a project boundary for a PTHP.
  - The survey will extend to 1000 ft beyond a potential disturbance for a non-PTHP project. MRC staff will ensure that no high or moderately protected territories have been located within this buffer area within the past 3 years.
- If habitat reduction is proposed, the survey area will extend to 0.7 miles beyond the project area.
- If blasting is proposed, the survey will extend 1 mile beyond the blast site.

K.5.1.4 Accuracy of 1-year and 2-year surveys

In preparing its 1992 protocol for northern spotted owls, USFWS analyzed survey data to determine the number of visits needed to detect territorial owls or to conclude that a lack of owl response reflected an absence of spotted owls. Their data analysis provided the basis for the number of visits that MRC requires for our 2-year survey (i.e., 3 visits per year) and 1-year survey (i.e., 6 visits per year). A complete survey covers a survey area to the required number of visits or documents activity centers of all spotted owl territories that account for all spotted owl habitat in the project impact area. Surveys over 2 years provide more confidence that the results reflect presence or absence in the current and subsequent year because owls sometimes occupy territories intermittently. MRC staff may actually complete such surveys before the end of 2 years if they obtain a response and confirm the status of the owl(s).

K.5.1.5 2-year survey

If a 2-year survey is completed without owl responses, the project may continue until the next breeding season. If MRC plans to restart the project beyond that point, we must complete 3 surveys in March that yield no owl response. This assumes that all high and moderate protection territories within 0.7 miles of a PTHP are located in the current year of harvest operations.

[2] A "disturbance-only PTHP" is one that does not propose any reduction in habitat.

EXAMPLE OF 2-YEAR SURVEY	
Year 1 (March - July)	3 visits with no response.
Year 2 (March - July)	3 visits with no response.
Year 3	A minimum of 3 surveys with no response prior to commencing operations.
Year 4	A minimum of 3 surveys with no response prior to commencing operations.
Year 5	A minimum of 3 surveys with no response prior to commencing operations.

K.5.1.6 1-Year survey

If a 1-year survey is completed and no responses are obtained, harvest may occur before the start of the next breeding season. If harvest is not completed by the start of that breeding season, another survey with a minimum of 3 visits needs to be conducted prior to harvest in Year 2. MRC will continue conducting 3 surveys a year until the harvest operations are complete. This assumes that all territories with high and moderate protection within 0.7 miles of a PTHP area are located in the current year of harvest operations.

EXAMPLE OF 1-YEAR SURVEY	
Year 1 (March - July)	6 visits with no responses.
Year 2	A minimum of 3 surveys with no response prior to commencing operations.
Year 3	A minimum of 3 surveys with no response prior to commencing operations.
Year 4	A minimum of 3 surveys with no response prior to commencing operations.
Year 5	A minimum of 3 surveys with no response prior to commencing operations.

K.5.1.7 Locating nest site or activity center

If a nest site or activity center is located during a survey and the project area is large enough to possibly support more than one site (i.e., there is at least a .5 mi. radius from the located owl to another site), the remaining potential habitat should be surveyed (Figure K-3). Half a mile is a commonly accepted distance for owl nests. Though our minimum inter-territory distance varies from this number, we believe, on average, territorial owl activity occurs a half mile or more from other owl territories. Minimum inter-territory distance does not represent the average distance between territories, only the minimum distance; it is not a good measure to address typical conditions.

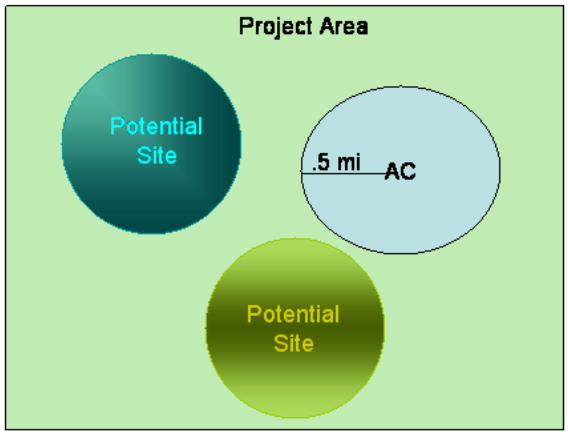

Figure K-3 Potential Sites in Project Area

K.5.1.8 Area of surveys

MRC will inventory all potential suitable habitat for northern spotted owls in a harvest impact area using current habitat typing. If potentially suitable habitat is located, MRC will conduct surveys. If no potentially suitable habitat is located within the harvest boundary or 0.7 mi. away, no surveys will be required. All areas of suitable habitat within the harvest boundary will be surveyed unless spotted owl territories have been located within 0.5 miles or survey work has adequately covered the area in the current year.

K.5.1.9 Timing of surveys

MRC will conduct surveys based on the timing of harvest operations.

K.5.1.9.1 Ongoing operations

Operations initiated prior to February 1 may continue past February 1 only if

- 1-year or 2-year protocol surveys have been completed in the prior year(s).
- 1 survey is completed in February, prior to harvest.
- Operations were ongoing between March 25 and March 31, excluding 3 days or less when operations halted due to weather.
- Activity centers are located for all active territories within 0.5 mile (or 1 mile if rock-blasting) of the harvest boundary.

Operations may continue past March 1 only if

- 1-year or 2-year protocol surveys have been completed in the prior year(s).
- One survey is completed in both February and March, concurrent, if necessary, with timber operations.
- Activity centers are located for all active territories within 0.5 mile (or 1 mile if rock-blasting) of the harvest boundary or activity centers saturate all suitable habitat for spotted owl territories within that distance.

K.5.1.9.2 Full operations

Start-up operations can be initiated between March 1 and May 15 only if

- 1-year or 2-year protocol surveys have been completed in the prior year(s).

- 3 surveys prior to operation start-up within 0.5 miles of the PTHP boundary have been completed.
- Activity centers (a) have been located and saturate all suitable habitat for all spotted owl territories within 0.5 miles (1 mile if rock-blasting) of the harvest area and (b) the operations adhere to disturbance limitations; or activity centers are located for all active territories within 0.5 mile (or 1 mile if rock-blasting) of the harvest boundary

Start-up operations can be initiated after May 15th only if

- 1-year or 2-year protocol surveys have been completed including surveys from the current year.
- Activity centers are located or deemed unoccupied for all active territories within 0.5 miles (1 mile if rock-blasting) and harvest area are located or deemed unoccupied.

  NOTE

  In this case, activity centers have saturated all suitable habitat within 0.5 miles of the harvest area and the operations adhere to disturbance limitations.

  OR
- The harvest area and area within 0.5 miles (1 mile if rock-blasting) of the PTHP (a) is saturated with owl activity centers (i.e., activity center + ½ mile buffer covers the entire harvest area and the area within 0.5 miles of the harvest boundary) and (b) the operations adhere to disturbance limitations.

K.5.1.9.3 Determining abandoned status of an historically occupied site

If after 3 consecutive years of surveying to protocol MRC has obtained no responses (during a combination of daytime and/or nocturnal surveys) at a historical site, we will consider the site abandoned, barring other evidence to the contrary. The following conditions will apply:

- If a territory becomes unoccupied and MRC declares the territory abandoned with concurrence of the wildlife agencies, the site will be available for harvest.
- If an abandoned site becomes re-occupied, MRC will base productivity calculations only on reproductive success of the current occupants.
- If the site becomes re-occupied by spotted owls which MRC can visually identify through leg bands as the prior occupants, we will include the prior reproductive calculations in our productivity assessment.

K.5.1.9.4 New territories

MRC considers any new territory a Level-3 territory until 3 years of data are collected. We will apply limited protection to this activity center unless we are not meeting our numeric objectives for Level-1 and Level-2 territories. In that case, we will provide moderate protection for new spotted owl territories.

K.5.1.9.5 Deviations from standard protocol

There are many situations where deviations from this protocol are warranted. Any information on owl presence within or adjacent to a proposed project area is important, even if it does not meet the guidelines described here. However, if information for a proposed activity is acquired through less intensive surveys, MRC will document why the recommended protocol was not followed and consult with the wildlife agencies prior to initiation of operations to assess impacts in a “worst case” analysis.

K.5.2 Protocol for night-calling survey

K.5.2.1 Habitat to be surveyed

For survey purposes, northern spotted owl habitat is nesting/roosting or foraging habitat. At a minimum, MRC must survey all nesting/roosting and foraging habitat.

K.5.2.2 Coordination of Information

MRC will avoid common mistakes, such as overlapping visits by more than one survey group, through coordinated planning. When possible, we will also inform adjacent landowners of all surveys near their property. Such surveys could affect their own management and logging operations. Moreover, neighboring landowners may provide information on off-property owls and cooperate in joint surveys. MRC will submit an annual report on all survey and PTHP activity completed to the wildlife agencies.

K.5.2.3 Survey period

Surveys of proposed management activity areas must take place between March 1 and August 1, unless proposed operations initiate prior to February 1. For areas where there is adequate biological information that birds are defending their established territories prior to March 1, MRC may use earlier dates as a starting time. Positive responses after August 1 are still valid, but negative results after this date do not count as required visits for completing a survey. Positive responses obtained after August 1 also indicate that the area in question should be surveyed the following year.

K.5.2.3.1 Establishing the survey area

- Develop transects or calling stations to cover all spotted owl habitat within the delineated survey area, including locations detailed in the sub-section, *Extent of survey area*. Surveys are not required for mainline haul routes.

- Establish calling stations and survey routes to achieve complete coverage of the area, preferably from more than 1 calling station. Calling stations should be spaced approximately 1/4 to 1/2 mile apart, depending on topography and background noise levels. Take advantage of prominent points within the survey area when establishing calling stations. If necessary, to ensure complete coverage of the area, supplement the prominent points with intermediate calling stations. Where known spotted owl activity centers exist within the survey area, survey areas may be adjusted to exclude habitat that would be within earshot of the activity center. However, consider the need to survey the known activity center for current status. The intent is to obtain complete coverage of the area where owls will be able to hear the surveyor and the surveyor will be able to hear the owl.

- Record, for each visit, whether results are positive or negative, and include the following information:
  - County
  - Watershed
  - PTHP or Inventory Block
  - Survey type (point, cruise, or combination)
  - Surveyor(s) name
  - Survey date
  - Brief description of survey route
  - Survey start and finish time

- Total time of survey
- Weather conditions (including estimated precipitation level, wind speed, and percent cloud cover)
- Survey results, i.e., spotted owl detections, including time of response, sex , and age (if possible); type of response (i.e., audio, visual, or both); azimuth of response; estimated distance of response; behavior or vocalization type; For multiple or moving owls, list information and number each response or observation. This will allow more accurate determinations of management centers.

- Record all sightings of or responses by barred owls, great horned owls, northern goshawks, or any other raptor species. The presence of other raptors may affect spotted owl responses.

- Map the following for each visit:

  - Route surveyed and stations called.

  - Spotted owl response or observation locations. For multiple or moving owls, map all response or observation locations and number to correspond with survey results. Again, this will assist in determining activity centers.

- Map responses or observation locations of barred owl, great horned owl, and northern goshawk. If a barred owl is detected, make a reasonable effort to determine a daytime location and assess reproductive status. Continue to monitor the barred owl territory throughout the term of the HCP/NCCP.

K.5.2.4 Survey methods

There are 4 types of acceptable surveys: point calling, cruising or leapfrog surveys, daytime calling surveys, and territory monitoring (site visits). Point calling is the recommended method for nocturnal surveys; territory monitoring is the recommended method for daytime surveys at historic site centers or nocturnal detection locations (i.e., daytime follow-up visits).

1. **Point calling**
   Set up a series of calling stations 1/4 to 1/2 mile apart along the road transects. When possible, pick prominent points which cover large areas. Spend at least 10 minutes at each station. If the topography lends itself to fewer, prominent calling stations, spend more time at each station. Be sure the entire survey area is adequately covered.

2. **Cruising or leapfrog surveys**
   Walk the designated route calling and pausing at prominent points and at regular intervals throughout the area to conduct informal stations of 10-minute duration. If 2 people are involved, you may use a leapfrog method (Forsman 1983).

3. **Daytime calling surveys**
   Set up a series of calling stations at least 600 ft apart along the road transects. When possible, pick prominent points which cover large areas. Spend at least 20 minutes at each station (section K.5.2.6).

4. **Territory monitoring (site visits)**

Walk a route through a historically occupied site during the daytime calling at regular intervals and pausing to search the area for sign of spotted owls (i.e., feathers, whitewash, nest structures, roosting birds, etc.). Once you locate the owls, note their location with a GPS unit and assess occupancy and reproductive status (section K.5.2.6.3). Spend a minimum of 90 minutes searching an historically occupied site if you are unable to detect a spotted owl.

K.5.2.5 Survey instructions

The following instructions apply to any of the methods described in section K.5.2.4:

- Elicit responses from northern spotted owls with voice calling or with a digital wildlife caller (recommended). Record the time you arrive at the station and begin calling. Continue this process for at least 10 minutes at each calling station.

- Use a digital wildlife caller to elicit a response, if surveys have detected a barred owl within 0.5 miles of the point location within the last 5 years. First, call spotted owls for 10 minutes, followed by 2.5 minutes of silence. If there is no response, call barred owls for 5 minutes, followed by 2.5 minutes of silence.

- Add an additional survey using the techniques discussed immediately above, if 3 surveys for a known historic territory result in no response.

- Add an additional survey if MRC, within the last 5 years, detects a barred owl within 0.5 miles of the point location and there has been no owl response during 4 surveys for a territory.

- Characterize behavioral observations. Make note of agitated calls, continuous responses, movement (toward you or away from you), or situations where there is only one owl response followed by quiet. Recording this type of information may assist with the identification of activity centers.

- Conduct night surveys between sunset and sunrise. Be sure not to call the same section of a survey route at the same time on each survey effort (i.e., vary the time you start and the section of the route from which you start).

- Do not survey under inclement weather conditions, such as high winds (> 10 mph), heavy rain, heavy fog, or high noise levels (e.g., stream noise, machinery, etc.) which would prevent you from hearing responses. If weather conditions or noise levels are in doubt, be conservative. Survey visits conducted under marginal conditions will reduce the quality of the overall survey effort. Negative results collected under inclement weather conditions may not be adequate for evaluating spotted owl presence or absence. When using an alternate survey point because of stream noise, note this on the survey sheet and re-locate the point in approximately the same survey area. Stream noise is generally a problem during surveys early in the breeding season from March through April.

- Resort to more than one visit, if necessary, to complete a survey. The objective of a complete visit is to conduct a thorough survey of the entire area in one field outing;

however, in some cases this may not be possible. A complete visit may be a combination of a day and a night field outing and, in addition, may include a daytime follow-up visit. If reasonable effort was made to cover the area in one outing, but this was not accomplished, then the remaining area should be surveyed in the following field effort. To reduce the chance of owls moving between portions of the survey area and, as a result, being missed, complete the visit on consecutive days as much as possible. The entire area should be covered within 7 days in order to be considered as one complete visit.

- Divide a large project area that cannot be surveyed in 7 days into smaller areas based on available habitat, topography, drainages, and other important factors. Survey areas need to be small enough to be completely surveyed within the specified time period.

- Count as 1 complete visit a night outing and daytime follow-up. If a surveyor goes out at night and does not get a response, a daytime follow-up would not be necessary. In this case, the night outing alone would be considered 1 complete visit. Whether or not owls are heard, the entire area needs to be surveyed to count as a complete visit.

- Space visits at least 5 days apart. For example, assume a visit ends on the 3rd of May. Using a proper 5-day spacing (May 4-8), the next possible visit date would be May 9th.

- Conduct at least 2 of the night visits per year before June 30 for a 2-year survey and at least 4 of the night visits before June 30 for a 1-year survey. During years when nesting occurs early,[3] 1 survey may occur after May 15 and before June 30; otherwise, the survey must occur during the month of June. Also, survey effort should be spread out over 5 months to avoid efforts concentrated in a short period of time, particularly at the beginning of the survey season. Exceptions to this timing may only occur when (a) operations begin prior to May 15 and (b) MRC has met either the 1-year or 2-year survey protocol.

- Adjust the survey period when there are season restrictions due to snow, landslides, mud, and bridge failures, etc., and provide documentation to explain the modifications.

- Conduct surveys during the day when there are no roads or foot trails to traverse at night or when there are other safety concerns. Provide documentation on the specific safety concerns.

K.5.2.6 Daytime calling survey

Permit daytime calling in areas that are not accessible with nocturnal surveys in order to reduce the chance of worker injury while hiking at night. Follow the point method, if possible, when using daytime surveys. Space call points no further than 600 ft apart, if using daytime surveys; owls do not respond from long distances during the day as they do at night. Conduct all daytime calling for at least 20 minutes. Increase, alternatively, inter-station distance to 0.25 mile when

[3] MRC and the wildlife agencies will determine an early nesting year. We will request such a determination by May 1 of the calendar year and the wildlife agencies must reply by May 31st of that year.

conducting a cruise survey between points, but still spend at least 20 minutes surveying each station.

K.5.2.6.1 Owls located during survey

- Estimate the owl's original and final location. One method is to triangulate on the owl's call, taking compass bearings from 2-3 locations. Make sure compass bearings are taken in as short a time-frame as possible. Record on the survey form the method used to estimate the location.

- Record the location(s) of the owl, preferably on a map or photo attached to the survey form.

- Attempt to confirm the owl(s) location with a daytime follow-up. The intent of triangulation and mapping is to provide a means for verification of the location. Daytime locations are very important in determining more precise activity centers.

- Record a bird response. If no response is heard, proceed to the next calling station. Continue until the survey area is completely covered.

- Return to the same area during the day if a bird responds at night; return within 72 hours to verify status. If weather precludes a return visit, document this.

- Conduct an intensive search during a daytime follow-up to locate spotted owls (pairs or singles) within the general vicinity of the night response. Surveys may begin from roads closest to the night response area. However, if owls do not respond to road surveys, surveyors should conduct walking routes through the area. Surveyors should spend sufficient time within the stand to cover the area well. This may take several hours, depending on the terrain. Observers should watch for owls flying in without responding and for other evidence of occupancy, such as pellets, whitewash, and feathers. Pellets, whitewash, or feathers alone are not sufficient to document spotted owl presence or residency. Mobbing jays are also a potential indicator of owl presence. The follow-up should be completed within 72 hours after presence was detected, as owls are more apt to be located near the previous night's location. A daytime follow-up is only the second part of a complete visit.

- Determine status if a response occurs during daylight hours and there is sufficient time to do so. Use conservative judgment and hoot only as much as needed to determine status. Do not hoot any more than is necessary. By stimulating the owls to move around, you increase their risk of predation. Excessive calling near a nest site may cause harassment by bringing the female off the nest. Excessive use of the agitated call in high owl density areas (e.g., California coastal areas) may also confound survey results by eliciting responses from owls representing multiple territories.

- Complete the survey route to determine pair status once a bird responds at night. To avoid *leading* a spotted owl through calling, go to the other end of the survey route and complete the rest of the survey once an owl responds. If that is not practical, survey only the remaining stations that are beyond the earshot of the responding bird. Beyond earshot is generally over a ridge or at least a 1/2 to 3/4 mile straight-line

distance from the owl. Completing the route will provide an opportunity to detect any other owls.

- Continue to call for the duration of the station visit even after other species respond unless the surveyor believes that this will increase the potential for predation, for example, by great horned owls or northern goshawks.

K.5.2.6.2 Additional visits

Additional visits may be required if resident status cannot be determined during surveys. These visits should be in the general area of the response (i.e., a 0.5-mile radius around the site). If resident status is determined at any point during the additional visits, no more visits to that particular site are required for the year. The same standards (timing, intervals, weather condition limitations, etc.) apply to additional visits.

In a 2-year survey, MRC will conduct additional visits the same year as the response:

- If the last response occurs on the 1 visit, MRC will conduct 1 additional visit.
- If the last response occurs on the 2nd visit, MRC will conduct 2 additional visits.
- If the last response occurs on the 3rd visit, MRC will conduct 3 additional visits.

In a 1-year survey, MRC will conduct additional visits the same year as the response:

- If the last response occurs on the 4th visit, MRC will conduct 1 additional visit.
- If the last response occurs on the 5th visit, MRC will conduct 2 additional visits.
- If the last response occurs on the 6th visit, MRC will conduct 3 additional visits.

If MRC cannot obtain 3 responses even after additional visits, we will not classify the owl as a resident single.

K.5.2.6.3 Status

MRC will establish pair status if

1. A male and female are heard or observed (either initially or through their movement) in proximity (< 1/4 mile apart) to each other on the same visit.
2. The male takes a mouse to the female.
3. The female is observed on a nest.
4. One or both adults are observed with young. Young alone do not define a pair because young barred owls look like young spotted owls until late in the summer.

When unidentified calls are heard in the vicinity of a known spotted owl, the surveyor should not assume species identification of the unknown owl. Daytime follow-ups should be used to clarify these situations.

MRC will establish resident single status if

1. There is presence or response of a single owl within the same general area on 3 or more occasions within a breeding season, with no response by an owl of the opposite sex after a complete survey.
2. There are multiple responses over several years (e.g., 2 responses in Year-1 and 1 response in Year-2, from the same general area).

A resident single may represent a succession of single owls within the same general area in single or multiple years. Determining if the responses occur within the same general area should be based on topography and the location of any other owls known for the surrounding area. This should be determined by the wildlife biologist for the particular area. Radio-telemetry and banding data can also be used to aid in determining status of singles.

MRC will establish status unknown if there is a response of a male and/or female which does not meet any of the above category definitions.

K.5.3 Protocol for determining reproductive status

K.5.3.1 Reproduction surveys

Determining reproductive success is not required to avoid "take," if breeding season restrictions are applied to all harvest activity in order to protect owl reproduction during any given year. Restrictions may be dropped if, according to the protocol, surveys reveal that owls are non-nesting or that no young were produced.

Following is MRC protocol for determining reproductive status of spotted owls. Reproduction surveys may provide information on nest tree locations and the most accurate activity center locations. There are 2 stages of reproduction surveys: nesting status and reproductive success.

K.5.3.1.1 Nesting Status

- Conduct nesting status surveys between March 11th and June 15th. The start date is based on nest initiation dates. Young identified after June 15 still confirm nesting.

- Spread the surveys throughout the survey period. Do not conduct all nesting status surveys early in the breeding season.

- Use a standard *mousing* procedure (section K.5.3.1.2) to determine nesting status. However, do not *mouse* birds any more than is necessary to determine nesting status. By stimulating them to move around during the day, you may increase their risk of predation. This applies to hooting as well. Excessive calling near a nest site may cause harassment and endanger eggs or young by bringing the female off the nest.

K.5.3.1.2 Mousing

- Locate one or both members of a pair during the day and offer mice or other small prey items.

- Record the *fate* of each prey item (e.g., eaten, cached, or given to female or young) once an owl takes prey or is found with natural prey. The fate of the prey is used to classify nesting status.

- Continue to offer additional prey items, if the owl eats the prey, until the owl caches the prey, sits on it for an extended period of time (60 minutes), refuses to take additional prey, or carries the prey away. If the bird flies with the prey, follow and try to determine the final fate of the prey. For more details on mousing procedures, see Forsman (1983).

- Make a concerted effort to get the owl(s) to take mice. Be creative in placing a mouse where the owl can easily see and capture it; offer mice to the mate of an owl.

K.5.3.2 Classifying sites

MRC will classify a site as nesting, non-nesting, or unknown nesting status based on field observations.

K.5.3.2.1 Nesting

MRC will classify owls as nesting if any of the following conditions are observed:

- Two observations, at least 7 days apart, if the first observation occurs before May 15.

  NOTE
  This is necessary because owls may show signs of initiating nesting early in the season. A surveyor may consider them nesting when, in fact, they are not nesting. For instance, a female observed on a nest early in the season may simply be roosting and not incubating eggs.

- One observation, if after May 1.

Nesting is confirmed if, on 2 visits before May 15 or 1 visit after May 1, any of the following apply:

- The female is observed on a nest.
- Either member of a pair carries natural or observer-provided prey to the nest.
- A female possesses a brood patch when examined in hand during mid-April to mid-June. Only 1 observation is required. Dates may vary with the particular areas. Be careful not to confuse the normal small area of bare skin (apteria) on the abdomen with the much larger brood patch. A fully developed brood patch covers most of the lower abdomen, extending to the base of the wings. Describe the brood patch on the field form, including length, width, color, and texture of the skin, and any evidence of regenerating feathers around the edge. While a scientific research permit is not required by USFWS for calling spotted owls, any capture or handling of spotted owls does require such a permit.
- One or both adults are observed with young. Because young barred owls look like young spotted owls until late in the summer, young alone are not sufficient.

K.5.3.2.2 Non-nesting

Except for brood patch information, 2 observations are required during the nest survey period, with at least 3 weeks separating these observations to ensure that late nesting attempts are not missed. The second observation should occur after April 15th. Because nesting attempts may fail before surveys are conducted, the non-nesting status includes owls that did not attempt to nest as well as those that have failed.

Non-nesting can be inferred if any of the following apply:

- The female is observed roosting for 60 minutes, particularly early in the season (March 11 to May 15). Be aware that nesting females with large nestlings often roost outside the nest during warm weather. If in doubt be sure to schedule 1 or more visits in mid-June to check for fledglings.

- The female does not possess a brood patch when examined in hand between mid-April and mid-June.

- Prey are offered to one or both adults and they cache the prey, sit with the prey for an extended period of time (60 minutes), or refuse to take additional prey beyond the minimum of 2 prey items.

- One or both spotted owls refuse to take prey for 60 minutes. This can only count for one of the two required visits to infer non-nesting; the other visit must use the procedure outlined above to infer non-nesting status.

Non-nesting can be inferred between May 16 and July 31:

- A pair is located between May 16 and July 31 on at least 2 occasions separated by at least 7 days.

AND

- Prey are offered to one or both adults and they cache the prey, sit with the prey for an extended period of time (60 minutes), or refuse to take additional prey beyond the minimum of 2 prey items.

OR

- One or both spotted owls refuse to take prey for 60 minutes; this can only count for 1 of the 2 required visits.

K.5.3.2.3 Unknown nesting status

Nesting status is unknown if any of the following apply:

- Nesting is not determined before June 1.
- Owls are found after June 1 without young.
- No owls are found after June 1 (at sites where they were present prior to June 1).

K.5.3.3 Reproductive success

Once an owl pair is classified as nesting, MRC will conduct reproductive success surveys when the young leave the nest (fledge)—although surveys are more successful in late May to late June. Surveyors may also assess reproductive success through the month of July and even later with positive results.

- Schedule at least 2 visits to a site to locate and count fledged young if 1 or 0 fledglings have been located; time the visits so that the fledged young are observed as soon as possible after they leave the nest to reduce predation.

- Attempt to locate fledged young. Use visual searches and mousing. If young are present, the adults should take at least some of the prey to the young. The sight of an adult with prey will usually stimulate the young to beg, revealing their number and location.

- Record 0 young if the birds take at least 2 prey items and eventually cache, sit with, or refuse further prey without ever taking prey to fledged young—on at least 2 occasions separated by at least 1 week.

- Count the number of fledged young seen or heard on the first successful reproductive visit. If 2 or 3 fledged young are identified, the reproductive status is complete.

- Conduct a minimum of 1 follow-up visit if only 1 fledged young is seen; the visit should be 3-10 days after the fledged young is seen in case some owlets are missed on a single visit.

- Classify the production of young as unknown, if there is no response after at least 2 visits, separated by at least 1 week during the fledging period.

- Classify the number of young as 1+, 2+, etc., if you count young on 1 visit but do not get back for a second visit, or find no owls on the second visit.

Opportunistic mousing late in the season (July 31) may be useful for providing supplemental information about site productivity. However, mousing efforts late in the season must be considered inconclusive if they fail to provide positive information, because dispersal or mortality may have occurred.

K.5.4 Protocol for determining activity center

Figure K-4 illustrates the decision process that MRC uses every year to select an activity center for each spotted owl territory. In reviewing the decision process, a few points should be noted: (1) MRC may locate an owl pair from auditory input, but at least one member of the pair must actually be observed; (2) MRC will select the most-used roost site (based on observations, presence of whitewash, and presence of pellets) in the event of multiple roost sites; and (3) MRC may consult with USFWS and CDFG and designate an alternate activity center, if the decision flow does not result in the most biologically suitable location.

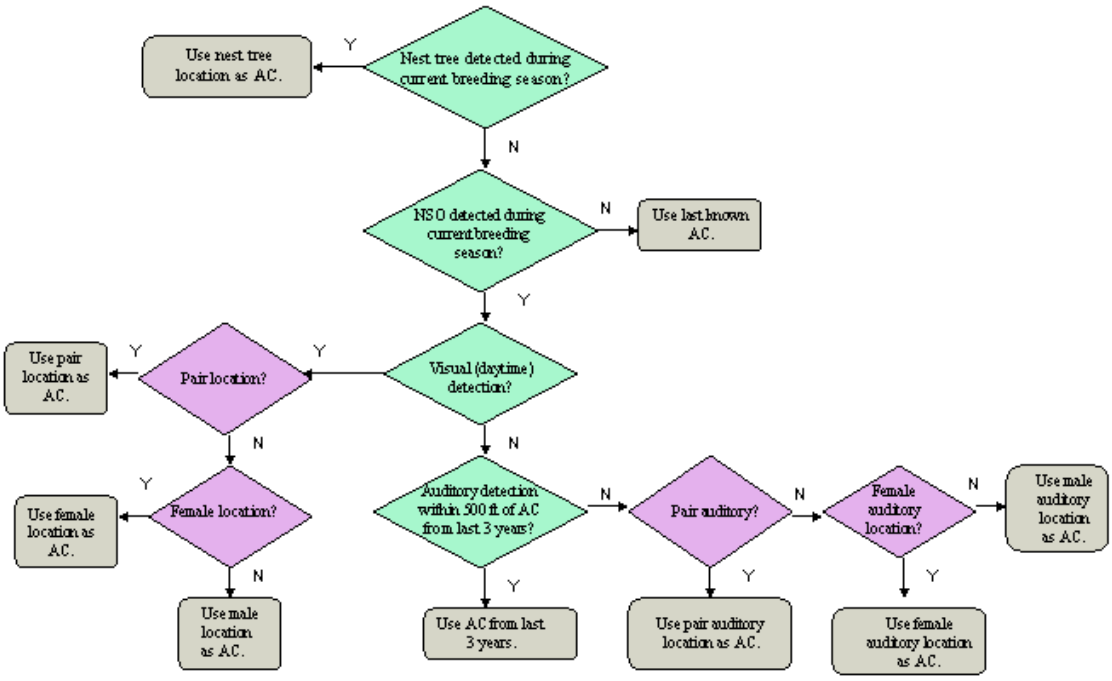

Figure K-4 Selecting an Activity Center

K.6 Spotted owl banding protocol

K.6.1 Authorized individuals

Only individuals authorized by the wildlife agencies may conduct banding activities. To request additional authorized individuals, MRC will submit 2 copies of a written request to the wildlife agencies at least 30 days prior to the effective date. The lead bander will sign and date the request that includes

1. Name of each individual to be appended to the list.
2. Resume or qualifications statement for each person to be appended to the list, detailing his or her experience with each species and type of activity for which authorization is requested.
3. Names and phone numbers of at least 2 references.
4. Names of individuals to be deleted from the list.

K.6.2 Banding of northern spotted owls

K.6.2.1 Provisions for banding owls

All authorized individuals are authorized to capture spotted owls within covered lands, as well as spotted owls previously banded or thought to be previously banded on covered lands. Captured spotted owls may be banded, held for no more than 30 minutes, and then released at the capture site, provided that

1. Adult and juveniles owls are captured by hand, noose pole, noose snare, dip net, balchatri, dho-gaza, or mist net.
2. Activities on land adjacent to covered lands are coordinated with managers of those lands to reduce handling of birds and eliminate possible cumulative impacts on owls. When previously banded birds are captured for identification purposes, all reasonable attempts will be made to contact and exchange information with the individual who originally banded the bird.
3. Owls distinguishable by color-marked or radio tags from other research projects are not recaptured by persons authorized under this permit, except with authorization of appropriate research project leader.
4. All banding is coordinated through the banding contact at the Arcata Fish and Wildlife Office and with adjacent project managers authorized under other permits.
5. Captured birds are processed efficiently and held less than half an hour.
6. No females are captured during March 15 through May 15, unless they are determined to be non-breeding.
7. Juvenile owls are not captured until they have been out of the nest for at least 2 weeks and are capable of independent flight.
8. Captors do not climb over 2 meters during capture attempts, except to release a tangled bird from a noose or other device.
9. No attempts are made to capture an owl when ambient air temperature at or below 5^0 C or during periods of precipitation.
10. Captors follow the guidelines for handling and collecting tissue (e.g. blood, feathers).

    NOTE
    Strict protocols, agreed upon by MRC and the wildlife agencies prior to the banding season, will limit the amount of collection materials. The wildlife agencies will determine the appropriate limits on an annual basis or less frequently, if they so choose.

    a. Take precautions to prevent the spread of disease from one owl to another, including the use of sterile equipment and the proper disposal of used equipment.
    b. Provide tissue samples to any scientist approved by the wildlife agencies for the purpose of laboratory analysis.

11. Collection is limited to 4 non-flight or body feathers (flight feathers lost incidentally during capture or processing will be collected and substituted for the non-flight or body feathers).
    a. Label all feather samples and store them in a dry container or alcohol until ready for analysis.
    b. Make feathers available to other researchers with concurrence from the wildlife agencies.

K.6.2.2 Guidelines for handling and reporting injured or killed owls

The allowable number of spotted owls that can be incidentally injured (debilitated) or killed during capture or handling is 2 in any calendar year. The following guidelines apply anytime an owl is incidentally injured or killed:

1. Perform a necropsy to determine cause of death (generally performed by a veterinary expert), if an owl is killed in the course of banding and/or the cause of death is unknown.
2. Transport injured owls immediately to the nearest veterinary hospital with facilities to treat injured birds.
3. Report the occurrence and disposition of any incidentally injured or killed owls within 3 working days to the wildlife agencies.
4. Adhere to the following procedures in the event the number of owls allowed to be incidentally injured or killed is met:
    a. Cease capturing or handling immediately until reauthorized by the wildlife agencies, which may, after analysis of the circumstances of mortality or injury, revoke or amend this permit.
    b. Notify the wildlife agencies immediately and follow up with written notification within 3 working days of the incident.
    c. Provide a report of the circumstances that led to the injury or mortality, including date, time, precise location, pertinent information (e.g., cause of death or injury), and measures taken to reduce the likelihood of a similar incident occurring again.
6. Bag, freeze, properly labeled, and deposit specimens at a designated depository.
7. Supply the depository with evidence that specimens were taken pursuant to the permit.

MRC must salvage all owl carcasses and deposit them with a designated depository. The initial designated depository is Humboldt State University, Department of Wildlife, Arcata, California; however, the wildlife agencies can add to or remove depository facilities at any time. For all owls killed, MRC will complete a California Natural Diversity Database form and submit it to the Natural Diversity Database, CDFG – NHD, 1416 Ninth Street, 12th Floor, Sacramento, California, 95814 with copies forwarded to the wildlife agencies.

K.7 Survey plan for determining population trends

To follow trends in spotted owl territories, MRC will survey its entire forest lands over a 5-year period. Sample units will be inventory blocks. We have specifically scheduled survey of inventory blocks to distribute our survey effort equally over time and space. This will limit the potential geographic effects (such as a lag in productivity and occupancy in our more northern tracts) and annual climate effects. For a map of inventory blocks and planned survey efforts, see Appendix B, *HCP/NCCP Atlas*, Maps 14a-c.

During the course of a year, wildlife staff will conduct night calls at survey points within assigned inventory blocks; they will conduct these night calls 3 times at each survey point in order to get an accurate count of territories and distinguish detections of spotted owls and barred owls. MRC will repeat this survey every 5 years within each inventory block for the full term of the HCP/NCCP. We will use the survey protocol outlined in section K.5.2, including for follow-ups on new detections. To ensure that owls are not "over-called," we will coordinate surveys for population trends with project surveys and other monitoring efforts.

Tables K-6 through K-10 show for each inventory block the number of survey stations and the mean acreage covered by each survey point. Some watersheds have more area and greater road density and, therefore, more survey stations. While survey stations are generally 0.25 to 0.5 miles away from each other, on covered lands the minimum distance between 2 survey stations is approximately 1000 ft and the maximum distance approximately 0.75 miles. Issues of road access or topography usually account for stations that exceed the 0.5 mile distance. Appendix B, *HCP/NCCP Atlas (*Maps 14a-c), contains maps of the current survey stations. Once an activity center is located, MRC will not make any night calls within 0.5 miles of it unless it becomes necessary in order to locate another owl territory[4] or to relocate a mobile owl activity center during the breeding season. This will insure we do not cause undue stress to breeding spotted owls.

Table K-8 Trend Monitoring of Spotted Owls: YEAR 1

Inventory Block	Survey Stations	MRC Acres	Mean Acres per Station
Albion	273	14797	54
Navarro East	437	30863	71
TOTAL	**710**	**45660**	**64**

Table K-9 Trend Monitoring of Spotted Owls: YEAR 2

Inventory Block	Survey Stations	MRC Acres	Mean Acres per Station
Navarro West	443	23549	53
Noyo	324	19350	60
TOTAL	**767**	**42899**	**56**

Table K-10 Trend Monitoring of Spotted Owls: YEAR 3

Inventory block	Survey Stations	MRC Acres	Mean Acres per Station
Rockport	485	38427	79
Ukiah	47	3591	76

[4] This may occur when spotted owl activity centers are closer than 0.5 miles to each other. MRC may need to call within 0.5 miles of one territory to locate an activity center of another territory.

Inventory block	Survey Stations	MRC Acres	Mean Acres per Station
TOTAL	**532**	**42018**	**79**

Table K-11 Trend Monitoring of Spotted Owls: YEAR 4

Inventory block	Survey Stations	MRC Acres	Mean Acres per Station
Big River	387	33479	87
Garcia	271	14906	55
TOTAL	**658**	**48385**	**74**

Table K-12 Trend Monitoring of Spotted Owls: YEAR 5

Inventory Block	Survey Stations	MRC Acres	Mean Acres per Station
South Coast	559	34281	61
TOTAL	559	34281	61

Appendix L

Marbled Murrelet Owl Data and Protocol

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L. MARBLED MURRELET DATA AND PROTOCOL

L.1 Marbled Murrelet Surveys on MRC Land from 1994-2005

Table L-1 includes all known marbled murrelet surveys and occurrences in the plan area from 1994-2005. The earliest data obviously pre-dates MRC ownership of the land. Most of the murrelet surveys used either ground observation or radar detection exclusively. The highlighted surveys were carried out with both ground observation and radar detection. In these latter instances, Table L-1 shows under "# Surveys" all completed surveys (i.e. both ground observations and radar detections), even though they may have been completed concurrently. The number in the "Radar" column indicates the number of murrelet-type targets detected by radar operators.

DEFINITION	A murrelet-type target is one that (a) occurs in a specific window of time—namely 1 ½ hours before or after sunrise; (b) has a recorded flight speed of at least 40 mph; and (c) appears to have a size typical for a murrelet.

Table L-1 shows all detections for a location, often compiled over multiple surveys. It is important to understand that detections do not necessarily indicate occupancy; on several occasions, for example, observers detected murrelets flying at least a kilometer away.

Table L-1 Murrelet Surveys

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Albion	Albion River 1995A	1995	435252	343549	0	8	N[3]
Albion	Albion River 1995B	1995	437896	343615	0	8	N
Albion	Enchanted Meadow	1996	437896	343615	0	3	N
Albion	Tom Bell Flat	1996	444617	346577	0	1	N
Albion	Albion	2000	433787	341630	0	3	13
Albion	Comptche-Ukiah 1	2000	441820	347618	0	4	N
Albion	Comptche-Ukiah 2	2000	441950	347770	0	4	N
Albion	Deadman	2000	437911	343597	0	4	N
Albion	Escola	2000	441548	345162	0	4	N
Albion	Confluence	2001	441504	345203	0	5	N
Albion	Lower Albion	2001	437932	343630	0	3	6
Albion	Lower Albion	2002	437932	343630	0	3	3
Albion	Comptche Motocross 1	2003	446088	347329	0	3	N
Albion	Comptche Motocross 2	2003	446336	347556	0	1	N
Albion	Comptche Motocross 3	2003	446348	347274	0	1	N
Albion	Comptche Motocross 1	2004	446088	347329	0	1	N
Albion	Comptche Motocross 4	2004	446140	347623	0	1	N
Albion	Comptche Motocross 5	2004	446389	347179	0	1	N
Albion	Comptche Motocross 6	2004	446504	347195	0	1	N
Albion	Comptche Motocross 7	2004	446440	347750	0	1	N
Albion	Comptche Motocross 4	2005	446140	347623	0	1	N

[1] Using NAD27 projection

[2] All murrelet-type targets are included in the radar detections column. In some cases, a ground observer accompanies the radar truck operator to confirm if radar detections are actual murrelets; the accompaniment of a ground observer is not generally the case. When there is no ground observer, the ground detections column will show "N".

[3] N indicates that there were no radar surveys at this location in this year.

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Albion	Comptche Motocross 6	2005	446504	347195	0	2	N
Albion	Comptche Motocross 8	2005	446395	347043	0	2	N
Albion	Comptche Motocross 9	2005	446346	347340	0	2	N
Albion	Comptche Motocross 10	2005	446171	347259	0	1	N
Albion	Comptche Motocross 11	2005	446208	347672	0	1	N
Albion	Nursey Gulch 1	2007	445845	342565	0	3	N
Albion	Nursey Gulch 2	2007	445635	342601	0	3	N
Albion	Table Mountain 1	2008	439254	342283	0	1	N
Albion	Table Mountain 2	2008	439265	342247	0	1	N
Albion	Table Mountain 3	2008	439263	342269	0	1	N
Big River	Russell Brook 1	1995	457136	350134	0	5	N
Big River	Russell Brook 2	1995	458945	349062	0	5	N
Big River	Russell Brook 1	1996	457136	350134	0	1	N
Big River	Russell Brook 2	1996	458945	349062	0	1	N
Big River	Russell Brook 2000	2000	458439	350048	0	4	N
Big River	Russell Brook 3	2001	458119	350021	0	3	N
Big River	Russell Brook 4	2001	458934	349611	0	2	N
Big River	Russell Brook 5	2001	457273	350489	0	1	0
Big River	Russell Brook 6	2001	457608	350296	0	1	0
Big River	Russell Brook 7	2004	458898	349594	0	2	N
Big River	Russell Brook 8	2004	459073	349058	0	1	N
Big River	Russell Brook 9	2004	457144	350181	0	1	N
Big River	Russell Brook 10	2004	458926	349173	0	1	N
Big River	Russell Brook 7	2005	458898	349594	0	1	N
Big River	Russell Brook 8	2005	459073	349058	0	2	N
Big River	Russell Brook 9	2005	457144	350181	0	2	N
Big River	Russell Brook 10	2005	458926	349173	0	1	N
Big River	Russell Brook 11	2005	459547	348607	0	1	N

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Big River	Russell Brook 12	2005	459779	348646	0	1	N
Big River	Russell Brook 13	2005	459311	348706	0	1	N
Big River	Russell Brook 14	2005	459835	348605	0	1	N
Big River	Russell Brook 15	2005	459379	348557	0	1	N
Big River	Russell Brook 16	2005	459315	348642	0	1	N
Big River	Russell Brook 17	2005	459649	348616	0	1	N
Big River	Russell Brook 18	2005	459421	348603	0	1	N
Big River	Russell Brook 19	2005	459600	348614	0	1	N
Big River	Russell Brook 20	2005	459384	348616	0	1	N
Big River	Russell Brook 21	2005	459717	348588	0	1	N
Big River	Russell Brook 22	2005	459427	348925	0	1	N
Big River	Russell Brook 23	2005	459865	348580	0	1	N
Big River	Russell Brook 24	2005	459810	348515	0	1	N
Big River	Russell Brook 25	2005	459311	348706	0	1	N
Big River	Russell Brook 25	2006	459311	348706	0	1	N
Big River	Russell Brook 16	2006	459315	348642	0	1	N
Big River	Russell Brook 15	2006	459379	348557	0	1	N
Big River	Russell Brook 20	2006	459384	348615	0	1	N
Big River	Russell Brook 18	2006	459421	348603	0	1	N
Big River	Russell Brook 22	2006	459427	348925	0	1	N
Big River	Russell Brook 11	2006	459547	348607	0	1	N
Big River	Russell Brook 19	2006	459600	348614	0	1	N
Big River	Russell Brook 17	2006	459649	348616	0	1	N
Big River	Russell Brook 21	2006	459717	348588	0	1	N
Big River	Russell Brook 12	2006	459779	348646	0	1	N
Big River	Russell Brook 24	2006	459810	348515	0	1	N
Big River	Russell Brook 14	2006	459835	348605	0	1	N
Big River	Russell Brook 26	2006	459878	348577	0	1	N

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Big River	Russell Brook 27	2008	457804	350235	0	2	Y
Big River	Russell Brook 28	2008	459736	349180	N	3	1
Big River	Russell Brook 29	2008	459515	349546	N	4	2
Big River	Russell Brook 30	2008	457233	351052	0	1	N
Big River	Russell Brook 31	2008	460332	348872	0	1	N
Big River	Russell Brook 32	2008	459415	350197	0	1	N
Big River	Russell Brook 33	2008	460586	349502	0	1	N
Big River	Russell Brook 34	2008	460006	349028	0	1	N
Big River	Russell Brook 35	2008	458425	350005	0	1	N
Big River	Wheeler Gulch 1	2004	463790	351448	0	2	N
Big River	Wheeler Gulch 2	2004	463117	351243	0	1	N
Big River	Wheeler Gulch 3	2004	463441	351300	0	2	N
Big River	Wheeler Gulch 4	2004	463470	351342	0	1	N
Big River	Wheeler Gulch 2	2005	463470	351342	0	1	N
Big River	Wheeler Gulch 1	2005	463790	351448	0	3	N
Big River	Wheeler Gulch 3	2005	463441	351300	0	1	N
Garcia	North Fork Garcia	2008	448836	307241	N	1	3
Navarro East	Wholy 1	1997	463650	336250	0	4	N
Navarro East	Wholy 1	1998	463650	336250	0	1	N
Navarro East	Wholy 2	1997	463300	335550	0	4	N
Navarro East	8-Mile	2000	470251	333780	0	4	N
Navarro East	Rose Creek 1	2001	470120	330414	0	3	N
Navarro East	Rose Creek 2	2001	469940	330786	0	2	N
Navarro East	Rose Creek 1	2002	470120	330414	0	3	N
Navarro East	Rose Creek 2	2002	469940	330786	0	2	N
Navarro West	Dimmick	2000	445427	334158	0	4	N
Navarro West	Flume Gulch	2000	441222	336566	0	4	N
Navarro West	Mouth of Navarro	2000	434554	338663	0	4	6

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Navarro West	Barton Gulch	2001	441222	336566	0	4	N
Navarro West	Dimmick	2001	445427	334158	0	5	N
Navarro West	Marsh Gulch 1	2001	439441	335420	0	5	N
Navarro West	Marsh Gulch 2	2006	439398	335078	0	1	N
Navarro West	Marsh Gulch 3	2006	439477	335342	0	1	N
Navarro West	Marsh Gulch 4	2006	439480	335140	0	1	N
Navarro West	Marsh Gulch 5	2006	439485	335009	0	1	N
Navarro West	Marsh Gulch 6	2006	439658	334906	0	1	N
Navarro West	Marsh Gulch 7	2006	439732	334939	0	1	N
Navarro West	March Gulch 2	2007	439398	335078	0	1	N
Navarro West	Marsh Gulch 5	2007	439485	335009	0	1	N
Navarro West	Marsh Gulch 3	2007	439477	335342	0	1	N
Navarro West	Marsh Gulch 4	2007	439480	335140	0	1	N
Navarro West	Marsh Gulch 6	2007	439658	334906	0	1	N
Navarro West	Marsh Gulch 7	2007	439732	334939	0	1	N
Navarro West	Marsh Gulch 8	2008	439291	335639	0	2	N
Navarro West	Marsh Gulch 9	2008	439176	335598	0	1	N
Navarro West	Marsh Gulch 10	2008	439115	335600	0	2	N
Navarro West	Marsh Gulch 11	2008	439142	335574	0	1	N
Navarro West	Marsh Gulch 12	2008	439039	335423	1	3	N
Navarro West	Marsh Gulch 13	2008	441387	334310	0	1	N
Navarro West	Marsh Gulch 14	2008	441333	334239	0	2	N
Navarro West	Marsh Gulch 15	2008	441376	334165	0	2	N
Garcia	North Fork Garcia	2008	448836	307241	N	1	3
Navarro West	Navarro (1.1)	2001	437046	338097	0	2	5
Navarro West	Navarro (1.1)	2002	437046	338097	0	2	6
Navarro West	Navarro (1.1)	2008	437046	338097	N	1	2
Navarro West	Navarro (4.2)	2001	441093	336698	0	2	5

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Navarro West	Navarro (4.2)	2002	441093	336698	0	2	0
Navarro West	Navarro (7.3)	2001	444641	335111	0	2	0
Navarro West	Navarro (7.3)	2002	444641	335111	0	2	2
Navarro West	Lower Navarro 1	2002	444063	335277	0	2	N
Navarro West	Lower Navarro 2	2002	444016	335265	0	3	N
Navarro West	Ray Gulch 1	2002	441904	336203	0	1	N
Navarro West	Ray Gulch 2	2002	441902	336158	0	4	N
Navarro West	Lower Navarro 1	2003	444063	335277	0	1	N
Navarro West	Lower Navarro 2	2003	444026	335265	0	4	N
Navarro West	Ray Gulch 2	2003	441902	336158	0	5	N
Navarro West	Lower Navarro 3	2004	438766	337268	0	2	N
Navarro West	Lower Navarro 4	2004	438798	337285	0	3	N
Navarro West	Lower Navarro 3	2005	438766	337268	0	3	N
Navarro West	Lower Navarro 4	2005	438798	337285	0	2	N
Noyo	McMullen Creek 1	2001	462500	363897	0	5	N
Noyo	Olds Creek 1	2001	453571	363624	0	3	N
Noyo	Olds Creek 2	2001	453136	363473	0	2	N
Noyo	Olds Creek 1	2002	453571	363624	0	2	N
Noyo	Olds Creek 2	2002	453136	363473	0	3	N
Noyo	Olds Creek 1	2003	453571	363473	0	2	N
Noyo	Olds Creek 3	2003	453203	363414	0	3	N
Noyo	Olds Creek 3	2006	453203	363414	0	2	N
Noyo	Olds Creek 4	2006	453625	363591	0	1	N
Rockport	Hardy Creek 1	1995	432185	396571	0	1	N
Rockport	Hardy Creek 2	1995	433063	397039	0	1	N
Rockport	Hardy Creek 3	1995	430913	395718	0	1	N
Rockport	Hardy Creek 1	1996	432185	396571	0	2	N

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
Rockport	Hardy Creek 2	1996	433063	397039	0	1	N
Rockport	Hardy Creek 3	1996	430913	395718	0	1	N
South Coast	Alder 1	1994	444760	317460	232	9	N
South Coast	Alder 2	1994	443940	316360	22	4	N
South Coast	Alder 3	1994	444200	317200	212	8	N
South Coast	Alder 4	1994	445080	317810	28	3	N
South Coast	Elk Creek 1	1994	446040	324152	0	2	N
South Coast	Elk Creek 2	1994	443369	326437	0	2	N
South Coast	Elk Creek 3	1994	444569	325761	0	1	N
South Coast	Greenwood Creek 1	1994	446903	327860	0	1	N
South Coast	Greenwood Creek 2	1994	442052	330969	0	1	N
South Coast	Greenwood Creek 3	1994	445019	330191	0	1	N
South Coast	Greenwood Creek 4	1994	439242	331618	0	1	N
South Coast	Alder 1	1995	444760	317460	48	5	N
South Coast	Alder 2	1995	443940	316360	49	8	N
South Coast	Alder 3	1995	444200	317200	59	7	N
South Coast	Alder 4	1995	445080	317810	26	4	N
South Coast	Alder 1	1996	444760	317460	51	2	N
South Coast	Alder 2	1996	443940	316360	33	2	N
South Coast	Alder 3	1996	444200	317200	46	2	N
South Coast	Greenwood Commons	1996	439220	331630	0	4	N
South Coast	Alder 1	1997	444760	317460	109	4	N
South Coast	Alder 2	1997	443940	316360	62	5	N
South Coast	Alder 3	1997	444200	317200	115	4	N
South Coast	Alder 4	1998	445080	317810	46	5	N
South Coast	Alder 6	1998	447900	318090	0	4	N
South Coast	Alder 7	1998	446410	317430	0	4	N

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
South Coast	Alder 8	1999	445297	316728	0	2	8
South Coast	Barn Gulch	1999	445627	329454	0	5	N
South Coast	Barn Gulch Confluence	1999	446980	328980	0	2	N
South Coast	Greenwood Commons	1999	439220	331630	0	5	N
South Coast	Lower Greenwood Creek	1999	438246	330649	0	5	7
South Coast	Mallo 1.6	1999	444640	321330	0	1	N
South Coast	Mallo Pass 1st	1999	444800	320990	0	2	N
South Coast	Mouth Greenwood Creek	1999	438740	330760	0	1	N
South Coast	Upper Greenwood Creek	1999	445757	4330071	0	3	0
South Coast	Alder 2000	2000	443013	316583	0	4	N
South Coast	Greenwood 2000	2000	438690	331235	0	2	30
South Coast	Greenwood Creek D	2000	439242	331618	0	8	N
South Coast	Alder Creek 3	2001	444200	317200	29	3	N
South Coast	Alder Creek 5	2001	444425	317288	22	3	N
South Coast	Greenwood 4.67	2001	444313	331498	0	2	0
South Coast	Greenwood Creek A	2001	445833	329910	0	2	N
South Coast	Greenwood Creek B	2001	447964	326749	0	1	N
South Coast	Alder 3	2001	444200	317200	19	3	19
South Coast	Lower Greenwood/Morrison	2001	445890	329938	0	1	1
South Coast	Alder 5	2002	444425	317288	10	2	N
South Coast	Lower South Elk 1	2002	440791	326684	3	0	N
South Coast	Lower South Elk 2	2002	440792	326635	2	0	N
South Coast	Lower South Elk 3	2002	439263	328873	0	2	2
South Coast	Lower South Elk 4	2002	439305	328680	0	3	N
South Coast	Lower South Elk 5	2002	439263	328873	N	3	2
South Coast	North Cabin 1	2002	447349	327969	0	3	N
South Coast	North Cabin 2	2002	447585	327442	0	1	N

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
South Coast	North Cabin 3	2002	447286	327891	0	1	N
South Coast	North Cabin 4	2002	447045	327381	0	1	N
South Coast	North Cabin 5	2002	446930	327579	0	4	0
South Coast	West Brushy 1	2002	445964	317383	17	4	N
South Coast	West Brushy 2	2002	445976	317520	67	5	N
South Coast	West Brushy 3	2002	446328	317234	2	1	N
South Coast	West Brushy 4	2002	446334	317005	6	3	N
South Coast	West Brushy 5	2002	446504	317575	N[4]	5	8
South Coast	Alder 8	2002	444082	317406	N	1	11
South Coast	Alder 9	2002	446504	317575	0	4	N
South Coast	Alder 10	2003	444425	317288	52	1	N
South Coast	Alder 11	2003	441615	316247	10	1	N
South Coast	Alder 12	2003	443897	316848	53	1	N
South Coast	Alder 13	2003	444604	317377	0	2	N
South Coast	Alder 14	2003	442126	316358	5	1	N
South Coast	Alder 15	2003	441253	316409	N	2	67
South Coast	Alder 16	2003	444069	317173	N	2	11
South Coast	Irish Gulch 1	2003	444272	317974	5	4	N
South Coast	Irish Gulch 2	2003	443989	318065	0	1	N
South Coast	Mills Creek 1	2003	442484	321704	0	5	N
South Coast	North Cabin 3	2003	447286	327891	0	1	N
South Coast	North Cabin 5	2003	447430	327978	0	2	N
South Coast	North Cabin 6	2003	447457	327862	0	2	N
South Coast	West Brushy 2	2003	445976	317520	43	8	N
South Coast	West Brushy 5	2003	446504	317575	N	2	4
South Coast	West Brushy 6	2003	445908	317199	0	1	N

[4] MRC did not complete ground surveys in this location in this year.

Murrelet Surveys							
Tract	Site	Year	UTME[1]	UTMN	Ground Detections	# Surveys	Radar Detections[2]
South Coast	Irish Gulch 1	2004	444272	317974	3[5]	3	N
South Coast	Irish Gulch 2	2004	443989	318065	0	2	N
South Coast	Mills Creek 1	2004	442484	321704	0	1	N
South Coast	Mills Creek 2	2004	442448	321643	0	4	N
South Coast	Alder 17	2004	441150	316607	N	2	50
South Coast	Alder 18	2004	444068	317414	N	2	24
South Coast	West Brushy 5	2004	446504	317575	N	2	1
South Coast	Alder 18	2005	444068	317414	N	2	50
South Coast	Alder 19	2005	441253	316409	N	2	50
South Coast	West Brushy 5	2005	446504	317575	N	2	1
South Coast	Alder 15	2008	441253	316409	N	5	57
South Coast	Alder 16	2008	444069	317173	N	5	14
South Coast	Owl Creek 1	2008	442873	316721	0	5	N
South Coast	Owl Creek 2	2008	442925	316788	0	5	N

[5] The detections from the "Irish Gulch 1" survey were actually murrelets flying in LACMA.

L.2 Radar surveys in LACMA

In 2003-2005, MRC and Hamer Environmental completed radar surveys in LACMA to assess variability within annual murrelet detections. With the 2003-2005 data, we estimated the number of surveys required to detect a difference in the annual number of murrelet detections (M§13.9.2.1-1 and M§13.9.2.1-2). Near the mouth of Alder Creek, for instance, a mean of 33.5 murrelets were detected in 2003, while a mean of 25 murrelets were detected in 2004. By understanding the level of variance in detections, we can determine whether differences in the means represent a true difference from year to year or whether there is a great variation in the number of detections at the same sites within and across years. MRC also conducted radar surveys in Lower Alder Creek in 2007 and 2008. However, we did not include the 2007 and 2008 data in our analysis since it only represented 2 consecutive years.

We assessed our initial power and the required number of samples to meet a certain objective (see 13.2.2.4). In making comparison, we would want a power of 0.90 (i.e., the likelihood of detecting a difference when there actually is one) and an alpha level of 0.10 (i.e., the likelihood of rejecting a hypothesis when it is false). For this and all statistical studies, our goal is to balance increased power with decreased alpha level.

To assess power level in 2003-2005, we used a power calculator accessed through the UCLA statistics website (Brown 2006). This calculator uses a t-test with Welch's approximation for the degrees of freedom to estimate power and required sample sizes. We compared the 2 marbled murrelet radar sites separately. This analysis was based on only 2 surveys at each site in each year – a very limited number to complete a power analysis and estimate standard deviation. Site 1 was near the mouth of Alder Creek and Site 2 was at the rock quarry. The tables below show the comparisons between 2003, 2004, and 2005 for each of the sites and a projection of required surveys to achieve a power of 0.90 and alpha of 0.10.

Table L-2 Detections, Means, and Standard Deviation at Survey Site 1

	Survey Years		
	2003	2004	2005
Means	33.5	25.0	25.0
Standard deviation	3.5	1.4	4.2
Number of surveys	2	2	2

Table L-3 Power and Survey Comparison at Site 1 by Survey Year

	Survey Years		
	2003-2004	2004-2005	2003-2005
Current power	0.772	NA*	0.658
Sample size to meet power = 0.9	6	NA*	4
Sample size to meet power = 0.8	6	NA*	4

TABLE NOTES

* Initially, the means are equal so power calculations are not applicable.

Table L-4 Detections, Means, and Standard Deviation at Survey Site 2

	Survey Years		
	2003	2004	2005
Means	5.5	12.0	2.0
Standard deviation	2.1	8.5	1.4
Number of surveys	2	2	2

Table L-5 Power and Survey Comparison at Site 2 by Year

	Survey Years		
	2003-2004	2004-2005	2003-2005
Current power	0.283	0.402	0.574
Sample size to meet power = 0.9	15	13	5
Sample size to meet power = 0.8	10	13	4

Tables L2 through L5 indicate that we would require from 4-15 surveys per site to meet our power and alpha-level goal and to assess differences in murrelet detections from year to year. While this analysis is informative, we believe it may underestimate the number of surveys required since (1) only 2 sites per year were surveyed in each case and (2) our survey effort in 2003-2005 was not consistent in timing and location. Our pilot study from 2010-2011 will determine whether we can confidently compare murrelet trends with 5 surveys at 2 sites. If not, we may concentrate on 10 surveys at Site 1 (the mouth of Alder Creek). Since Site 1 generally has more murrelet detections and generally has less variation in numbers of detections, there is a greater likelihood of detecting differences in annual murrelet trends with limited effort. Our initial analysis suggests that we will not be able to lump data from Site 1 and Site 2 for a year-to-year comparison. However, we believe it is important to continue to monitor Site 2 because of its proximity to occupied stands in Alder Creek.

L.3 Lower Alder Creek Management Area (LACMA) Map

The map labeled Figure L-1 defines the boundaries of LACMA in the Lower Alder Creek planning watershed. The map shows the locations of trees occupied by murrelets and an eggshell fragment found in 1993.

L.4 Marbled Murrelet Survey Protocol

MRC will use the most current version of the Pacific Seabird Group (PSG) protocol for murrelet surveys, updated over the term of the HCP/NCCP by PSG or the wildlife agencies. This protocol was developed for terrestrial surveys for marbled murrelets; the protocol is for both land management and research purposes. The most recent version of the PSG protocol was published in 2003 (Evans Mack et al. 2003). We use this version with guidance from the wildlife agencies and with certain enhancements for surveys within LACMA. For this HCP/NCCP, we will add certain enhancements (section 10.3.2.1.2) for surveys within LACMA.

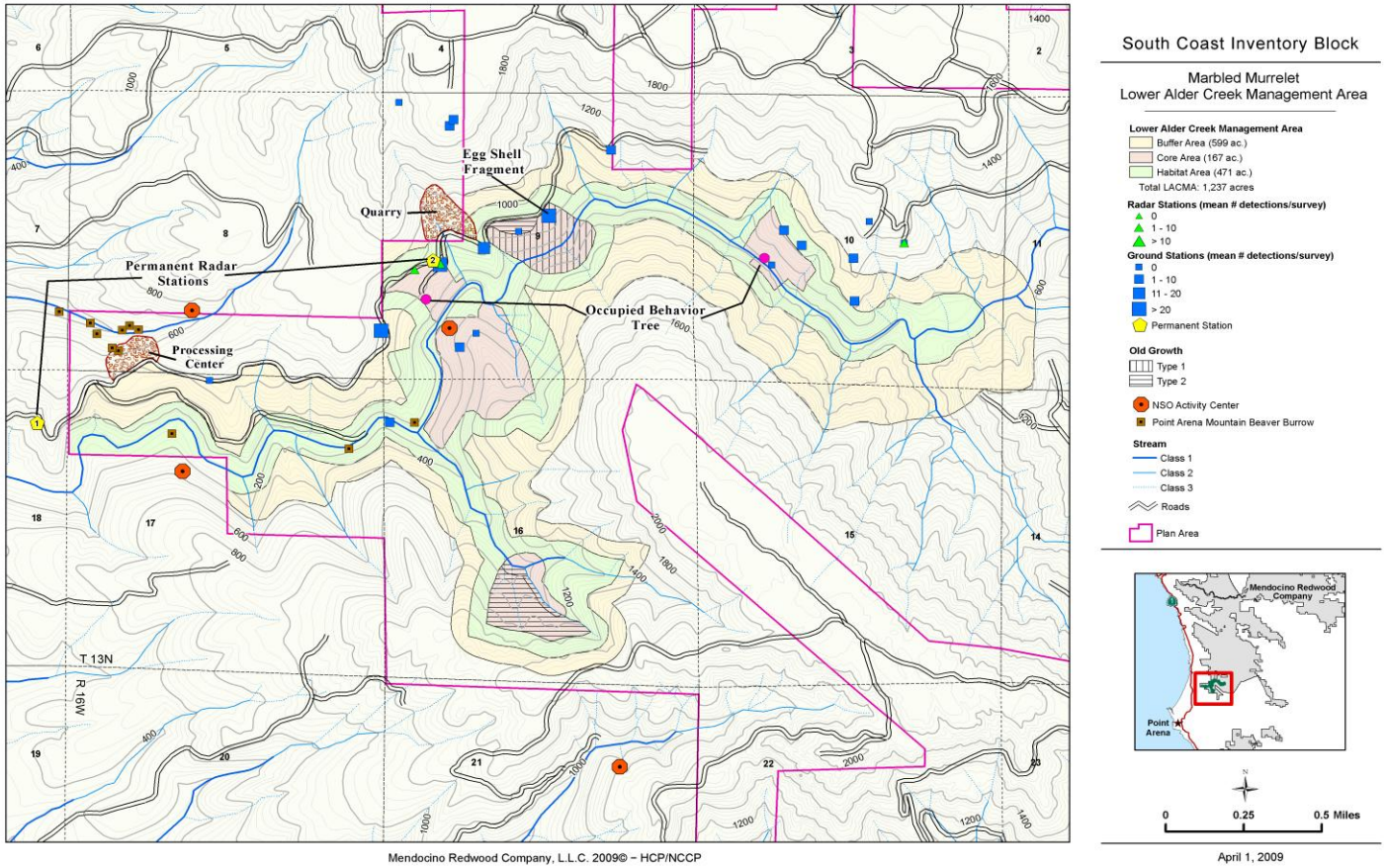

Figure L-1 LACMA Map

Appendix M

Point Arena Mountain Beaver Protocol

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M. POINT ARENA MOUNTAIN BEAVER PROTOCOL

The following protocol was developed by USFWS and Kim Fitts[1] in October 2002. MRC has modified it to meet the needs of our HCP/NCCP.

On December 12, 1991, USFWS listed the Point Arena mountain beaver (PAMB) as endangered under the Endangered Species Act of 1973. The Recovery Plan for the Point Arena Mountain Beaver (USFWS 1998a) identified the need to conduct surveys to locate and protect new populations; moreover, it suggested that a presence-absence survey protocol should guide these efforts. The habitat assessments and surveys described in this document are not intended for research. Rather they are to be conducted prior to any project within the assessment area of Point Arena mountain beaver that might result in ground or vegetation disturbance. This survey assessment follows the current USFWS protocol for Point Arena mountain beaver (Hunter and Fitts 2005).

MRC will

1. Conduct an assessment to determine if potentially suitable habitat exists in a project area.
2. Conduct thorough surveys of these potential habitat areas for presence of Point Arena mountain beaver.

If only small pockets of potential habitat are located, MRC may conduct assessments and surveys simultaneously. Defining the "impact area" will depend on the type of the disturbance and the nature of the habitat-modification, both discussed in the conservation measures for Point Arena mountain beaver (C§10.3.3.3-1 through C§10.3.3.3-18). In most cases, assessment and surveys within 500 ft of proposed activities will be sufficient.

M.1 Habitat Assessments

While MRC can provide some generalizations about mountain beaver habitat, there is limited information based on quantitative descriptions of vegetation height, percent ground cover, species composition, and other variables. Burrow openings are often found in areas of lush herbaceous and woody vegetation. These areas are often, but not always, located on steep north-facing slopes or in gullies, where soils are well-drained and friable. Mountain beavers also are known to use areas around and beneath coarse woody material on the ground.

For habitat assessments, MRC will collect the following information:

- Date(s) of assessment.
- Time spent on-site in the field conducting the assessment.
- Name(s) and contact information for person(s) conducting assessment.
- A description of the project or activity for which the assessment was conducted.
- A map, at appropriate scale, showing: the footprint of the project area; locations of proposed activities; areas covered by the habitat assessment; areas not assessed; and reasons why areas were not assessed, e.g., lack of access to private land.
- A map, at appropriate scale, showing locations of potential suitable habitat.
- A general description of the vegetation in the potential habitat areas, including, if possible, photos with labels.
- Information, if available, on soils in the project and assessment area.

[1] Kim Fitts is the owner and wildlife biologist of Bioconsultant located at 122 Calistoga Road #360, Santa Rosa, CA 95409.

M.2 Surveys

M.2.1 Criteria for presence or absence

Once potentially suitable habitat areas are located, MRC will conduct surveys to determine whether mountain beavers are present or absent. Only areas with burrow openings are considered to have mountain beavers "present." These areas can then be classified as either "active" or "inactive" (see M.2.5). MRC will consider a site "occupied," if there are signs of mountain beaver activity or if signs of activity are inconclusive.

M.2.2 Timing of surveys

MRC may conduct surveys at any time of the year. Surveys, however, will not be conducted after heavy rains when soils are saturated; this will reduce the likelihood that burrows will collapse as a result of foot travel. Generally, we will not conduct surveys more than 8 weeks prior to operations to reduce the likelihood that mountain beavers move into a project area after a survey. In some situations, we may conduct surveys more than 8 weeks in advance of operations to allow sufficient time for environmental analysis. In these situations, we will re-survey these sites within 8 weeks of operations. During the mountain beaver dispersal season (April 15th to September 30th), we will not conduct surveys more than 4 weeks prior to operations and will re-survey if necessary. When mountain beaver are found or occupancy is assumed, re-surveying will not be necessary. If we do not locate mountain beavers within 500 ft of an operation's impact area, these survey results will be valid for 2 years. If we do not locate mountain beavers within 250 ft of an operation's impact area, these survey results will be valid for 1 year.

M.2.3 Survey method

The primary survey method consists of a set of transects that are approximately parallel to one another, where all areas are visually inspected for the presence of burrow openings or other signs of mountain beaver activity. The number of transects and the distance between transects is variable depending on the density of vegetation; however, all areas are visually inspected. The time of year is a factor; vegetation is generally denser in late spring and early summer and sparser in fall and early winter. In areas of very rugged topography or dense vegetation, the surveyor may need to actually crawl through vegetation. The use of a walking stick or similar object can be useful for parting or lifting vegetation to inspect for burrows. Areas not surveyed to this level are assumed to be occupied.

M.2.4 Diagnostic features

Burrow openings average 6 in. (15 cm) in diameter, and range from 4-11 in. (10-28 cm). Excavated soil or debris may not always be present. A diagnostic feature of mountain beaver burrows is that burrows remain approximately the same diameter, about as far as a surveyor's arm can reach. Burrows also lie at a downward angle. Unsealed openings of the pocket gopher are considerably smaller and narrower, i.e., to the width of several fingers. California ground squirrels are typically observed during the daytime near their burrow openings. The presence of rabbit pellets in burrow entrances and excavated soil does not indicate absence of mountain beavers since rabbits (and other species) will share burrows. While less diagnostic, other indicators of mountain beaver presence include: runways through the vegetation; vegetation that has been clipped off; and exposed caches of vegetative material such as "haystacks." The presence of old, dried, or "worked" vegetation can be evidence of burrow cleaning activity. This material can be either food waste or old nesting material. A large amount of this vegetation (an arm load) indicates that the burrow leads directly to the nest chamber.

M.2.5 Active and inactive burrows

If possible, MRC will note during surveys whether burrow openings are active or inactive. Indicators of activity include: a large mound of freshly dug loose soil at the burrow entrance; wilted vegetation in or near the burrow opening; an open and clean burrow entrance; and a wad of old dried vegetation in or near the burrow opening or inside of the burrow. Indicators of inactivity include debris in burrow openings and collapsing of burrow openings. Heavy spider webs may indicate inactivity, but caution should be used when applying this criterion because web building can be very rapid. Burrow systems also have multiple entrances, some of which are infrequently used. In addition, certain burrows may only be used seasonally for specific activities or when certain nearby plants are optimum as a food source. Use of mountain beaver burrows by rabbits and other species also confuses assessment of activity. As a result, a determination that burrow openings are "active" or "inactive" is somewhat subjective; it is difficult to make a reliable determination that all mountain beaver burrows are inactive and a site is unoccupied.

A primary consideration during surveys is to prevent crushing or collapsing a burrow and disturbing the vegetation. Surveyors should walk slowly and carefully, making note of foot placement. While counting burrow openings and determining if they are active provides good information on the site, such data should not be collected if it may result in collapsing burrows.

For surveys, MRC will collect the following information:

- Date(s) of survey.
- Time spent on-site conducting surveys.
- Name(s) and contact information for person(s) conducting surveys.
- Map, at appropriate scale, showing the areas of potentially suitable habitat.
- Description of survey intensity and method, e.g., "parallel transects at 5 m spacing" or "wandering surveys with >75% of ground surface observed."
- Map, at appropriate scale, showing suitable habitat areas with mountain beaver presence or absence and any suitable habitat areas that were not adequately surveyed, along with the reasons for not surveying, e.g., access denied to private property, presence of poison oak, steep topography, impenetrable vegetation, etc.
- UTM coordinates for the center point of each area with presence.
- Map detailing spatial extent of each burrow system observed.
- Discussion or description of the habitat in areas with burrow openings present versus suitable areas without burrow openings present. Topics should include plant species present, vegetation height and percent ground cover, slope and aspect, and soil characteristics if known.
- Presence of other fossorial species.

MRC will report all positive survey results to the CDFG Natural Diversity Database (NDDB). In addition, we will submit an annual report to the wildlife agencies with the results of all surveys and habitat assessments. In the annual compliance report, we will include survey results for Point Arena mountain beaver, along with a map. The map will show (a) the nearest known burrows to projects completed in that calendar year and (b) the closest distance of known burrows to any activities (proposed or not) within 1000 ft of the burrows.

M.3 Qualifications of surveyors

MRC will conduct a training program to ensure that our staff properly conducts habitat assessments and surveys. We will invite the wildlife agencies to attend these training sessions and

include in an annual report to the wildlife agencies the date of the training, an outline of topics covered, the names and backgrounds of individuals who attended, and length of training. The wildlife agencies may decide not to approve surveyors; in such cases, they will submit to MRC within 30-days of receiving the annual report their reasons for denying approval.

Appendix N

Amphibian Data and Protocol

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N. AMPHIBIAN DATA AND PROTOCOLS

N.1 Surveyor Qualifications

Individuals trained in herpetology or those who have received training specific to the biology of covered aquatic species from experienced MRC staff will conduct all aquatic surveys. The USFWS and CDFG must approve those who are performing the surveys based on their resume and relevant experience. If MRC trains individuals to conduct survey work, USFWS and CDFG must approve their curriculum and trainer.

N.2 Baseline Distribution of Red-legged Frog Breeding Sites

N.2.1 Establishing baseline distribution

MRC will locate potential breeding sites of red-legged frogs by reviewing existing data, looking at aerial photographs, examining maps, driving roads, and walking over countryside. In addition, we will conduct surveys in and around potential breeding sites, i.e., ponds, marshes, and still-water habitats with water present after June 1.

N.2.2 Characteristics of potential breeding sites

Upon encountering a specific wet-area feature, we will determine whether or not the site could support red-legged frog reproduction. If a site could support reproduction, we will classify it as a potential breeding site for red-legged frogs, using criteria for depth and persistence of water (see Table N-1). A site which is 1.25 ft deep during high water, for example, and which has both hydrophytic vegetation and invertebrate life is a potential red-legged frog breeding site.

Table N-1 Characteristics of Breeding Sites

Characteristics of Potential Red-legged Frog Breeding Sites	
Habitat	Site must have standing, slow, or still water (lentic environment).
Depth	Site, measured during high water conditions, must have water to a depth of 10 in. or more (USFWS 2002).
Persistence of Water	Site must retain water, given average rainfall, until June 1st and meet 1 of the following criteria: 1. Presence of hydrophytic or obligatory wetland plant species and presence of aquatic invertebrate life. 2. Presence of aquatic phases or newly metamorphosed amphibian species which use "pond type" habitats for reproduction (northwestern salamanders, pacific newts, bullfrogs, etc), excluding pacific tree frogs. **NOTE** Pacific tree frogs are not good indicators of water persistence; they often use water puddles to breed which dry up before the larvae complete metamorphosis. 3. Presence of fish species.

N.2.3 Sampling intensity

Upon locating a potential breeding site for red-legged frogs, MRC will determine the sampling intensity. Sampling intensity will depend on habitat complexity and accessibility. In MRC protocol, sites are either "easy to sample" or "difficult to sample" (see Figure N-1). A site is "difficult to sample" if seining, dip-netting, or observing are hard to perform, subsequently reducing the likelihood of detecting red-legged frogs. MRC will expend more effort at such sites. We will conduct surveys at each potential breeding site at least 10 days apart to increase the likelihood of encountering egg masses. Our nocturnal surveys may take place on the same calendar date as a daytime survey.

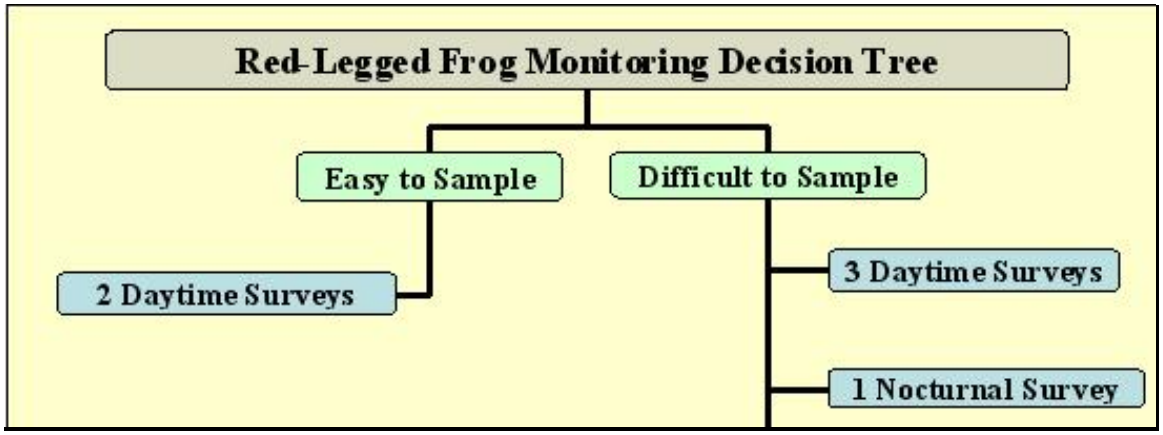

Figure N-1 Decision Tree

MRC will classify a site as "difficult to survey" if it meets 2 or more of the following criteria:

1. Maximum water depth is >6 ft during high water.
2. Floating woody debris covers at least 30% of the water's surface area or submerged vegetation and woody material make seining difficult.
3. Less than 40% of the water's perimeter is accessible due to steep gradient, brush, etc.
4. Water surface area is >1500 ft^2, as measured during high water.

Fish, particularly centrarchids, inhibit the growth and success of red-legged frogs. MRC will survey potential breeding sites of red-legged frogs for fish species at least once in a given monitoring cycle, if the site has sufficient persistence of water to support fish species. Fish surveys will focus on habitat most likely to contain centrarchids, since these amphibian predators are not native; surveys will consist of seining, dip-netting, and hook-and-line sampling.

N.2.4 Surveying potential breeding sites

MRC conducts surveys for red-legged frogs in late winter or early spring (from January 1–May 1). At these times, the species generally congregates at breeding sites to reproduce. Using techniques to detect evidence of reproduction such as tadpoles or egg masses, we search potential breeding sites. As part of the search, we walk the perimeter of the potential breeding site, turn over movable objects, examine vegetation in the water, and look for conspicuous red-legged frog egg masses. We use dip nets and seines to capture larval red-legged frogs and other amphibian species. To survey the entire wetted area, we use small vessels, including kayaks and rafts. While

identifying encountered species to their lowest taxonomic level, we also note their life stage (adult, larval, or embryonic).

N.2.5 Measuring habitat quality at potential breeding sites

Upon surveying a potential breeding site, MRC measures habitat characteristics which we will then monitor over time for our inventory database. An observer must use his or her best judgment to estimate what a feature might look like during high water conditions. Due to variation in rainfall and survey timing, a site's water surface area and maximum depth fluctuate. For standardization, we measure surface area (length x width) and maximum depth during high water conditions, which is often, of course, an estimate.

N.2.6 Documented red-Legged frog breeding site

Potential breeding sites become documented breeding sites when we observe evidence of red-legged frog reproduction, i.e., egg masses or larvae. We assume red-legged frogs are using documented breeding sites for reproduction due to the presence of embryonic or larval life stages. If we do not observe any evidence of red-legged frog reproduction, a site remains a potential breeding site.

N.3 Monitoring Occupancy of Documented Breeding Sites

Every year MRC monitors all documented breeding sites of red-legged frogs identified during either an initial distribution survey or a follow-up survey; we use the survey methodology presented in N.1.4. The intent of these surveys is to assess whether or not red-legged frogs used the site for reproduction during the given season. The presence of adult, or post-metamorphic frogs, does not indicate red-legged frogs used the site for reproduction.

N.4 Re-assessing Distribution and Monitoring Habitat Quality

Every 5 years, MRC will re-visit the potential breeding sites identified during the initial distribution study to (1) assess the persistence of the habitat and (2) evaluate whether or not red-legged frogs are present. At that time, we will take measurements of habitat quality using the methodology presented in N.1.5. Surveys at potential breeding sites follow the methodology presented in N.1.3 and N.1.4.

N.5 Establishing the Baseline Distribution of Coastal Tailed Frogs

During the first 2 years of HCP/NCCP implementation, MRC will establish the baseline distribution of coastal tailed frogs. As of 2009, we have surveyed approximately 75% of the plan area and detected coastal tailed frogs at more than 70 of the 450 sites surveyed. Chapter 13, section 13.5.3.1, outlines our survey methodologies. Maps showing planning watersheds occupied by coastal tailed frogs are in the *HCP/NCCP Atlas*, MAPS 11A-C.

N.6 Distribution and Relative Abundance of Coastal Tailed Frogs

MRC will re-survey approximately 10 streams per year to monitor for the continued presence and relative abundance of coastal tailed frogs. Based upon our current knowledge of the baseline distribution of coastal tailed frogs, there are approximately 70 occupied streams. We must still survey 10 additional planning watersheds for coastal tailed frogs by Year 2 of HCP/NCCP implementation. Based upon the results of the remaining baseline distribution survey work, the averages presented below may increase by 1 year.

On average once every 7-8 years, MRC will monitor all occupied streams identified during baseline distribution surveys, new surveys, or incidental observations throughout the HCP/NCCP term. Monitoring will focus on (1) determining whether coastal tailed frogs continue to remain present in occupied sites and (2) determining the relative abundance of coastal tailed frogs at occupied sites. Sampling will begin in late spring or early summer when flows are low enough for MRC biologists to work efficiently in the stream; they must complete the animal sampling by late July when larvae metamorphose and leave the stream.

N.6.1 Monitoring distribution of coastal tailed frogs

Monitoring surveys will consist of searching upstream using glass bottom viewing boxes and rubble rousing techniques to attempt to locate any life stages of coastal tailed frogs. Surveys will continue upstream until the animals are located or until 1 hour of search time has elapsed. Upon encountering the first coastal tailed frog during a monitoring survey, we will confirm and document presence. We will note the required search time to detect the initial animal and take water quality measurements.

N.6.2 Monitoring relative abundance of coastal tailed frogs

MRC modified the process in the *Green Diamond Aquatic Habitat Conservation Plan* (2006) to determine relative abundance. Measurements and sampling for relative abundance will begin immediately upstream of (and not including) the location of the animal located during the monitoring survey as described in N.2.1. During each subsequent monitoring cycle, the start point of the relative abundance measurements will be variable and based upon where observers locate the initial animal. We decided this approach will focus on areas closest to the animals bred that season, rather than on areas permanently monumented and subjected to chronic disturbance from monitoring efforts.

N.6.2.1 Sampling belt selection

The sampling procedure is as follows:

1. Delineate habitat units by hiking upstream with a hip chain and recording fast and slow-water stream habitat units which are at least 1.0 m in length. Fast-water equates to riffles and cascades; slow-water, to pools and runs. Units less than 1.0 m long are subsumed into the adjacent units (i.e., not distinguished from them).
2. Continue up stream until there is a combined total of at least 150 m of fast water habitat delineated. All fast-water habitat units will be, in theory, placed end-to-end as if contained in one long habitat unit.
3. Choose a random start, labeled m, between 1 and 3.
4. Sample every tenth fast water unit after the m-th unit.
    - Sample the m-th unit from the beginning of the linear assemblage of fast water habitat.
    - Sample the (m+10)-th unit from the beginning of the linear assemblage.
    - Sample the (m+20)-th unit from the beginning of the linear assemblage.
    - Sample until there are a total of 10 sampling belts (a cumulative total of 20 m of fast water habitats).

Each sampling belt is 2 m long and may contain up to 1 m of slow water. If the designated unit is unsearchable due to water depth, organic debris, or excessive gradient, proceed to the next available sampling belt immediately upstream.

N.6.2.2 Animal sampling procedure

The procedure for animal sampling is as follows:

1. Place a blocking net at the upstream and downstream ends of the unit, prior to any disturbance of the sampling belt.
2. Measure the gradient, average depth, and average width of the belt.
3. Remove all the substrate that can be moved by hand within the sampling belt and collect any animals that may be incidentally seen during this process.
4. Complete the first visual search of the sampling belt using a viewing bucket and remove all coastal tailed frogs observed.
5. Place the coastal tailed frogs removed from the viewing bucket in an appropriate container and repeat the visual search 3 additional times.

   NOTE

   MRC will make an effort to keep the frogs in separate, identifiable buckets per pass to allow for an estimate of population size.
6. Check the blocking net after each pass and place any animals encountered with the other animals collected during the search.
7. Perform an additional pass if the number of frogs obtained in a removal pass is at least 50% of the number of frogs obtained in a previous pass.
8. Record the sex (adults only) and developmental stage for each coastal tailed frog captured.
9. Remove the blocking net following the final search.
10. Put the substrate back into the stream.
11. Release the coastal tailed frogs back into the stream.

N.6.2.3 Data analyses

MRC will collect measurement of relative abundance from 10 occupied coastal tailed frog streams every year. In annual reports, we will include the following data:

- Locations of detections.
- Stream characteristics (length, average depth, width, surface area, and volume of water searched).
- Total number of animals collected.
- Estimate of population depletion.
- Number of animals found per unit of water.

Appendix O

SNAGS AND DOWNED WOOD

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O. SNAGS AND DOWNED WOOD

Snags are defined as dead standing trees ≥16 in. dbh and >30 ft tall. Snags can be either hardwoods or conifers. Table O-1 shows, within each watershed analysis unit, the number of snags and the average number of snags per acre, as well as the total number of snags on covered lands as of 2010.

Downed wood is counted as a log if its average diameter is ≥16 in and >6 ft long. Logs can be redwood, other conifers, and hardwood. Table O-2 shows, within each watershed analysis unit, the number of logs, the average number of logs per acre as of 2010.

After commencement of the HCP/NCCP, MRC will provide similar reports to the wildlife agencies; within watershed analysis units, the reports will be broken down by size and hardness class within a THP. The reports will also include wildlife trees. There is currently no information on density of wildlife trees in the plan area.

The data for this appendix came from the MRC inventory program. The protocol that MRC uses to gather data for the inventory program is designed to assess standing live trees, not snags or downed wood.

Table O-1 2010 Estimate of Snags on Covered Lands

2010 Estimate of Snags on Covered Lands			
Watershed	**Species**	**# Snags**	**Snags per Acre**
Albion River	Conifer	3855	0.27
	Hardwood	2147	0.15
	Total	6002	0.42
Alder Creek/Schooner	Conifer	2115	0.17
	Hardwood	1679	0.14
	Total	3794	0.31
Big River	Conifer	2384	0.07
	Hardwood	5966	0.19
	Totals	8350	0.26
Cottaneva Creek	Conifer	155	0.02
	Hardwood	7268	0.96
	Totals	7423	0.98
Elk Creek	Conifer	1525	0.12
	Hardwood	489	0.04
	Totals	2014	0.15
Garcia River	Conifer	4679	0.43
	Hardwood	826	0.07
	Totals	5505	0.50
Greenwood Creek	Conifer	1291	0.14

2010 Estimate of Snags on Covered Lands			
Watershed	**Species**	**# Snags**	**Snags per Acre**
	Hardwood	1672	0.18
	Totals	2963	0.32
Hollow Tree Creek	Conifer	2559	0.13
	Hardwood	5692	0.29
	Totals	8251	0.42
Navarro River	Conifer	5202	0.10
	Hardwood	14613	0.28
	Totals	19815	0.38
Noyo River	Conifer	1434	0.08
	Hardwood	3920	0.21
	Totals	5354	0.29
Rockport Coastal	Conifer	1433	0.15
	Hardwood	495	0.05
	Totals	1928	0.20
Upper Russian River	Conifer	139	0.06
	Hardwood	1171	0.49
	Totals	1310	0.55
	Grand Total	72,709	0.36

Table O-2 2010 Estimate of Logs on Covered Lands

2010 Estimate of Logs on Covered Lands			
Watershed	**Species**	**Downed Logs per Acre**	**Total Acres in WAU**
Albion River			14,080
	Redwood	5.0	
	Hardwood	0.3	
	Other Conifer	1.7	
	Total	7.1	
Alder Creek/Schooner			12,277
	Redwood	5.7	
	Hardwood	0.3	
	Other Conifer	1.0	

2010 Estimate of Logs on Covered Lands			
Watershed	**Species**	**Downed Logs per Acre**	**Total Acres in WAU**
	Total	7.1	
Big River			32,099
	Redwood	6.3	
	Hardwood	0.3	
	Other Conifer	0.7	
	Totals	7.3	
Cottaneva Creek			7587
	Redwood	7.0	
	Hardwood	0.6	
	Other Conifer	0.9	
	Total	8.5	
Elk Creek			13057
	Redwood	7.0	
	Hardwood	0.6	
	Other Conifer	0.9	
	Totals	8.5	
Garcia River			10945
	Redwood	5.8	
	Hardwood	0.8	
	Other Conifer	1.4	
	Totals	8.0	
Greenwood Creek			9222
	Redwood	7.8	
	Hardwood	0.5	
	Other Conifer	1.0	
	Totals	9.3	
Hollow Tree Creek			19767
	Redwood	6.7	
	Hardwood	0.4	
	Other Conifer	0.6	
	Totals	7.7	
Navarro River			52,019
	Redwood	7.5	
	Hardwood	0.5	
	Other Conifer	1.0	
	Totals	9.0	
Noyo River			18,713
	Redwood	4.8	
	Hardwood	0.2	

2010 Estimate of Logs on Covered Lands			
Watershed	**Species**	**Downed Logs per Acre**	**Total Acres in WAU**
	Other Conifer	0.4	
	Totals	5.4	
Rockport Coastal			9770
	Redwood	4.8	
	Hardwood	0.4	
	Other Conifer	0.7	
	Totals	5.9	
Upper Russian River			2391
	Redwood	0.5	
	Hardwood	2.1	
	Other Conifer	6.3	
	Totals	9.0	
	Grand Total	**6.4**	

Appendix P

Natural Community Schemes

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P. NATURAL COMMUNITY SCHEMES

A crosswalk is a table that maps relationships and equivalencies. Table P-1 is a crosswalk for various schemes of natural community designations. It shows the terms for natural communities that we use in our HCP/NCCP (section 1.11 and Table 3-20), along with schemes from P.A. Munoz and D.D. Keck (1968); K.E. Mayer and W.F. Laudenslayer (1988); N.H. Cheatham and J.R. Haller (1975); the California Natural Data Diversity Base (CNDDB); and the California Native Plant Society (CNPS). Table P-2 shows the threats to natural communities in the HCP/NCCP plan area, the potential effects of MRC covered activities, and the proposed conservation strategies to counteract those effects.

Table P-1 Crosswalk for Natural Community Schemes

Crosswalk for Natural Community Schemes							
Current MRC HCP/NCCP	**Community Types VegCAMP Code (CDFG 2010)[1]**	**Sensitive community?**	**CNDDB (Holland 1986)**	**CNPS Rare Plant Inventory (2001)**	**Munz and Keck (1968)**	**Mayer and Laudenslayer (1988)**	**Cheatham and Haller (1975)**
North Coast coniferous	redwood forest (86.100.00)	No, but may include sensitive associations	North Coast alluvial forest, upland redwood forest	North Coast coniferous forest	redwood forest	redwood forest	redwood forest
	Douglas-fir forest (82.200.00)	No, but may include sensitive assoc.	upland Douglas-fir forest	North Coast coniferous forest	Douglas-fir forest	Douglas-fir forest	Douglas-fir forest
broadleaved upland							
	Douglas-fir - tanoak forest (82.500.00)	Yes?					
	California bay forest (74.100.00)	No				montane hardwood	mixed evergreen forest
	madrone forest (73.200.00)	No					
closed cone coniferous	beach pine forest (87.060.00)	Yes	close cone coniferous forest	closed cone coniferous forest	closed cone pine forest	closed cone pine-cypress	closed-cone coniferous forest
	Bishop pine forest (87.070.00)	Yes					

[1] See http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf , accessed 05/09/2011.

Crosswalk for Natural Community Schemes							
Current MRC HCP/NCCP	**Community Types VegCAMP Code (CDFG 2010)[1]**	**Sensitive community?**	**CNDDB (Holland 1986)**	**CNPS Rare Plant Inventory (2001)**	**Munz and Keck (1968)**	**Mayer and Laudenslayer (1988)**	**Cheatham and Haller (1975)**
	knobcone pine forest / woodland (87.100.00)	No					
	Mendocino pygmy cypress woodland (81.400.00)	Yes					
	Sargent cypress woodland (81.500.00)	Yes					
oak woodlands							
	tanoak forest (73.100.00)	Yes					northern oak woodland
	California black oak forest (71.010.00)	No, but may include sensitive associations	broadleaved upland forest	broadleaved upland forest, cismontane woodland			
	canyon live oak forest (71.050.00)	No, but may include sensitive associations	broadleaved upland forest				live oak forest
	interior live oak woodland (71.080.00)	No	mixed evergreen forest				

Crosswalk for Natural Community Schemes							
Current MRC HCP/NCCP	**Community Types VegCAMP Code (CDFG 2010)[1]**	**Sensitive community?**	**CNDDB (Holland 1986)**	**CNPS Rare Plant Inventory (2001)**	**Munz and Keck (1968)**	**Mayer and Laudenslayer (1988)**	**Cheatham and Haller (1975)**
	coast live oak woodland (71.060.00)	No, but may include sensitive associations	riparian forest, broadleaved upland forest				coastal oak woodland
	blue oak woodland (71.020.00)	No	valley and foothill grasslands, broadleaved upland forest	broadleaved upland forest, valley and foothill grasslands	northern oak woodland	Coastal oak woodland	northern oak woodland
	Oregon white oak woodland (71.030.00)	Yes		broadleaved upland forest		montane hardwood	
	valley oak woodland (71.040.00)	Yes					
	ceanothus chaparral (37.200.00 series)	May include sensitive alliances	mixed chaparral	chaparral	chaparral	chaparral	chaparral
	manzanita chaparral (37.300.00 series)	May include sensitive alliances					

Crosswalk for Natural Community Schemes							
Current MRC HCP/NCCP	**Community Types VegCAMP Code (CDFG 2010)[1]**	**Sensitive community?**	**CNDDB (Holland 1986)**	**CNPS Rare Plant Inventory (2001)**	**Munz and Keck (1968)**	**Mayer and Laudenslayer (1988)**	**Cheatham and Haller (1975)**
	oak chaparral (37.400.00 series)	No					
	native perennial grassland (several alliances could occur)	May include sensitive communities	coastal prairie, coastal terrace prairie	coastal prairie	coastal prairie	perennial grasslands	coastal prairie
	common velvet grass (42.050.00)	No					
	California annual grassland	No	valley and foothill grasslands	valley and foothill grasslands	valley grassland	annual grassland	valley and foothill grasslands
salt marsh	salt marsh (bulrush marshes) 52.112.00	Yes	marshes and swamps, meadows	meadows and seeps		wet meadow	meadows and swamps
deciduous riparian							
	black cottonwood forest (61.120.00)	Yes	riparian forest, riparian woodland	riparian forest, riparian woodland	riparian forest	valley foothill riparian	mixed riparian woodland
	Oregon ash groves (61.960.00)	Yes					

Crosswalk for Natural Community Schemes							
Current MRC HCP/NCCP	**Community Types VegCAMP Code (CDFG 2010)[1]**	**Sensitive community?**	**CNDDB (Holland 1986)**	**CNPS Rare Plant Inventory (2001)**	**Munz and Keck (1968)**	**Mayer and Laudenslayer (1988)**	**Cheatham and Haller (1975)**
	bigleaf maple forest (61.450.00)	Unknown at this time				valley foothill riparian, montane riparian	
	white alder groves (61.420.00)	No, but may include sensitive associations				montane riparian	
	red alder forest (61.410.00)	No, but may include sensitive associations				valley foothill riparian, montane riparian	red alder groves
	Willow riparian forest and scrub types (several alliances could occur)	Yes	riparian forest, riparian woodland, riparian scrub	riparian forest, riparian woodland, riparian scrub		valley foothill riparian, montane riparian	mixed riparian woodland, willow thickets
aquatic	meadows and seeps (45.000.00 series) (several alliances could occur)	May include sensitive alliances	marshes and swamps, meadows	meadows and seeps	freshwater marsh, valley grassland, coastal prairie	wet meadow	meadows and swamps

Table P-2 Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities

Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities			
HCP/NCCP Natural Communities	**Sensitive Community Types (Table P-1)**	**Threats to Natural Community**	**Effects of MRC Covered Activities and Proposed Conservation Strategies**
▫ North Coast coniferous			
▫ Broadleaved upland	▫ tanoak woodland	Sudden Oak Death (SOD) (Standiford, R. 2000).	There are records of Sudden Oak Death infections in Mendocino County, including on tanoak. Sudden Oak Death has been confirmed in 2 areas of MRC land in Sonoma County but not within the HCP/NCCP plan area (see 14.9). Silvicultural activities may spread Sudden Oak Death through the transfer of the pathogen by equipment or personnel. MRC has committed to a range of actions to combat SOD and other pathogen outbreaks that reach a specified threshold (see.14.9.2).
		Change in fire return frequency and intensity (Plumb & McDonald 1981). Although tanoak does not depend on fire for regeneration, regular low-intensity fires may reduce populations of acorn and seedling predators, reduce competing vegetation, and decrease fuel loading that could increase fire intensity, killing seedlings and mature trees.	Fire suppression for management of timberlands could alter the natural fire frequency within this natural community. MRC will only conduct emergency fire suppression. MRC vegetation management practices include prescribed burning to promote conifer growth. Burns will be small in scale and away from sensitive habitats.
		Timber harvest and conversion to conifers (Griffin 1988,	Currently, MRC conducts hardwood control, including tanoak removal, from conifer sites where hardwoods

Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities			
HCP/NCCP Natural Communities	**Sensitive Community Types (Table P-1)**	**Threats to Natural Community**	**Effects of MRC Covered Activities and Proposed Conservation Strategies**
		Barnhart et al 1996).	interfere with conifer regeneration. MRC operational guidelines, however, prohibit elimination of all tanoak stands on covered lands. These guidelines exclude harvests from stands dominated by native hardwoods, including tanoak, which have never been managed for conifer timber production.
▫ closed cone coniferous	▫ beach pine forest ▫ Bishop pine forest ▫ pygmy cypress dwarf woodland ▫ Sargent cypress woodland	Changes in fire-return interval, i.e., too long, too short (Barbour 2007, p. 297).	Fire suppression for management of timberlands could alter the natural fire frequency that these community types depend on for successful reproduction and recruitment. MRC will work with the wildlife agencies to mimic natural disturbance within this natural community, including using controlled burns.
		Fragmentation of stands by access roads, mining, and development (Barbour 2007, p. 309).	Construction of new roads, landings, and skid trails could increase fragmentation of closed-cone coniferous forest. MRC will avoid construction of new facilities such as roads, landings, and skid trails in this natural community. MRC can only disturb, over the 80-year span of the HCP/NCCP, up to 5 ac of pygmy forest. MRC will work with the wildlife agencies to decommission, close, and re-vegetate historic roads within this natural community (see Appendix E, *Road, Landing, and Skid Trail Standards*, section E.2.1)..

Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities			
HCP/NCCP Natural Communities	**Sensitive Community Types (Table P-1)**	**Threats to Natural Community**	**Effects of MRC Covered Activities and Proposed Conservation Strategies**
▫ oak woodlands	▫ Oregon white oak woodland ▫ valley oak woodland ▫ grasslands	Timber harvest and conversion to conifers (Griffin 1988, Barnhart et al 1996).	Currently, MRC conducts hardwood control, including tanoak removal, from conifer sites where hardwoods interfere with conifer regeneration. MRC operational guidelines, however, prohibit elimination of all tanoak stands on covered lands. These guidelines exclude harvests from stands dominated by native hardwoods, including tanoak, which have never been managed for conifer timber production. MRC will maintain true oak stands, harvesting oak woodlands and true oak forests only to remove invasive conifers.
		Poor regeneration caused by acorn or seedling damage by insects, livestock, deer, rodents (Biswell 1989, Swiecki et al. 1997).	MRC does not know whether timber harvests will change patterns of herbivory of oak acorns or seedlings on our land. Our conservation measures include retention of clusters of mast-producing hardwoods (C§9.3.3.2-4) and retention of all true oak trees and madrones > 18 in. dbh unless it is necessary to remove them for safety, road right-of-way, or yarding corridors. (C§9.3.3.2-5).

Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities			
HCP/NCCP Natural Communities	**Sensitive Community Types (Table P-1)**	**Threats to Natural Community**	**Effects of MRC Covered Activities and Proposed Conservation Strategies**
		Change in fire return frequency and intensity (Biswell 1989, Bartolome et al 2002, Allen-Diaz et al. 2007). Oaks do not depend on fire for regeneration, however regular low-intensity fires may reduce populations of acorn and seedling predators, reduce competing vegetation, and decrease fuel loading that could increase fire intensity, killing seedlings and mature trees. Fire suppression may promote the invasion of oak woodlands by Douglas-fir (Barnhart et al. 1996).	Fire suppression for management of timberlands could alter the natural fire frequency within this natural community. MRC will only conduct emergency fire suppression. MRC vegetation management practices include prescribed burning to promote conifer growth. Burns will be small in scale and away from sensitive habitats.
▫ salt marsh			MRC will preserve 67 ac of salt marsh by limiting our activities within and adjacent to them. When covered activities must occur, there will be strict levels of protection in place. The location of this habitat makes it very unlikely that many activities will take place near or within them

Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities			
HCP/NCCP Natural Communities	**Sensitive Community Types (Table P-1)**	**Threats to Natural Community**	**Effects of MRC Covered Activities and Proposed Conservation Strategies**
▫ deciduous riparian forest	▫ black cottonwood riparian forest	Alteration of flow regimes by dam construction, channelization and levee construction (Knopf et al. 1988).	Improving in-stream habitat could impact adjacent riparian habitats. MRC will make improvements such as structure replacement, channel re-alignment, and bedload reduction as described in Chapter 8, *Conservation Measures for Aquatic Habitat*.
	▫ Oregon ash riparian forest ▫ willow riparian forest and scrub	Introduction and spread of invasive plants (Knopf et al. 1988), e.g., eucalyptus invasion, displaces native trees, reduces diversity and abundance of understory, and increases fire risk (Bossard et al. 2000).	By creating ground disturbance and opening canopy, timber harvest can increase the risk that non-native species will invade adjacent natural communities. MRC currently controls occurrences of invasive plant species when feasible, and will continue to do so after permit issuance. MRC will develop an Invasive Plant Control Program within the first 5 years of HCP/NCCP implementation. When MRC completes the program, we will incorporate elements of it into individual PTHPs and other site-specific projects. MRC and the wildlife agencies will evaluate and revise the program as needed or at least every 5 years. MRC will prevent, where feasible, the expansion of eucalyptus, a non-native tree which can invade riparian areas, and attempt to eradicate it.

Sensitive Natural Communities, Threats, and Effects of MRC Covered Activities			
HCP/NCCP Natural Communities	**Sensitive Community Types (Table P-1)**	**Threats to Natural Community**	**Effects of MRC Covered Activities and Proposed Conservation Strategies**
		Clearing for timber harvest, road construction, gravel mining.	Timber harvest and its associated operations, such as road building, could impact riparian habitat. MRC will not conduct timber harvest operations in naturally occurring deciduous riparian habitat. MRC has adopted *Road, Landing, and Skid Trail Standards* (Appendix E). The specific standards which apply to road drainage and stream crossings will protect riparian vegetation. Other standards cover rock pits and quarries. Improving in-stream habitat could impact adjacent riparian habitat. MRC will make improvements such as structure replacement, channel re-alignment, and bedload reduction as described in Chapter 8, *Conservation Measures for Aquatic Habitat*.
▫ aquatic	▫ freshwater marsh ▫ meadows and seeps	Alteration of flow regimes (Mitsch and Gosselink 1993).	Improving in-stream habitat could impact adjacent riparian habitat. MRC will make improvements such as structure replacement, channel re-alignment, and bedload reduction as described in Chapter 8, *Conservation Measures for Aquatic Habitat*.
		Introduction and spread of invasive plants that displace native vegetation and reduce biodiversity (Bossard et al 2000).	MRC currently controls occurrences of invasive plant species when feasible, and will continue to do so after permit issuance. MRC will develop an Invasive Plant Control Program within the first 5 years of HCP/NCCP implementation. When MRC completes the program, we will incorporate elements of it into individual PTHPs and other site-specific projects. MRC and the wildlife agencies will evaluate and revise the program as needed or at least every 5 years.

Appendix Q

Rare Plant Communities by MRC Inventory Blocks

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Q. RARE PLANT COMMUNITIES BY MRC INVENTORY BLOCKS **Q-1**

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Q. RARE PLANT COMMUNITIES BY MRC INVENTORY BLOCKS

Appendix Q provides the following information for rare plants and plant communities in the MRC inventory blocks:

- Scientific name
- Common name
- Microhabitat
- Elevation
- Blooming period.

Q.1 Albion

RARE PLANT SCOPING

Key Quads:
Noyo Hill Mendocino
Mathison Peak Elk
Comptche Navarro

IMMEDIATE COASTAL HABITATS (COASTAL PRAIRIE/COASTAL SCRUB)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Carex saliniformis	deceiving sedge	mesic	9-690 (3-230 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Gilia capitata ssp. *pacifica*	pacific gilia	sandy coastal bluffs	15-900 (5-300m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	wet cliffs	98-2132 (30-650 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/often disturbed	6-2100 (2-700 m)								
Sidalcea malviflora ssp. *purpurea*	purple-stemmed checkerbloom	mesic	50-213 (15-65 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								

CLOSED-CONE CONIFEROUS FOREST (BISHOP PINE/ PYGMY/TRANSITION)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900(90-885m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	NA - evergreen							
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								
Pinus contorta ssp. *bolanderi*	Bolander's beach pine	often podzol- like soil	245-820 (75-250 m)	N/A-evergreen							
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	NA - evergreen							
Campanula californica	swamp harebell	coastal/mesic	3-1215 (1-405 m)								
Carex californica	California sedge	coastal/mesic	270-1005 (90-335 m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	rocky/mesic	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	open areas	98-2132 (30-650 m)								
Piperia candida	white-flowered rein orchid	open to shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/ often disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex californica	California sedge	coastal-FAC	270-1005 (90-335 m)								
Carex saliniformis	deceiving sedge	coastal/fresh/saline-FACW	9-690 (3-230 m)								
Carex virdula var. *virdula*	green sedge	freshwater -OBL	3-4800 (0-1600 m)								
Campanula californica	swamp harebell	coastal-OBL	3-1215 (1-405 m)								
Coptis laciniata	Oregon goldthread	mesic-NL	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Juncus supiniformis	hair-leaved rush	coastal-OBL	60-300 (20-100 m)								
Lilium maritimum	coast lily	coastal-FACW	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	often serpentine-FACW	180- 4200 (60 - 1400 m)								

TABLE NOTES
OBL->99% occurrence in wetlands
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands
NL- not listed

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy	150-1500 (50-500m)								
Limnanthes bakeri	Baker's meadowfoam	ditches/vernal pools/marsh edges	560-2912 (175-910m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

Q.2 Big River

RARE PLANT SCOPING

Key Quads:
Comptche
Greenough Ridge
Navarro
Bailey Ridge
Orrs Springs

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Piperia candida	white-flowered rein orchid	open to shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/ disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	grassland-OBL	<1200 (0-425 m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	often serpentine-FACW	180- 4200 (60 - 1400 m)								

TABLE NOTES
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation Ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	grassland-OBL	<1200 (0-425 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	openings, sandy	150-1500 (50-500 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	-	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	-	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400m)								

Q.3 Garcia

RARE PLANT SCOPING

Key Quads:

Point Arena	Eureka Hill
Zeni Ridge	Saunders Reef
Gualala	McGuire Ridge

IMMEDIATE COASTAL HABITATS (COASTAL PRAIRIE/COASTAL SCRUB)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Carex comosa	bristly sedge	wet grassland	<1200 (0-425 m)								
Carex saliniformis	deceiving sedge	mesic	9-690 (3-230 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Gilia capitata ssp. *pacifica*	pacific gilia	sandy coastal bluffs	15-900 (5-300 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	within 1 mi of coast	15-1005 (5-335 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	wet cliffs	98-2132 (30-650 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Sidalcea malviflora ssp. *purpurea*	purple-stemmed checkerbloom	mesic	50-213 (15-65 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								

CLOSED-CONE CONIFEROUS FOREST (BISHOP PINE/ PYGMY/TRANSITION)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	N/A - evergreen							
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often inboard ditches	180-2370 (60-790 m)								
Pinus contorta spp. *bolanderi*	Bolander's pine	often podzolic soil	245-820 (75-250 m)	N/A-evergreen							

CLOSED-CONE CONIFEROUS FOREST (BISHOP PINE/ PYGMY/TRANSITION)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation Ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	NA - evergreen							
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	coastal/mesic	270-1005 (90-335m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	within 1 mi of coast	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often inboard ditches	180-2370 (60-790 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	open areas	98-2132 (30-650 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	coastal-OBL	3-1215 (1-405 m)								
Carex californica	California sedge	coastal-FAC	270-1005 (90-335m)								
Carex comosa	bristly sedge	inland grassland-OBL	<1200 (0-425m)								
Carex saliniformis	deceiving sedge	fresh & saline-FACW	9-690 (3-230 m)								
Carex virdula var. *virdula*	green sedge	freshwater -OBL	3-4800 (0-1600m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Juncus supiniformis	hair-leaved rush	coastal-OBL	60-300 (20-100 m)								
Lilium maritimum	coast lily	coastal-FACW	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	wet inboard ditches-FAC	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	bogs/streams/often serpentine-FACW	180- 4200 (60 - 1400 m)								

TABLE NOTES
OBL->99% occurrence in wetlands
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	inland mesic	<1200 (0-425 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open sandy	150-1500 (50-500 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open sandy	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400 m)								

Q.4 Navarro East

RARE PLANT SCOPING

Key Quads:
Navarro
Bailey Ridge
Philo
Boonville

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Coptis laciniata	Oregon goldthread	mesic/streamside	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Lycopodium clavatum	running-pine	mesic/often inboard ditches	180-2370 (60-790 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	grassland-OBL	<1200 (0-425 m)								
Coptis laciniata	Oregon goldthreads	mesic/streamside	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Lycopodium clavatum	running-pine	often inboard ditches-FAC	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								

TABLE NOTES
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation Ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	mesic	<1200 (0-425 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open/ sandy	150-1500 (50-500 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/open	150-1500 (50-500 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400 m)								

Q.5 Navarro West

RARE PLANT SCOPING

Key Quads:

Elk	Cold Springs
Philo	Bailey Ridge
Navarro	

IMMEDIATE COASTAL HABITATS (COASTAL PRAIRIE/COASTAL SCRUB)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Carex comosa	bristly sedge	wet grassland	<1200 (0-425 m)								
Carex saliniformis	deceiving sedge	mesic	9-690 (3-230 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Gilia capitata ssp. *pacifica*	pacific gilia	sandy coastal bluffs	15-900 (5-300 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	within 1 mi of coast	15-1005 (5-335 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	wet cliffs	98-2132 (30-650 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Sidalcea malviflora ssp. *purpurea*	purple-stemmed checkerbloom	mesic	50-213 (15-65 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								

CLOSED-CONE CONIFEROUS FOREST (BISHOP PINE/ PYGMY/TRANSITION)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900(90-885m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	NA - evergreen							
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								

CLOSED-CONE CONIFEROUS FOREST (BISHOP PINE/ PYGMY/TRANSITION)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Pinus contorta ssp. *bolanderi*	Bolander's beach pine	often podzol- like soil	245-820 (75-250 m)	N/A-evergreen							
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	NA - evergreen							
Campanula californica	swamp harebell	coastal/mesic	3-1215 (1-405 m)								
Carex californica	California sedge	coastal/mesic	270-1005 (90-335 m)								
Coptis laciniata	Oregon goldthread	mesic/streamside	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	open areas	98-2132 (30-650 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	mesic/often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/often disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	coastal-OBL	3-1215 (1-405 m)								
Carex californica	California sedge	coastal-FAC	270-1005 (90-335m)								
Carex comosa	bristly sedge	inland grassland-OBL	<1200 (0-425m)								

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex saliniformis	deceiving sedge	fresh & saline-FACW	9-690 (3-230 m)								
Carex virdula var. *virdula*	green sedge	freshwater -OBL	3-4800 (0-1600m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Juncus supiniformis	hair-leaved rush	coastal-OBL	60-300 (20-100 m)								
Lilium maritimum	coast lily	coastal-FACW	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	wet inboard ditches-FAC	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	bogs/streams/often serpentine-FACW	180- 4200 (60 - 1400 m)								

TABLE NOTES
OBL->99% occurrence in wetlands
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	inland mesic	<1200 (0-425 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open sandy	150-1500 (50-500 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/open	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400 m)								

Q.6 Noyo

RARE PLANT SCOPING

Key Quads:
Sherwood Peak
Northspur
Burbeck

NORTH COAST CONIFEROUS FOREST (UPLAND)/BROADLEAVED UPLAND FOREST

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	opening	585-2250 (195- 750 m)								
Coptis laciniata	Oregon goldthread	mesic/streamside	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Lycopodium clavatum	running-pine	mesic	180-2370 (60-790 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	mesic/often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)

				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	grassland-OBL	<1200 (0-425m)								
Coptis laciniata	Oregon goldthread	mesic/streamside	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Lycopodium clavatum	running-pine	wet inboard ditches-FAC	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	bogs/streams/often serpentine-FACW	180- 4200 (60 - 1400 m)								

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct

TABLE NOTES
OBL->99% occurrence in wetlands
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	mesic	<1200 (0-425 m)								
Erigeron biolettii	streamside daisy	rocky/mesic	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open/sandy	150-1500 (50-500m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/open	150-1500 (50-500 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400 m)								

Q.7 Rockport

RARE PLANT SCOPING

Key Quads:
Hales Grove Leggett
Westport Lincoln Ridge

IMMEDIATE COASTAL HABITATS (COASTAL PRAIRIE/COASTAL SCRUB)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Carex saliniformis	deceiving sedge	mesic	9-690 (3-230 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Gilia capitata ssp. *pacifica*	pacific gilia	sandy coastal bluffs	15-900 (5-300m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	wet cliffs	98-2132 (30-650 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/often disturbed	6-2100 (2-700 m)								
Sidalcea malviflora ssp. *purpurea*	purple-stemmed checkerbloom	mesic	50-213 (15-65 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Campanula californica	swamp harebell	coastal/mesic	3-1215 (1-405 m)								
Carex californica	California sedge	coastal/mesic	270-1005 (90-335 m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	rocky/mesic	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Packera bolanderi var. *bolanderi*	seacoast ragwort	open areas	98-2132 (30-650 m)								
Piperia candida	white-flowered rein orchid	open to shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/ often disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex saliniformis	deceiving sedge	coastal/fresh/saline-FACW	9-690 (3-230 m)								
Carex virdula var. *virdula*	green sedge	freshwater -OBL	3-4800 (0-1600 m)								
Campanula californica	swamp harebell	coastal-OBL	3-1215 (1-405 m)								
Coptis laciniata	Oregon goldthread	mesic-NL	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Juncus supiniformis	hair-leaved rush	coastal-OBL	60-300 (20-100 m)								
Lilium maritimum	coast lily	coastal-FACW	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often ditches	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	often serpentine-FACW	180- 4200 (60 - 1400 m)								

TABLE NOTES
OBL->99% occurrence in wetlands
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands
NL- not listed

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400m)								

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open sandy	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open (inland)	1275-1725 (425-575 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400 m)								

Q.8 South Coast

RARE PLANT SCOPING

Key Quads:

Elk
Cold Springs
Eureka Hill
Mallo Pass Creek
Point Arena
Zeni Ridge

IMMEDIATE COASTAL HABITATS (COASTAL PRAIRIE/COASTAL SCRUB)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Carex comosa	bristly sedge	wet grassland	<1200 (0-425 m)								
Carex saliniformis	deceiving sedge	mesic	9-690 (3-230 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Gilia capitata ssp. *pacifica*	pacific gilia	sandy coastal bluffs	15-900 (5-300 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	within 1 mi of coast	15-1005 (5-335 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	wet cliffs	98-2132 (30-650 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Sidalcea malviflora ssp. *purpurea*	purple-stemmed checkerbloom	mesic	50-213 (15-65 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								

CLOSED-CONE CONIFEROUS FOREST (BISHOP PINE/ PYGMY/TRANSITION)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	N/A - evergreen							
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	mesic	270-1005 (90-335 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often inboard ditches	180-2370 (60-790 m)								
Pinus contorta spp. *bolanderi*	Bolander's pine	often podzolic soil	245-820 (75-250 m)	N/A-evergreen							
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

NORTH COAST CONIFEROUS FOREST (UPLAND) / BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation Ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Kopsiopsis hookeri	small groundcone	salal/huckleberry/madrone	295-2900 (90-885 m)								
Hesperocyparis pygmaea	pygmy cypress	often podzolic soil	90-1500 (30-500 m)	NA - evergreen							
Campanula californica	swamp harebell	mesic/open	3-1215 (1-405 m)								
Carex californica	California sedge	coastal/mesic	270-1005 (90-335m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/mesic	150-1500 (50-500 m)								
Lilium maritimum	coast lily	within 1 mi of coast	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	mesic/often inboard ditches	180-2370 (60-790 m)								
Packera bolanderi var. *bolanderi*	seacoast ragwort	open areas	98-2132 (30-650 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Campanula californica	swamp harebell	coastal-OBL	3-1215 (1-405 m)								
Carex californica	California sedge	coastal-FAC	270-1005 (90-335m)								
Carex comosa	bristly sedge	inland grassland-OBL	<1200 (0-425m)								
Carex saliniformis	deceiving sedge	fresh & saline-FACW	9-690 (3-230 m)								
Carex virdula var. *virdula*	green sedge	freshwater -OBL	3-4800 (0-1600m)								
Coptis laciniata	Oregon goldthread	mesic	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Juncus supiniformis	hair-leaved rush	coastal-OBL	60-300 (20-100 m)								
Lilium maritimum	coast lily	coastal-FACW	15-1005 (5-335 m)								
Lycopodium clavatum	running-pine	wet inboard ditches-FAC	180-2370 (60-790 m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	bogs/streams/often serpentine-FACW	180- 4200 (60 - 1400 m)								

TABLE NOTES
OBL->99% occurrence in wetlands
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	inland mesic	<1200 (0-425 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open sandy	150-1500 (50-500 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Erythronium revolutum	coast fawn lily	mesic/often streamside	<3200 (0-1065 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	open sandy	150-1500 (50-500 m)								
Lilium maritimum	coast lily	coastal	15-1005 (5-335 m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open (inland)	1275-1725 (425-575 m)								
Piperia candida	white-flowered rein orchid	open-shaded in conifer forest	100-4300 (30-1310 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Sanguisorba officinalis	great burnet	wet areas/ often serpentine	180- 4200 (60 - 1400 m)								
Sidalcea malachroides	maple-leaved checkerbloom	mesic/disturbed	6-2100 (2-700 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							
Viburnum ellipticum	oval-leaved viburnum	inland/often northern aspects	705-4600 (215-1400 m)								

Q.9 Ukiah

RARE PLANT SCOPING

Key Quads:
Orrs Springs
Laughlin Range
Ukiah

NORTH COAST CONIFEROUS FOREST (UPLAND)/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	opening	585-2250 (195- 750 m)								
Coptis laciniata	Oregon goldthread	mesic/streamside	<3300 (0-1000 m)								
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656m)	N/A-lichen							

WETLAND/AQUATIC (RIPARIAN/BOG & FEN/MARSH & SWAMP/VERNAL POOL/MEADOWS)											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Carex comosa	bristly sedge	inland mesic	<1200 (0-425 m)								
Coptis laciniata	Oregon goldthread	mesic/streamside	<3300 (0-1000 m)								
Erythronium revolutum	coast fawn lily	often streamside-FAC	<3200 (0-1065 m)								
Limnanthes bakeri	Baker's meadowfoam	vernal pools/swales-OBL	560-2912 (175-910m)								
Pleuropogon hooverianus	North Coast semaphore grass	grassy seeps-FACW	32-2032 (10-635 m)								

TABLE NOTES
FACW- 67-99% occurrence in wetlands
FAC-34-66% occurrence in wetlands

VALLEY FOOTHILL GRASSLAND/ OAK WOODLAND											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Erigeron biolettii	streamside daisy	mesic/rocky	90-3300 (30-1100 m)								
Fritillaria roderickii	Roderick's fritillary	heavy clay soil	48-384 (15-120 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy	150-1500 (50-500m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic	32-2032 (10-635 m)								
Tracyina rostrata	beaked tracyina	dry inland	295-1705 (90-520 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic/grassland	35-205 (10-65m)								
Usnea longissima	long-beard lichen	often snags/residual trees	<2000 (<656 m)	N/A-lichen							

CHAPARRAL/BROADLEAVED UPLAND FOREST											
				Blooming Period							
Scientific Name	**Common Name**	**Microhabitat**	**Elevation ft (m)**	March	April	May	June	July	Aug	Sept	Oct
Astragalus agnicidus	Humboldt milkvetch	often ridges/disturbed	585-2250 (195- 750 m)								
Hesperolinon adenophyllum	glandular western flax	often serpentine/rocky	450-3945 (150-1315 m)								
Horkelia tenuiloba	thin-lobed horkelia	sandy/open	150-1500 (50-500m)								
Malacothamnus mendocinenis	Mendocino bush mallow	open (inland)	1275-1725 (425-575 m)								
Pleuropogon hooverianus	North Coast semaphore grass	mesic/grassland	32-2032 (10-635 m)								
Trifolium buckwestiorum	Santa Cruz clover	mesic	35-205 (10-65m)								
Viburnum ellipticum	oval-leaved viburnum	often northern aspects	705-4600 (215-1400 m)								

Appendix R

Plant Rankings

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R. PLANT RANKINGS

R.1 CNPS and CRPR Rankings

In all the HCP/NCCP drafts prior to 2011, MRC referred to the California Native Plant Society (CNPS) plant rankings. In 2010, however, CDFG changed the name of the "CNPS List" or "CNPS Ranks" to the "California Rare Plant Rank" (CRPR) in its publications: A CNDDB Newsletter (September 2010)[1] explains the reason for the change:

> This was done to reduce confusion over the fact that currently the Rare Plant Status Review groups (300+ botanical experts from government, academia, NGOs and the private sector) produce the rank assignments for rare plants and that both DFG and CNPS jointly manage this collaborative effort. The old name gave the false impression that CNPS solely assigned the ranks and therefore had excessive influence on the regulatory process. We made this name change in consultation and agreement with the CNPS Executive Director and the CNPS Board of Directors. Nothing about the actual process of rare plant review or rank assignment has changed and the same committee of experts from many organizations (including DFG and CNPS) still reviews each change and ultimately assign the ranks.

The California Rare Plant Rank (CRPR) recognizes 5 different levels of plant rarity, as shown in Table R-1.

Table R-1 CRPR Levels of Rarity

Level	Description
1A	Presumed extinct in California
1B	Rare or endangered in California and elsewhere
2	Rare or endangered in California but more common elsewhere
3	More information needed—review list
4	Plants of limited distribution—watch list

In 2005, CNPS modified their R-E-D Code, which contained information on rarity, endangerment, and distribution. The CNPS inventory retains the information in the R-E-D Code with the following modifications:

- A new threat code extension replaces the E value from the R-E-D Code. To parallel information in the California Natural Diversity Database (CNDDB), the lower the threat code number, the higher the threat level. The new Treat Code extensions are:

1	Seriously endangered in California.
2	Fairly endangered in California.
3	Not very endangered in California.

  All plants that are level 1A and some level 3 plants lacking any threat information receive no threat code extension. Also, these threat code guidelines represent a starting point in the assessment of threat level. CNPS considers other factors, such as habitat vulnerability, in setting the threat code.

- Inventory entries for those taxa that only occur in California display "CA Endemic."

[1] http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/CNDDB_News_Sep_2010.pdf (accessed 15 April 2011)

- The state rank (S-rank) of the CNDDB now displays as the R (rarity) value of the former R-E-D Code.
- The global rank (G-rank) of the CNDDB displays for out-of-state distribution.

R.2 CNDDB Rankings

The global and state rankings cited here are taken from a recent publication (April 2011) of CDFG.[2] The rankings reflect a plant's overall condition throughout its global range in number of individual plants or acres.

Table R-2 CNDDB Global Rankings

Level	Description
G1	Critically imperiled—at very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors
G2	Imperiled—at high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors
G3	Vulnerable —at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors
G4	Apparently secure —uncommon but not rare; some cause for long-term concern due to declines or other factors
G5	Secure —common; widespread and abundant

A state ranking (S1 through S5) is similar to the global ranking, but state ranks refer to the imperilment status only within California's state boundaries.

Table R-3 State Rankings

Level	Description
S1	Critically imperiled—critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province
S2	Imperiled—imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province
S3	Vulnerable—vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	Apparently secure—uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure—common, widespread, and abundant in the state.

[2] California Department of Fish and Game, Natural Diversity Database. April 2011. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication. 71 pp. http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPPlants.pdf (accessed 15 April 2011)

Subspecies have a T-rank attached to the G-rank. The G-rank reflects the condition of the entire species, while the T-rank reflects the condition of the subspecies.

Other symbols include:

?	Uncertainty
S2S3	The rank is somewhere between S2 and S3.
GH	All sites are historical; the element has not been seen for 20+ years, but suitable habitat still exists.
GX	All sites are extirpated; the element is extinct in the wild.
GXC	Extinct in the wild; exists in cultivation.
G1Q	The element is very rare; there are taxonomic questions.

Appendix S

Targets for LWD and Effective Shade

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S. TARGETS FOR LWD AND EFFECTIVE SHADE

S.1 Introduction

This appendix describes how MRC set our long-term targets for large woody debris (LWD) and instream canopy. Appendix G, *Watershed Analysis: Background and Methods,*[*] explains how we derived our current targets and collected data relevant to those targets.

Table S-1 summarizes, for each watershed analysis, the level of effort expended during field surveys. To obtain the percentage of effort, we divided the sum of the surveyed miles of Class I habitat by the total miles of Class I habitat that MRC owns within a watershed analysis unit. The surveys included LWD (13.4.1.3), instream shade (13.4.1.4) and the initial surveys of fish habitat. MRC occasionally surveys Class II and Class III streams in watershed analysis, but the majority of surveying is within Class I streams. As of 2010, MRC staff have walked approximately 50 miles of Class I watercourse habitat, making observations for riparian stand recruitment potential, LWD quality, instream shade, and fish habitat typing.

Table S-1 Field Observation Effort

WAU	Field Survey Effort of Class I Stream as of 2010		
	Total Class I Miles in Plan Area	Class I Miles Observed	% of Class I Habitat Surveyed
Garcia River	23.1	5.7	24.6%
Albion River	34.9	2.6	7.5%
South Coast Streams	19.0	3.5	18.5%
Cottaneva Creek	12.9	3.7	29.1%
Elk Creek	20.5	7.0	34.3%
Noyo River	37.6	3.4	9.2%
Rockport Coastal Streams	17.5	5.3	30.5%
Big River	60.6	4.2	7.0%
Hollow Tree Creek	45.7	3.5	7.6%
Navarro River	133.2	8.6	6.4%
Greenwood Creek	20.5	1.8	8.6%
Northern Russian River	8.1	0.6	7.8%
TOTAL	433.5	50.1	11.5%

In 2010, however, MRC is still analyzing field data collected from the Watershed Analysis Units for South Coast streams and Rockport coastal streams. As a result, this appendix actually describes conditions from 2005; the data included here will be the basis for future targets for each planning watershed.

Figures S-1 and S-2 show how conditions for LWD demand and effective shade vary across the plan area.

[*] See specifically section G.2.4 on riparian function.

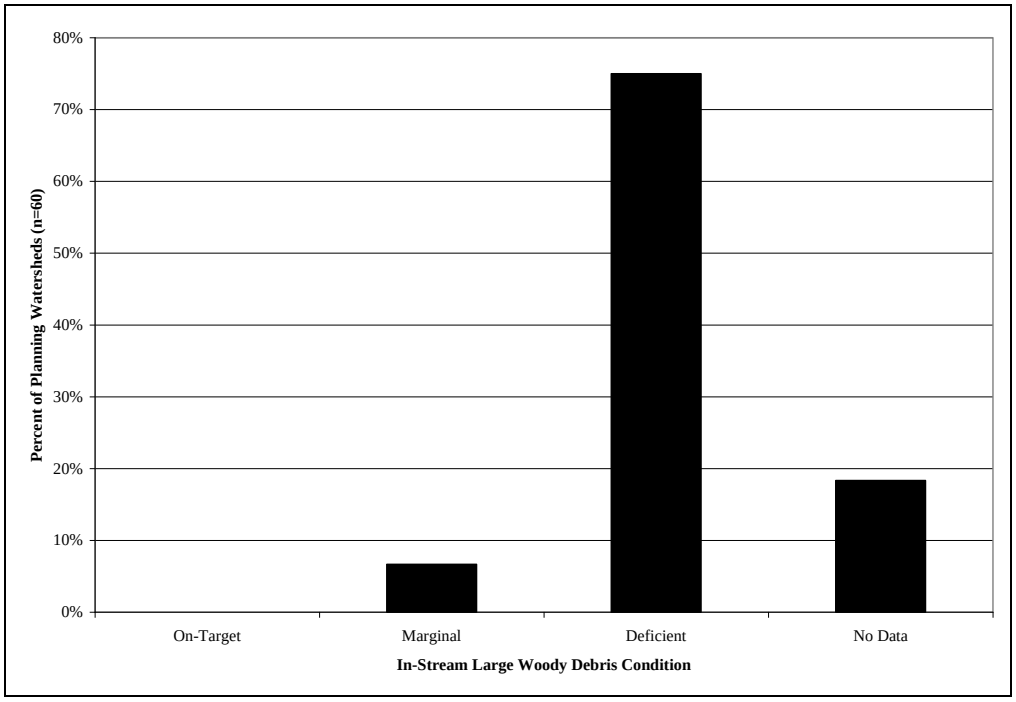

Figure S-1 LWD Conditions within the Plan Area by Planning Watershed as of 2005

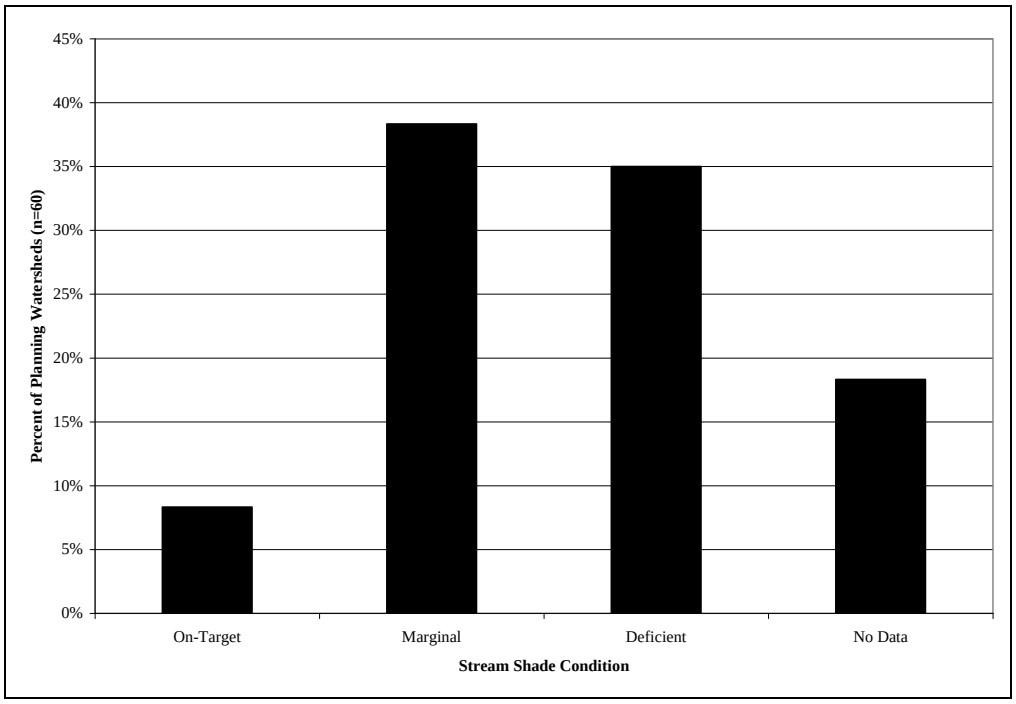

Figure S-2 Effective Stream Shade within the Plan Area by Planning Watershed as of 2005

S.2 LWD in the Plan Area

Our overall goal for instream LWD is to achieve on-target LWD quality ratings (Table S-2) in the planning watersheds. For each planning watershed, this means over 80% of the stream segments[†] will have low or moderate LWD demand. Similar criteria exist for marginal and deficient ratings for LWD demand, all of which depend in part upon the number of key LWD pieces in the stream.

Table S-2 LWD Quality Ratings by Planning Watershed

ON TARGET	Over 80% of surveyed segments by length have low or moderate LWD demand.
MARGINAL	50-80% of surveyed segments by length have low or moderate LWD demand OR over 80% of stream segments have at least half of their target number of key LWD pieces.
DEFICIENT	Less than 50% of surveyed segments by length have low or moderate LWD demand and low numbers of functional or key LWD.

S.2.1 Future targets for LWD

MRC developed future LWD targets to satisfy requirements for our HCP/NCCP. The process for setting these targets is as follows:

1. Determine the number of key pieces of LWD per surveyed stream segment (Tables S-3 and S-4).

   NOTE
   In general, average diameter, length, and volume of pieces of wood increases as stream size increases, whereas the frequency of occurrence of woody debris decreases (Bilby and Ward 1989).
2. Divide the total length of segments meeting the key piece target by the total length of segments surveyed in a planning watershed.
3. Divide the total length of segments meeting 50% of the key piece target by the total length of segments surveyed in a planning watershed.
4. Divide the total length of segments with moderate or high recruitment potential (Table S-5) by the total length of segments surveyed in a planning watershed.

   NOTE
   The recruitment potential of a stream describes the riparian stand conditions and the potential of that stand to deliver LWD. Recruitment potential increases, in general, with density, size, and proportion of conifer species.
5. Determine the LWD demand for the segment (Table S-6).

   NOTE
   LWD demand is a function of recruitment potential and channel sensitivity rating (see Appendix G, *Watershed Analysis: Backgrounds and Methods*, section G.2.5).
6. Set the 40-year target for LWD key pieces by increasing the current percentage of segments, by length, with low or moderate demand for LWD (Table S-7).

[†] MRC uses the term *segment* in 3 aquatic monitoring programs: watershed analysis, long-term channel monitoring, and focus watershed studies. A segment is typically 20-30 bankfull widths in length (roughly 300–1500 ft for most streams in the plan area). Each planning watershed will have anywhere from 3 to 30 field-observed segments, depending upon how much of the planning watershed MRC owns. The average planning watershed where MRC owns a majority of the watershed contains roughly 10–20 segments for watershed analysis and 1 long-term channel monitoring segment.

NOTE

Table S-7 is a matrix used to project LWD conditions for each planning watershed within the plan area. The values in the matrix are based on 2 assumptions:

1. Planning watersheds currently with low amounts of LWD and good recruitment potential will have the greatest potential for an increase in their number of segments on target.
2. Planning watersheds currently with high amounts of LWD and poor recruitment potential will have the lowest potential for future increases in in-stream LWD densities.

The values highlighted in red font in Table S-7 illustrate that a 20% increase of segments with low or moderate demand occur in a planning watershed with a moderately low number of key pieces (i.e., 25%-50%) in the segments meeting at least 50% of their key piece target and having very poor riparian stand conditions (i.e., < 25% of the segments have moderate or high recruitment potential).

7. Examine each planning watershed to determine if it meets its on-target requirements for LWD demand (Table S-2).

NOTE

MRC assumes that, in the future, the planning watersheds that currently meet at least 50% of the key piece requirement will see a greater increase in the percentage of their segments that are on-target than those that currently exceed 50% of the key piece requirement. Stream channel sensitivity to LWD should remain constant over the term of the HCP/NCCP. Figure S-3 depicts estimated LWD conditions at Year 40 of the plan.

8. Set the 80-year target for the percentage of segments meeting the LWD key pieces requirements at an optimal value of 90% due to our ability to introduce LWD into the streams where necessary.

Example for Calculating On-Target LWD
East Branch North Fork Big River

LWD demand for each surveyed segment is based on 3 components: (1) the amount of key pieces; (2) the recruitment potential (riparian stand conditions); and (3) stream channel sensitivity. As of 2005, only 1 segment (BE8 Bull Team Gulch) out of 4 surveyed meets the LWD target in the East Branch North Fork Big River planning watershed (Table S-8 and Figure S-3). We determined that this segment has low recruitment potential (poor riparian stand conditions) and a moderate sensitivity to LWD, based on a geomorphologic assessment. Since the segment meets the key piece requirements, it has an LWD demand of moderate (Table S-6). This single segment was 218 ft long. In its planning watershed, we surveyed a total of 1927 ft. Therefore, roughly 11% (218/1927) of the total length of segments surveyed in this planning watershed is currently on-target for LWD. As of 2005, 76% of the segments surveyed, by length, have moderate or high recruitment potential in the East Branch North Fork Big River planning watershed and 11% or 1 of the segments surveyed meets at least half of the key piece requirements for LWD (the same segment that met the full target). Based on this information and the assumptions for setting the values in Table S-7, we estimate that, in this planning watershed, the number of segments, by length, having low or moderate demand for LWD at Year 40 will increase by 40%—from 11% to 51%. This value is still too low for this planning watershed to be rated *on-target* for LWD quality at Year 40 of the HCP/NCCP. Therefore, it will be rated as *marginal* at Year 40 (Table S-2). At Year 80, however, we anticipate, due to our ability to artificially introduce LWD into the streams, that this planning watershed will be *on-target* for LWD quality.

Table S-3 Criteria for LWD Key Piece

Bankfull Width (ft)	Diameter (in.)	Length (ft)		Volume Alternative* (yds^3)
0-10	13	1.5 times the channel width		1
10-20	16	1.5 times the channel width		3
20-30	18	1.5 times the channel width	OR	5
30-40	21	1.5 times the channel width		8
40-60	26	1.5 times the channel width		15
60-80	31	1.5 times the channel width		25
80-100	36	1.5 times the channel width		34

TABLE NOTE
The length requirement is 1.0 times the channel width if the piece has a rootwad.

Table S-4 LWD Key Piece Targets per Stream Segment

Bankfull width (ft)	Target (Minimum) Number of Key Pieces per 100 Meters
<15	6.6
15-35	4.9
35-45	3.9
>45	3.3

Table S-5 Recruitment Potential

Vegetation Type	Size and Density Classes					
	Size Classes 1-2 (Young)		Size Class 3 (Mature)		Size classes 4-5 (Old)	
	Sparse (O,L)	Dense (M, D, E)	Sparse (O,L)	Dense (M, D, E)	Sparse (O,L)	Dense (M, D, E)
RW	Low	Low	Moderate	High	High	High
RD	Low	Low	Moderate	High	High	High
CH	Low	Low	Low	Moderate	High	High
MH	Low	Low	Low	Moderate	Moderate	Moderate

Table S-6 Instream LWD Demand

Recruitment Potential Rating	Key LWD	Channel LWD Sensitivity Rating		
		Low	**Moderate**	**High**
LOW	On Target	Low	Moderate	High
	Off Target	High	High	High
MODERATE	On Target	Low	Moderate	Moderate
	Off Target	High	High	High
HIGH	On Target	Low	Moderate	Moderate
	Off Target	Moderate	High	High

Table S-7 LWD Key Piece Target Increases in Planning Watersheds by Year 40 of the HCP/NCCP

Increase in % of Segments with Low or Moderate Demand for LWD		% of Segments Meeting at least 50% of the Key Piece Target (as of 2005)			
		<25%	**25-50%**	50-75%	>75%
% of Segments with Moderate or High Recruitment Potential (as of 2005)	**<25%**	25%	**20%**	15%	10%
	25-50%	30%	25%	20%	15%
	50-75%	35%	30%	35%	20%
	>75%	40%	35%	30%	25%

TABLE NOTE
The bold red font illustrates the "Note" under section S.2.1, #7.

Table S-8 Instream LWD Demand

Recruitment Potential Rating	Key LWD	Channel LWD Sensitivity Rating		
		Low	**Moderate**	**High**
LOW	On Target	Low	Moderate	High
	Off Target	High	High	High
MODERATE	On Target	Low	Moderate	Moderate
	Off Target	High	High	High
HIGH	On Target	Low	Moderate	Moderate
	Off Target	Moderate	High	High

Table S-9 LWD data for East Branch North Fork Big River Planning Watershed (2000)

Planning Watershed	Stream Segment Name	Stream Segment ID#	Segment Length (ft)	Bankfull Width (ft)	Key LWD Pieces per 100m	LWD Key Target
EBNF Big River	Frykman Gulch	BE14	234	8.2	2.8	6.6
EBNF Big River	East Branch NF Big River	BE1	929	31.0	0.0	4.9
EBNF Big River	East Branch NF Big River	BE2	546	20.3	2.4	4.9
EBNF Big River	Bull Team Gulch	BE8	218	6.7	9.0	6.6

S.2.2 Future conditions for LWD

MRC estimates that at Year 40 of the HCP/NCCP approximately 5% of the plan area will be rated on-target for LWD, 12% will be marginal, and about 65% will be deficient (see Figure S-3). This is partly due to the fact that LWD demand is based not only on instream amounts of LWD, but also on riparian stand conditions. Artificial installations of LWD can improve instream conditions. We cannot, however, manipulate riparian tree growth; this is a long-term process that will improve overall LWD demand on our land. We estimate LWD quality ratings will be *on-target* for at least 90% of the plan area by Year 80 of the HCP/NCCP due to riparian conservation measures and instream LWD enhancements. Table S-10 and S-11 show current and future LWD targets within the plan area by planning watershed.

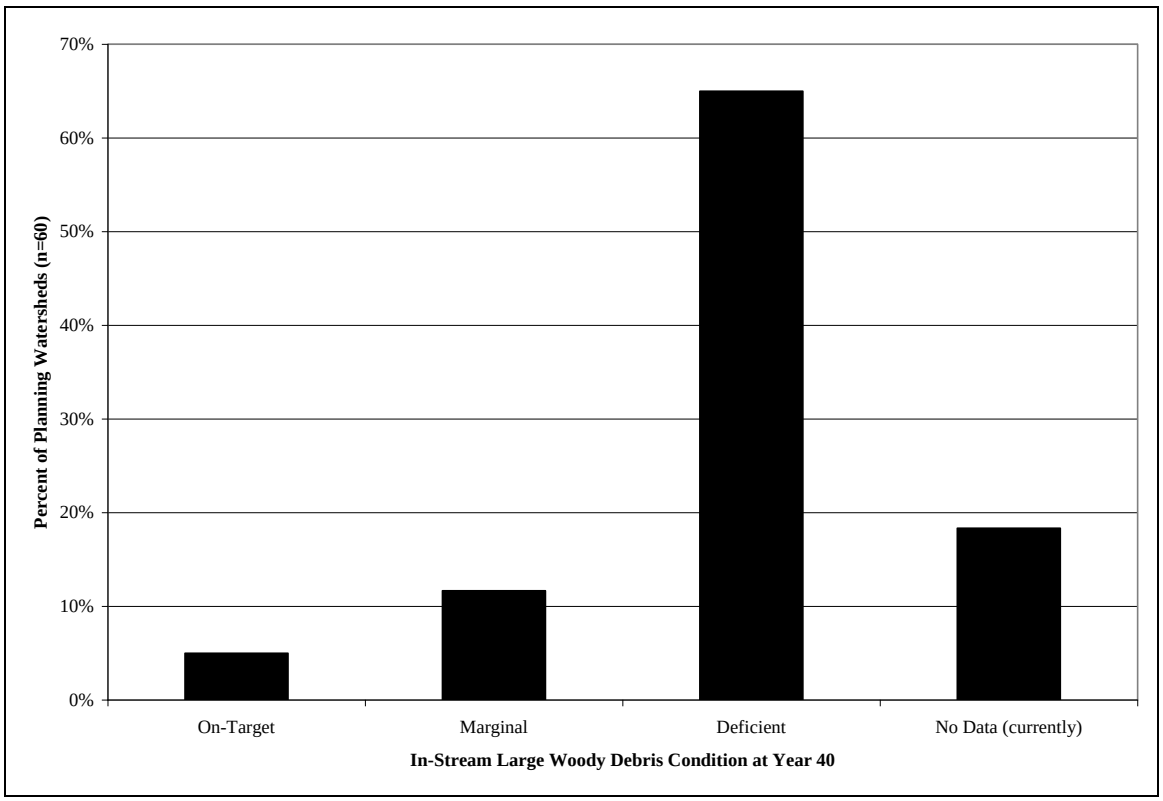

Figure S-3 LWD Conditions at Year 40 of the HCP/NCCP

Table S-10 Current LWD Targets within the Plan Area by Planning Watershed

Current LWD Targets within the Plan Area by Planning Watershed					
	% of Stream Segments				
Planning Watershed	**Moderate or High Recruitment Potential**	**Low or Moderate Demand**	**Meets Key Piece Targets**	**Meets ≥ 50% of Key Piece Targets**	**2005 Rating**
Lower Albion River	32%	0%	9%	51%	deficient
Middle Albion River	87%	0%	0%	16%	deficient
South Fork Albion River	15%	0%	12%	48%	deficient
Upper Albion River	100%	0%	0%	0%	deficient
Lower Alder Creek	To be completed 2012				
North Fork Alder Creek	To be completed 2012				
East Branch North Fork Big River	0%	11%	11%	11%	deficient
Lower North Fork Big River	0%	23%	23%	23%	deficient
Mettick Creek	0%	6%	6%	19%	deficient
Rice Creek	0%	0%	0%	0%	deficient
Russell Brook	0%	7%	7%	21%	deficient
South Daugherty Creek	0%	9%	34%	61%	deficient
Two Log Creek	45%	4%	4%	4%	deficient
Lower Brush Creek	To be completed 2012				
Cottaneva Creek	39%	32%	32%	46%	deficient
Lower Elk Creek	69%	2%	2%	12%	deficient
Upper Elk Creek	62%	10%	10%	30%	deficient
East of Eureka Hill		28%	72%	72%	deficient
Rolling Brook		0%	0%	0%	deficient
South Fork Garcia River		19%	15%	20%	deficient
Lower Greenwood Creek	8%	14%	14%	14%	deficient
Upper Greenwood Creek	0%	19%	10%	28%	deficient
Lower Hollow Tree Creek	0%	0%	0%	0%	deficient
Middle Hollow Tree Creek	0%	0%	0%	0%	deficient
Upper Hollow Tree Creek	0%	0%	23%	45%	deficient
Mallo Pass Creek	To be completed 2012				
Dutch Henry Creek	0%	0%	0%	35%	deficient
Flynn Creek	0%	0%	0%	28%	deficient
Hendy Woods	0%	0%	0%	0%	deficient
John Smith Creek	0%	0%	46%	46%	deficient
Little N. Fork Navarro River	0%	0%	20%	74%	deficient
Lower S. Branch Navarro River	18%	0%	0%	28%	deficient
Middle Navarro River	0%	0%	0%	0%	deficient

Current LWD Targets within the Plan Area by Planning Watershed					
	% of Stream Segments				
Planning Watershed	**Moderate or High Recruitment Potential**	**Low or Moderate Demand**	**Meets Key Piece Targets**	**Meets ≥ 50% of Key Piece Targets**	**2005 Rating**
Middle S. Branch Navarro River	87%	0%	0%	5%	deficient
Mouth of Navarro River	0%	18%	18%	34%	deficient
North Fork Indian Creek	0%	0%	100%	100%	marginal
North Fork Navarro River	0%	0%	0%	100%	marginal
Ray Gulch[C]	19%	19%	52%	71%	deficient
Upper Navarro River	0%	30%	20%	30%	deficient
Upper S. Branch Navarro River	0%	0%	0%	20%	deficient
Upper Ackerman Creek	0%	0%	0%	0%	deficient
Hayworth Creek	51%	51%	51%	51%	marginal
McMullen Creek	0%	0%	0%	0%	deficient
Middle Fork N. Fork Noyo River	35%	9%	9%	22%	deficient
North Fork Noyo River	91%	0%	0%	16%	deficient
Olds Creek	66%	0%	0%	23%	deficient
Redwood Creek	60%	0%	0%	0%	deficient
Point Arena Creek	To be completed 2012				
Hardy Creek	To be completed 2012				
Howard Creek	To be completed 2012				
Juan Creek	To be completed 2012				

Table S-11Future LWD Targets within the Plan Area by Planning Watershed

Future LWD Targets within the Plan Area by Planning Watershed								
	Year 40				Year 80			
Planning Watershed	Moderate or High Recruitment Potential	Meets Key piece Requirement for LWD	Meets ≥ 50% Key Piece Requirement for LWD	% Low or Moderate Demand for LWD	Moderate or High Recruitment Potential	Meets Key Piece Requirement for LWD	Meets ≥ 50% Key Piece Requirement for LWD by Year 80	% Low or Moderate Demand for LWD
Lower Albion River	61%	20%	50%	71%	90%	90%	90%	90%
Middle Albion River	89%	40%	45%	53%	90%	90%	90%	90%
South Fork Albion River	53%	20%	51%	69%	90%	90%	90%	90%
Upper Albion River	95%	40%	45%	45%	90%	90%	90%	90%
Lower Alder Creek		To be completed 2012			90%	90%	90%	90%
North Fork Alder Creek		To be completed 2012			90%	90%	90%	90%
East Branch North Fork Big River	45%	36%	51%	51%	90%	90%	90%	90%
Lower North Fork Big River	45%	48%	57%	57%	90%	90%	90%	90%
Mettick Creek	45%	31%	48%	55%	90%	90%	90%	90%
Rice Creek	45%	25%	45%	45%	90%	90%	90%	90%
Russell Brook	45%	32%	49%	56%	90%	90%	90%	90%
South Daugherty Creek	45%	24%	62%	76%	90%	90%	90%	90%
Two Log Creek	68%	34%	47%	47%	90%	90%	90%	90%
Lower Brush Creek		To be completed 2012			90%	90%	90%	90%
Cottaneva Creek	65%	57%	61%	68%	90%	90%	90%	90%
Lower Elk Creek	80%	37%	46%	51%	90%	90%	90%	90%
Upper Elk Creek	76%	40%	50%	60%	90%	90%	90%	90%
East of Eureka Hill	90%	90%	90%	90%	90%	90%	90%	90%
Rolling Brook	90%	25%	45%	45%	90%	90%	90%	90%
South Fork Garcia River	90%	44%	53%	55%	90%	90%	90%	90%

Future LWD Targets within the Plan Area by Planning Watershed								
	Year 40				Year 80			
Planning Watershed	Moderate or High Recruitment Potential	Meets Key piece Requirement for LWD	Meets ≥ 50% Key Piece Requirement for LWD	% Low or Moderate Demand for LWD	Moderate or High Recruitment Potential	Meets Key Piece Requirement for LWD	Meets ≥ 50% Key Piece Requirement for LWD by Year 80	% Low or Moderate Demand for LWD
Lower Greenwood Creek	49%	39%	52%	52%	90%	90%	90%	90%
Upper Greenwood Creek	45%	39%	50%	59%	90%	90%	90%	90%
Lower Hollow Tree Creek	45%	25%	45%	45%	90%	90%	90%	90%
Middle Hollow Tree Creek	45%	25%	45%	45%	90%	90%	90%	90%
Upper Hollow Tree Creek	45%	25%	57%	68%	90%	90%	90%	90%
Mallo Pass Creek	To be completed 2012				90%	90%	90%	90%
Dutch Henry Creek	45%	25%	45%	63%	90%	90%	90%	90%
Flynn Creek	45%	25%	45%	59%	90%	90%	90%	90%
Hendy Woods	45%	25%	45%	45%	90%	90%	90%	90%
John Smith Creek	45%	25%	25%	25%	90%	90%	90%	90%
Little N. Fork Navarro River	45%	15%	55%	82%	90%	90%	90%	90%
Lower S. Branch Navarro River	54%	20%	45%	59%	90%	90%	90%	90%
Middle Navarro River	45%	25%	45%	45%	90%	90%	90%	90%
Middle S. Branch Navarro River	89%	40%	45%	48%	90%	90%	90%	90%
Mouth of Navarro River	45%	38%	54%	62%	90%	90%	90%	90%
North Fork Indian Creek	45%	100%	100%	100%	90%	90%	90%	90%
North Fork Navarro River	45%	10%	45%	95%	90%	90%	90%	90%
Ray Gulch	55%	34%	71%	81%	90%	90%	90%	90%
Upper Navarro River	45%	55%	55%	60%	90%	90%	90%	90%
Upper S. Branch Navarro River	45%	25%	45%	55%	90%	90%	90%	90%
Upper Ackerman Creek	45%	25%	45%	45%	90%	90%	90%	90%

Future LWD Targets within the Plan Area by Planning Watershed								
	Year 40				Year 80			
Planning Watershed	Moderate or High Recruitment Potential	Meets Key piece Requirement for LWD	Meets ≥ 50% Key Piece Requirement for LWD	% Low or Moderate Demand for LWD	Moderate or High Recruitment Potential	Meets Key Piece Requirement for LWD	Meets ≥ 50% Key Piece Requirement for LWD by Year 80	% Low or Moderate Demand for LWD
Hayworth Creek	71%	76%	76%	76%	90%	90%	90%	90%
McMullen Creek	45%	25%	45%	45%	90%	90%	90%	90%
Middle Fork N. Fork Noyo River	63%	39%	50%	56%	90%	90%	90%	90%
North Fork Noyo River	91%	40%	45%	53%	90%	90%	90%	90%
Olds Creek	78%	35%	45%	57%	90%	90%	90%	90%
Redwood Creek	75%	35%	45%	45%	90%	90%	90%	90%
Point Arena Creek	To be completed 2012				90%	90%	90%	90%
Hardy Creek	To be completed 2012				90%	90%	90%	90%
Howard Creek	To be completed 2012				90%	90%	90%	90%
Juan Creek	To be completed 2012				90%	90%	90%	90%

S.3 Effective Shade

MRC assesses conditions for instream effective shade based on two factors: (1) stream temperature and (2) stream canopy cover. A stream is *on-target* for effective shade if stream temperatures at that location are below 15°C, even if canopy cover is deficient. We take measurements of instream canopy at discrete points rather than continuously throughout surveyed stream segments. Next we apply an average canopy value to that segment. Future targets for effective shade are based on the number of segments surveyed since we assume that canopy cover will likely increase evenly across our land. We do not make this assumption, however, in areas that receive restoration harvest treatments.

S.3.1 Future targets for effective shade

MRC develops future targets for effective shade according to the following guidelines:

1. Determine what the current temperature conditions are:
   a. If the MWAT (averaged over 3 consecutive seasons) for the watercourse segment is below 15°C, current shade conditions provide *on-target* effective shade for all watercourse segments in that basin (see footnote #2).
   b. If the MWAT for the watercourse segment is above 15°C, proceed to Step 2.
   c. If there is no temperature data available for a watercourse segment, assume that the segment does not meet the temperature target and proceed to Step 2.

2. Determine if the watercourse segment, based on bankfull width, meets the average canopy requirement (Table S-12):

Table S-12 Canopy Requirements[3]

Rating	Bankfull Width (ft)	Percent Canopy Closure
On Target	< 30	> 90
On Target	30–100	> 70
On Target	100–150	> 40

3. Assess the effective shade of the entire planning watershed based on the number of segments (not weighted by stream length) that meet stream temperature or canopy cover requirements (Table S-13):

Table S-13 Effective Shade Ratings for Planning Watersheds

ON TARGET	Over 80% of surveyed watercourse segments have on-target effective shade.
MARGINAL	60-80% of surveyed watercourse segments have either (a) on-target effective shade or (b) over 70% canopy.
DEFICIENT	Less than 60% of surveyed watercourse segments have either (a) on-target effective shade or (b) less than 70% canopy.

[3] Refer to Figures G-6, G-7, and G-8 in Appendix G, *Watershed Analysis: Background and Methods*, to learn how we derived this table.

4. Determine the canopy target at Year 40 of the HCP/NCCP:

$$CT = TS-1 / TS$$

NOTE
For a planning watershed, the canopy target (CT) is equal to the total number of segments surveyed (TS) minus 1 divided by TS. MRC assumes that near-stream conservation measures should promote substantial growth of riparian stands over the long term, thus increasing instream canopy cover and possibly decreasing stream temperature values. We set the target at 50% in the event we only sample 1 segment. The maximum target is 90% due to sampling error. This is the target at Year 80 of the HCP/NCCP.

Example for Calculating Effective Shade
East Branch North Fork Big River

As of 2005, 2 out of 4 segments monitored in the East Branch of the North Fork of Big River planning watershed had maximum weekly average temperature (MWAT) values of less than 15 °C (Table S-15). One of the segments had high MWAT values. Canopy cover estimates from 2000, however, indicated that this segment (BE1) exceeded the target canopy cover value based on the bankfull width of that segment. Thus, as of 2005, 3 out of the 4 segments surveyed (75%) in the East Branch North Fork Big River planning watershed had either low enough MWAT values or high enough canopy cover values to exceed the desired target levels. MRC would rate this planning watershed as *marginal* for effective shade (Table S-11).MRC surveyed a total of 4 segments in the East Branch North Fork Big River planning watershed as part of the watershed analysis in 2000. We anticipate that, at Year 40 of the HCP/NCCP, 3 out of 4 of the segments surveyed will still be *on-target* for effective shade. As a result, we will still rate this planning watershed as marginal. At Year 80 of the HCP/NCCP, however, this value will increase to 90% (essentially all 4 segments), making this planning watershed *on-target* for effective shade.

Table S-14 Instream Canopy Cover and Stream Temperature Data (2000)

East Branch North Fork Big River Planning Watershed						
Planning watershed	Stream Segment Name	Stream Segment ID#	Most Recent 3-Year Average MWAT (°C)	Bankfull Width (feet)	Canopy Cover (%)	Table S-10: Canopy Cover Target (%)
EBNF Big River	Frykman Gulch	BE14	13.6	8.2	94	90
EBNF Big River	East Branch NF Big River	BE1	17.6	31.0	82	70
EBNF Big River	East Branch NF Big River	BE2	17.6	20.3	76	90
EBNF Big River	Bull Team Gulch	BE8	14.2	6.7	78	90

S.3.2 Future conditions for effective shade

MRC estimates that, at Year 40 of the HCP/NCCP, approximately 30% of the plan area will be *on-target* for effective shade (Figure S-4); at Year 80, 100% of the plan area will be *on-target* for effective shade due to riparian conservation measures. Table S-15 details future effective shade targets by individual planning watersheds in the plan area.

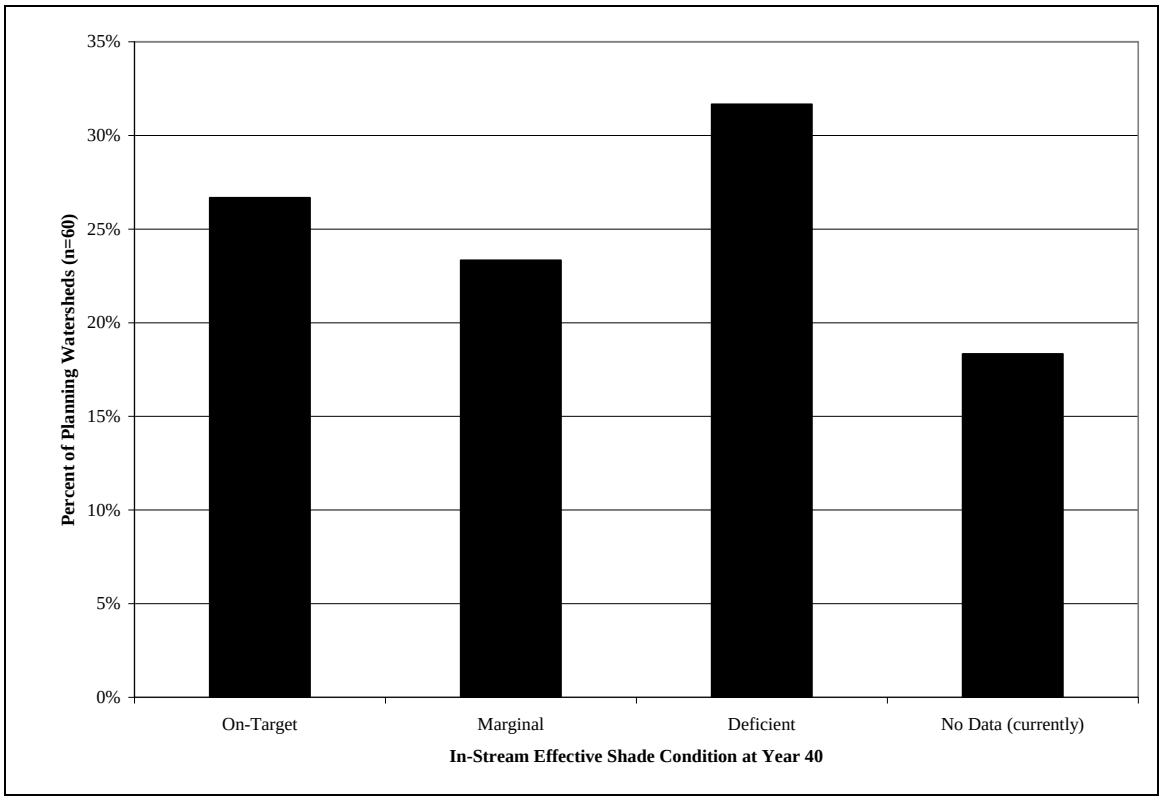

Figure S-4 Instream Effective Shade Conditions at Year 40 of the HCP/NCCP

Table S-15 Future Effective Shade Targets within the Plan Area by Planning Watershed

Future Effective Shade Targets within the Plan Area by Planning Watershed								
MRC Watershed Analysis Unit	Planning Watershed	Number of Segments		% Segments Currently On Target			% Segments	
		Surveyed	MWAT < 15^{0}C and/or Average Canopy > Target	MWAT < 15^{0}C and/or Average Canopy > Target (col. 4/col. 3)[a]	>70% Average Canopy	Current Rating (as of 2005)	On Target for Effective Shade by Year 40 col. 3-1)/col.3[b]	On Target for Effective Shade by Year 80
Albion River	Lower Albion River	8	6	75%	100%	marginal	88%	90%
Albion River	Middle Albion River	4	2	50%	100%	marginal	75%	90%
Albion River	South Fork Albion River	6	3	50%	100%	marginal	83%	90%
Albion River	Upper Albion River	1	0	0%	100%	marginal	50%	90%
Alder Creek	Lower Alder Creek			To be completed 2012				90%
Alder Creek	North Fork Alder Creek			To be completed 2012				90%
Big River	East Branch North Fork Big River	4	3	75%	100%	marginal	75%	90%
Big River	Lower North Fork Big River	3	2	67%	67%	deficient	67%	90%
Big River	Mettick Creek	13	5	38%	46%	deficient	90%	90%
Big River	Rice Creek	2	0	0%	0%	deficient	50%	90%
Big River	Russell Brook	7	4	57%	57%	deficient	86%	90%
Big River	South Daugherty Creek	7	3	43%	86%	marginal	86%	90%
Big River	Two Log Creek	7	5	71%	71%	marginal	86%	90%
Brush Creek	Lower Brush Creek			To be completed 2012				90%
Cottaneva Creek	Cottaneva Creek	34	22	65%	94%	marginal	90%	90%
Elk Creek	Lower Elk Creek			To be completed 2012				90%
Elk Creek	Upper Elk Creek			To be completed 2012				90%
Garcia River	East of Eureka Hill	3	0	0%	67%	deficient	67%	90%
Garcia River	Rolling Brook	4	4	100%	75%	on-target	75%	90%

Future Effective Shade Targets within the Plan Area by Planning Watershed

MRC Watershed Analysis Unit	Planning Watershed	Number of Segments		% Segments Currently On Target			% Segments	
		Surveyed	MWAT < 15^{0}C and/or Average Canopy > Target	MWAT < 15^{0}C and/or Average Canopy > Target (col. 4/col. 3)[a]	>70% Average Canopy	Current Rating (as of 2005)	On Target for Effective Shade by Year 40 col. 3-1)/col.3[b]	On Target for Effective Shade by Year 80
Garcia River	South Fork Garcia River	16	12	80%	73%	marginal	90%	90%
Greenwood Creek	Lower Greenwood Creek	8	5	63%	75%	marginal	88%	90%
Greenwood Creek	Upper Greenwood Creek	5	3	60%	80%	marginal	80%	90%
Hollow Tree Creek	Lower Hollow Tree Creek	2	0	0%	0%	deficient	50%	90%
Hollow Tree Creek	Middle Hollow Tree Creek	8	4	50%	75%	marginal	88%	90%
Hollow Tree Creek	Upper Hollow Tree Creek	12	8	67%	100%	marginal	90%	90%
Mallo Pass Creek	Mallo Pass Creek			To be completed 2012				90%
Navarro River	Dutch Henry Creek	2	0	0%	0%	deficient	50%	90%
Navarro River	Flynn Creek	3	2	67%	100%	marginal	67%	90%
Navarro River	Hendy Woods	1	0	0%	100%	marginal	50%	90%
Navarro River	John Smith Creek	2	1	50%	100%	marginal	50%	90%
Navarro River	Little N. Fork Navarro River	5	1	20%	100%	marginal	80%	90%
Navarro River	Lower S. Branch Navarro River	1	0	60%	80%	marginal	50%	90%
Navarro River	Middle Navarro River	4	1	0%	0%	deficient	75%	90%
Navarro River	Middle S. Branch Navarro River	4	1	25%	25%	deficient	75%	90%
Navarro River	Mouth of Navarro River	5	3	25%	50%	deficient	80%	90%
Navarro River	North Fork Indian Creek	1	0	0%	0%	deficient	50%	90%
Navarro River	North Fork Navarro River	2	2	0%	0%	deficient	50%	90%
Navarro River	Ray Gulch	5	4	80%	80%	marginal	80%	90%
Navarro River	Upper Navarro River	3	1	33%	67%	deficient	67%	90%
Navarro River	Upper S. Branch Navarro River	5	0	0%	40%	deficient	80%	90%
Northern Russian River	Jack Smith Creek	2	0	0%	50%	deficient	50%	90%

Future Effective Shade Targets within the Plan Area by Planning Watershed

MRC Watershed Analysis Unit	Planning Watershed	Number of Segments		% Segments Currently On Target			% Segments	
		Surveyed	MWAT < 15^{0}C and/or Average Canopy > Target	MWAT < 15^{0}C and/or Average Canopy > Target (col. 4/col. 3)[a]	>70% Average Canopy	Current Rating (as of 2005)	On Target for Effective Shade by Year 40 col. 3-1)/col.3[b]	On Target for Effective Shade by Year 80
Northern Russian River	Lower Ackerman Creek	1	0	0%	0%	deficient	50%	90%
Northern Russian River	Upper Ackerman Creek	5	0	0%	0%	deficient	80%	90%
Noyo River	Hayworth Creek	5	2	40%	60%	deficient	80%	90%
Noyo River	McMullen Creek	1	1	100%	100%	on-target	90%	90%
Noyo River	Middle Fork N. Fork Noyo River	8	2	25%	100%	marginal	88%	90%
Noyo River	North Fork Noyo River	4	2	50%	100%	marginal	75%	90%
Noyo River	Olds Creek	4	2	50%	100%	marginal	75%	90%
Noyo River	Redwood Creek	2	2	100%	100%	on-target	90%	90%
Point Arena Streams	Point Arena Creek			To be completed 2012				90%
Rockport Small Coastal Streams	Hardy Creek			To be completed 2012				90%
Rockport Small Coastal Streams	Howard Creek			To be completed 2012				90%
Rockport Small Coastal Streams	Juan Creek			To be completed 2012				90%

TABLE NOTES

[a] The number in this column is derived by dividing the number in column 4 (e.g., 6) by the number in column 3 (e.g., 8).

[b] The number in this column is derived by subtracting 1 from the number in column 3 and dividing it by itself, e.g., (8-1)/8.

MRC set the target for Year 40 at 50% in the event we only survey 1 segment. The maximum target for Year 80 of the HCP/NCCP is 90% due to sampling error

Appendix T

Master Agreement for Timber Operations

Contents

T. MASTER AGREEMENT FOR TIMBER OPERATIONS ***T-1***

T. MASTER AGREEMENT FOR TIMBER OPERATIONS

Following is a draft of the Master Agreement for Timber Operations submitted by CDFG for the Public Draft of our HCP/NCCP on 6 June 2011.

MASTER STREAMBED ALTERATION AGREEMENT
FOR TIMBER OPERATIONS
WITH REGARD TO
THE MENDOCINO REDWOOD COMPANY
HABITAT CONSERVATION PLAN / NATURAL COMMUNITIES CONSERVATION PLAN

Notification Number: R1-09-0367

By And Between

THE CALIFORNIA DEPARTMENT OF FISH AND GAME

and

THE MENDOCINO REDWOOD COMPANY

DRAFT 1
July 1, 2010

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Notification No. R1- R1-09-0367

LONG-TERM LAKE OR STREAMBED ALTERATION AGREEMENT BETWEENTHE CALIFORNIA DEPARTMENT OF FISH AND GAME AND MENDOCINO REDWOOD COMPANY, LLC

This Streambed Alteration Agreement ("Agreement") is entered into between the California Department of Fish and Game ("Department") and Mendocino Redwood Company ("MRC").

WHEREAS, MRC manages lands in the State of California that are used primarily for timber production; and

WHEREAS, it is essential that MRC maintain and improve the road systems on the timber production lands it manages by constructing, installing, improving, maintaining, and/or removing watercourse crossings, controlling erosion, and stabilizing banks, among other activities associated with watercourse crossings, waterholes, temporary dams, diversion structures and bank stabilization structures authorized under this Agreement ("road construction and maintenance activities"); and

WHEREAS, Fish and Game Code § 1602 makes it unlawful for any person to substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake, without first notifying the Department of that activity and, if that activity may substantially adversely affect an existing fish or wildlife resource, enter into a streambed alteration agreement with the Department; and

WHEREAS, the Department has determined that Fish and Game Code § 1602 applies to the construction and maintenance of transportation facilities and aquatic habitat improvement actions this Agreement covers (collectively, "activities"); and

WHEREAS, roads and landings are a covered activity identified in Section 1.14 of the Habitat Conservation Plan ("HCP") and Natural Communities Conservation Plan ("NCCP") among MRC, the Department, the United States Fish and Wildlife Service, and the National Marine Fisheries Service; the terms of which recognize the application of conditions in a Streambed Alteration Agreement as part of the conservation program for some covered aquatic species, as well as require MRC to take specified actions to improve aquatic habitat ("aquatic habitat improvement activities"); and

WHEREAS, it is mutually beneficial to the Department and MRC to establish procedures that will allow MRC to conduct the activities this Agreement covers in accordance with conditions necessary to protect fish and wildlife resources that may be substantially adversely affected by the activities;

NOW, THEREFORE, the Department and MRC agree as follows:

I. PURPOSE

The purpose of this Agreement is to allow MRC, acting through its employees, agents, and contractors and their subcontractors to conduct the activities identified in Section IV below ("Covered Activities") without the need to enter into any additional streambed alteration agreements from the Department while this Agreement is in effect, while at the same time protecting existing fish and wildlife resources the Covered Activities could substantially adversely affect.

II. LAND AREA AND FACILITIES COVERED

This Agreement authorizes Covered Activities on existing and new transportation facilities and on watercourses on or over land areas owned by MRC and managed under the HCP/NCCP within Mendocino County, including lands acquired in the "adjustment area" and as described and mapped in the HCP/NCCP (Section 1.12.2 and Fig. 1-1, respectively).

III. DEFINITIONS

For purposes of this Agreement only, the following definitions apply:

"<" means less than.

">" means greater than.

"Active channel" means the zone of active, annual streambed scour and deposition. The active channel generally is that portion of a watercourse's bed and bank that is delimited by ordinary high-water marks and permanent vegetation, and is characterized by alluvial materials, including particles larger than sand. In a floodplain morphology, an active channel is usually smaller than the bankfull channel.

"Activity" means any action that by itself would be subject to subdivision (a) of FGC § 1602.

"Adjustment area" means lands not owned by MRC at the initiation of the HCP/NCCP, but which are similar in character to MRC's lands and are included in the analysis in the HCP/NCCP to anticipate MRC's potential acquisition, timber harvest rights or other interest in those lands after the HCP/NCCP is approved. A map is included in the HCP/NCCP (Fig. 1-1).

"Administrative access" means travel on roads only for purposes other than timber management, such as inspecting roads and crossings, performing PTHP preparation and agency review work (Pre-harvest Inspections), patrolling covered lands, conducting tours, and carrying out fish/wildlife/forest data collection (studies, surveys, inventory). Mode of transport is limited to ATVs and standard production 4WD vehicles.

"AMZ" means the Aquatic Management Zone, and is the area along Class I, Class II, and Class III watercourses managed primarily for protecting and improving riparian and aquatic functions and processes.

"Angular rock" means rock that is characterized by straight, abrupt, and jagged edges and has not been rounded or smoothed by river or other mechanical abrasion.

"Avoid" or "avoidance" means a form of mitigation that prevents impact altogether by not taking certain action or parts of an action so that there is no impact to the resource being protected.

"Bank" means that part of a channel, which in cross section has a steeper or more vertical slope than the adjacent channel bed and floodplain.

"Bankfull channel" means that portion of a floodplain that conveys flows at bankfull stage.

"Bankfull stage" means the water depth where the stream fills the entire channel cross section without significant inundation of the adjacent floodplain. Flow at bankfull stage generally has a recurrence interval of 1.5 to 2.0 years.

"Bed" means that that part of the channel, which in cross section has more level or horizontal form relative to the bank. The thalweg is located in the bed.

"Biweekly" means every two weeks.

"CEQA Guidelines" means the regulations that implement CEQA in § 15000 *et seq.* in title 14 of the California Code of Regulations.

"CEQA" means the California Environmental Quality Act (Public Resources Code § 21000 *et seq.*).

"CESA" means the California Endangered Species Act (Fish & Game Code, § 2050 et seq.)

"cfs" means cubic feet per second, a measure of stream flow.

"Channel" means a natural waterway or modified natural waterway that periodically or continuously contains moving water, has a definite bed, and has banks that confine water at low to moderate streamflows. "Channel" does not mean a road-side ditch.

"Check dam" means an obstruction constructed across a channel to decrease the velocity of flow and thus promote settling of suspended sediments from the water.

"Class I" means waters where fish are always or seasonally present onsite, and includes habitat to sustain fish migration, spawning and rearing.

"Class II" means waters where fish are always or seasonally present offsite within 1,000 feet downstream and/or those that provide aquatic habitat for non-fish aquatic species. These are further subdivided into large Class IIs (II_L) where the drainage area exceeds 100 acres or wherever the Class II is inhabited by tailed frogs; and small Class IIs ($II_{S)}$ where drainage area is less than 100 acres and the Class II is not inhabited by tailed frogs.

"Class III" means waters where aquatic life is absent, but watercourses showing evidence of being capable of sediment transport to Class I and II waters under normal high water flow conditions after completion of timber operations.

"Cofferdam" means a temporary water-tight enclosure built in the water and pumped dry to expose the bottom so that work can be undertaken in a dewatered condition.

"Construction" means specifically the creation of a new ground transportation feature where none was present beforehand, or an upgrade of an existing transportation feature that supports an increased level-of-service, expands the type of equipment intended, or modifies the hydrological design, such that the upgrade results in potentially new or different adverse environmental effect compared to the existing transportation feature. Generally, construction means the activities that are undertaken to construct a new facility or reconstruct, repair, or decommission an existing facility.

"Covered Activities" means the activities specifically addressed in the HCP/NCCP and for which MRC received a take permit pursuant to Fish and Game Code § 2835 and an incidental take permit pursuant to Section 10 of ESA. The HCP/NCCP will authorize take incidental to the implementation of HCP/NCCP Covered Activities only. The Covered Activities" of this agreement (Section IV) are a subset and detailing of those in the HCP/NCCP.

"Covered species" means CESA- or ESA-listed and non-listed species for which conservation and management measures are explicitly provided by the HCP/NCCP and take is authorized by the wildlife agencies.

"Crossing" means a facility designed and constructed to enable ground-based mechanized equipment to pass from one side of a watercourse to another. A crossing may be comprised of manufactured items (e.g., culverts, beams), fill material, and approaches including road surfaces and roadside ditches.

"Cumulative precipitation threshold" means the time each autumn when a total of 4 inches of rain have fallen during the water-year (July 1 of one year through June 30 of the subsequent year), as measured at the South Fork Caspar Creek gage.

"Decommission" means leaving a road impassable to motorized vehicles; removing watercourse crossings, providing conditions on roads and landings intended to yield permanent and maintenance-free drainage, dispersed flow, and minimal erosion and slope instability; and promoting native conifer regeneration. Decommissioned roads are removed from the permanent road system.

"Design flow" means the peak discharge, expressed it terms of a stated recurrence frequency, for which a crossing is designed to pass effectively without compromising the crossing and its related roads. Under this Agreement, all new watercourse crossings and, at the time of their reconstruction or replacement, existing crossings will be designed and constructed to pass at least the 100-year flood (i.e., has a 1 in 100 probability in any year) inclusive of sediment and wood loads.

"Diversion dam" means a temporary structure built to direct flow around a work-site through side channels or temporary pipes.

"Drainage facilities" means features constructed to control water other than that in watercourses, including, but not limited to roadside ditches, waterbreaks, outsloping, and rolling dips.

"Dry" means devoid of free-flowing or standing water above the channel's surface, or free water (water not adhered to substrate particles) is not readily apparent in the immediate subsurface.

"Earthen spoil material" means organic and inorganic materials derived from the ground and highly subject to erosion. The working definition is soil and rock accumulations comprised of > 20% by volume fine materials (< 3 millimeters diameter).

"Emergency" means a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services. "Emergency" includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage.

"Encroachment" is synonymous with "project."

"Erosion controls" means actions to reduce surface erosion, gullying, and ditch erosion such as, but not

limited to, mulching, slash packing, seeding.

"ESA" means the federal Endangered Species Act (16 U.S.C. § 1531 *et seq.*)

"Existing roads" and "existing crossings" mean features present in place and design prior to a specified operation. To be considered "existing," either the road prism (at, and across a permanent crossing) or the approaches to the active channel (at a seasonal crossing) would not require reconstruction.

"Facility" means watercourse crossings, near-stream roads (roads close enough that graded road surface or sidecast earthen material will deliver to the bankfull channel); water drafting sites; and all associated road approaches, drainage facilities, bank stabilization structures, temporary dams, and diversion dams.

"Footprint" means the area of a facility delimited by changes in the ground's surface from that of the no-project condition, the change being required for the functioning of the project. Support areas (e.g., spoil or borrow areas) are part of the footprint.

"gpm" means gallons per minute, a measure of the rate of water flow and pumping.

"Heavy equipment" means any ground-based, motorized equipment other than ATVs and standard production 4-wheel drive vehicles.

"Hinge point" means the transition between crossing road fill material and the naturally occurring ground surface.

"HW/D" means the headwater to diameter ratio, a value that compares the depth of water at the inlet to the dimensions of the culvert. HW/D < 1 describes a culvert with a headwater depth below the top of the culvert inlet, HW/D = 1 is the condition in which the headwater at the inlet is equal to the culvert diameter, and HW/D >1 is when the headwater depth exceeds the culvert diameter.

"Humboldt crossing" means a stream crossing constructed with logs set parallel to the stream channel and covered with fill.

"Hydrologically connected" means a surface of a road, landing, or disturbed area from which precipitation will runoff directly into a watercourse. Hydrologically connected areas are inherently delimited by topography and can be truncated with drainage facilities that divert runoff to the forest floor.

"Informing notice" means a subnotification under this agreement that MRC must submit before it may undertake certain activities to advise the Department of the schedule for approved, impending activities. An informing notice does not require an analysis, approval, or response from the Department. Informing notices provide the Department with knowledge about the timeframe of an approved activity and enables the Department to conduct an inspection.

"In-stream" means within the surface water of a channel.

"Inventory block" means a geographic unit of scale that contains multiple planning watersheds and typically represents a region (Albion, Navarro, Rockport, etc.) of MRC land (Map 1 of the HCP/NCCP Atlas [Appendix B]). MRC uses inventory blocks in characterizing landscape conditions .

"Live car" means any container that can hold living fish and allows substantial surface water flow to pass through (e.g., a box-frame with seine siding, buckets with numerous small holes).

"LWD" means large woody debris, a term describing logs and large branches in watercourses. For purposes of this agreement, size requirements are as described for "key pieces."

"Key piece" means LWD ≥ the sizes described in Appendix G of the HCP/NCCP (Table G-19).

"Maintenance" means collectively both occasional and routine maintenance.

"mm" means millimeter.

"Natural channel bottom" means a watercourse where the bed's elevation has not been aggraded or degraded due to anthropogenic features such as roads, culverts, landings, or short-term but natural features such as log jams.

"New facility" means a feature not existent in function prior to the feature under consideration, or if there is a substantial change in alignment or increase in earthen materials within the floodplain as a result of a facility being replaced. For temporary crossings, this includes any watercourse crossing at a location that has not been used as a temporary crossing for more than 20 years.

"Normal high water" means the flow with a flood frequency of 1.8- to 2-year return interval. On streams with floodplains, it is a flow that corresponds to the discharge at which streams overtop their banks, also known as the bankfull flow.

"Operator" means MRC and its employees, agents, contractors, and their subcontractors, and any party authorized by MRC to complete one or more of the Covered Activities on behalf of MRC.

"Occasional maintenance" means the infrequent (usually less frequent than once every two years) collection and disposal of silt, sand, sediment, debris, trash, rubbish, flood-deposited woody materials, living vegetation, and any other obstructions that reduce a watercourse crossing's or drainage facility's capacity to convey design flows and/or endanger a facility. It also means the minor repair of damaged features that return the feature back to its original design (e.g., repair or replacement of energy dissipaters).

"Permanent crossing" means a bridge, culvert, ford, or vented ford that was constructed to accommodate the design flow and will remain in place when timber operations have been completed.

"Permanent road" means a road which is planned and constructed to be a permanent all-season transportation facility. These roads, which are generally main haul roads out of a tract, have surfaces suitable for trucks to haul forest products throughout the entire winter period and are inspected and maintained during the winter period. Crossings on permanent roads are capable -- or will be upon the first repair, replacement, or reconstruction -- of accommodating the design flow.

"Pool" means a channel feature that is relatively deep, the bottom is noticeably concave along the channel's longitudinal section, and the water surface area is flat at low flow. Pools are created by scour at high flow, but have slow current at low flow.

"Pre-consult" means a Department evaluation of a proposed activity in advance of the subnotification timelines. A voluntary action, MRC may pre-consult via providing draft subnotification material to the Department, enabling the Department to conduct a field review if necessary. A pre-consultation can reduce the likelihood of a Department non-concurrence to a subnotification based on needed information. A pre-consultation is documented by a written response from the Department.

"Project" means one activity that is conducted at one location, or two or more activities that are interrelated and could affect similar fish and wildlife resources at one location. "Project" in this agreement is not as defined in PRC § 21065 or CCR Title 14 § 15378. The Department retains final authority on identification of a project, or if several activities are logically connected. Logical connection means activities undertaken together due to proximity and need.

"PTHP" means a Programmatic Timber Harvesting Plan.

"Reconstruction" means improvements to substantially failed existing watercourse crossings and facilities that returns them to the original design for hydrology as well as traffic type and capacity. Reconstruction does not include routine maintenance, or occasional maintenance, but might include repair that requires substantial work to achieve the original prism of the road. Reconstruction requires heavy equipment such as backhoes, bulldozers, and/or excavators.

"Redd" means a location in the channel's gravel substrate where a spawning female salmonid deposits her eggs.

"Removal" means the dismantling of temporary crossings and serial-seasonal crossings that are not permanent.

"Repair" means modifications to a failing road prism or crossing to retain its operational and functional design.

"Replacement" means the function of an existing facility is recreated substantially in place (original alignment) to support the pre-existing road designation (primary, secondary, seasonal road system), but with a different crossing type (e.g., culvert to a bridge).

"Restorable Class I" means an inherently fish-bearing watercourse that currently provides aquatic habitat only for non-fish aquatic species due to the presence of temporary physical or physiological barriers, but with

appropriate management may again bear fish. In cases of classification disputes, the Department shall be the final arbiter.

"Re-establishment" of Class II or III channels means to restore natural flow paths (channels) disrupted during past land uses.

"Residual pool" means the water conditions (depth, volume, size) at the time at which flow stops draining over the downstream riffle crest. It is a measure of a pool's characteristics that is independent of variations in discharge.

"River-run rock" means rock derived from a river bed characterized by mostly rounded edges that are derived from abrasion as the rocks tumble along as bedload.

"Rolling Dip" means a drainage facility that is constructed to remain effective while allowing passage of motor vehicles.

"Routine maintenance" means frequently recurring activities (usually ≤ annually) that are needed to sustain, but not enhance the hydrologic and transportation design function of the existing transportation facility. Examples include grading, erecting and leveling waterbars, rocking road surfaces, and clearing cross drains. Routine maintenance is typically limited to hand tools and graders.

"RPF" means Registered Professional Forester, a person who holds a valid license as a professional forester pursuant to the provisions of California Code of Regulations, Title 14, Chapter 10.

"Seasonal crossing" means a crossing planned and constructed as part of the transportation system that is not used during the winter period for commercial hauling. During the winter period, access for administrative activities such as fire control, forest management, and occasional harvesting of minor forest products is limited to dry periods of the winter. Seasonal crossings may be either permanent crossings, or a crossing installed and removed serially, usually on an annual basis.

"Seasonal road" means a road which is planned and constructed as a permanent transportation facility on which: A) commercial hauling is discontinued during the winter period except when the risk of sediment delivery is low (for example, hauling may occur during the winter period on seasonal ridge roads with no watercourse crossings); B) MRC may access the road during dry periods of the winter for fire control, forest management, occasional harvesting of minor forest products, and other necessary activities; and C) permanent or serial-seasonal crossings remain at the watercourse.

"Serial, seasonal crossing" is a crossing on the road system that is installed and removed within the same year, usually on an annual basis to support administrative use and operations beyond those of a single PTHP [Compare to Temporary crossing]. This type of crossing is typically used where a permanent structure is unfeasible, such as a bridge within the floodplain.

"Slash" means tree tops, branches, bark, or other woody residue left on the ground after logging or other forestry operations.

"Slope" is the deviation of the ground surface from the horizontal. In this agreement, the unit of measure is percent (%) and is calculated as rise (vertical distance) divided by run (horizontal distance, in same units as rise) multiplied by 100.

"Special status species" means a species listed as threatened or endangered under the ESA or CESA, listed as sensitive by the Board of Forestry in the California Forest Practice Rules (California Code of Regulations, Title 14, § 895.1), and/or may meet the criteria the CEQA Guidelines § 15380.

"Stilling basin" means a depression in a flow path that is excavated to collect sediment that settles as the flow drops.

"Stream" means a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface of subsurface flow that supports or has supported riparian vegetation. For purposes of this agreement, stream and watercourse are synonymous.

"Subnotification" means a notice under this agreement that MRC must submit to the Department for review and approval before MRC may begin certain activities covered by this Agreement. Pursuant to Fish and

Game Code § 1602, MRC submitted the notification that encompasses these subnotifications in 2009.

"Substantially changed" conditions" means one or more of the following: 1) the work described in this Agreement is substantially changed; 2) conditions affecting fish and wildlife resources substantially change and those resources are or will be adversely affected by the work that is or will be conducted under this Agreement; and 3) the measures necessary to protect fish and wildlife resources do not reflect advances in design and techniques that would significantly increase protection of fish and wildlife resources.

"Supports" for bridges means those components that hold up and anchor the bridge, such as abutments, footings, and piers.

"Surface water" means water at or above the substrate of the waterbody. When applied to conditions at a work-site, surface water shall be determined at proximal locations that are both affected (i.e., in downstream scour pools) and not affected by any existing structure (i.e., above sediment accumulations).

"Take" means to hunt, pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture, or kill, or to attempt to engage in these activities (Fish & Game Code, § 86). Under ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a threatened or endangered species, or attempt to do so.

"Temporary crossing" means a stream crossing 1) used intensely only during timber operations in a local area, then use is infrequent (less frequent than once every 5 years) and sporadic; 2) seasonally installed and removed to near-natural channel cross-section subject to the timeframes specified in the seasonal work periods (Attachment A); and 3) designed to pass all flows while the crossing is in place. Temporary crossings intended for use during the winter period will be sized and armored to pass the design flow.

"Temporary road" means a road that is to be used only during a timber operation. These roads have: 1) a surface adequate for seasonal hauling; 2) watercourse crossings which will be removed prior to the winter period or designed to be self-maintaining; and 3) infrequent, sporadic use which periodically can become more intense.

"Timber management access" means travel on roads for the purposes of administrative access and for moving heavy equipment, transporting rock and gravel, and hauling forest products.

"Unimpeded flow" means the volume of water passing a cross section of a watercourse per unit of time (e.g., cfs) unmodified by the diversion or storage for which its value is relevant. For cumulative impacts analysis, unimpeded flow means no diversions at any relevant storage, drafting, or diversion site.

"Upgrade" means to increase the size of a facility or constituent parts compared to the existing facility such that its capacity to convey water or traffic is increased.

"Vented ford" means a permanent ford designed to pass summer low flows through an embedded culvert but to pass higher flows by overtopping.

"Washed or clean" rock means a rock mixture that contains 10% or less (by volume) fines and sand (defined as particles < 3.3 mm in diameter).

"Watercourse" means a well-defined channel with distinguishable bed and bank and showing evidence of having contained flowing water indicated by scour or deposit of rock, sand, gravel, or soil, including but not limited to, streams as defined in PRC 4528(f). Watercourse also includes manmade watercourses. For purposes of this agreement, stream and watercourse are synonymous.

"Watercourse crossing" means a feature constructed to enable vehicles and equipment to negotiate a stream. These includes bridges, culverts, fords, and vented fords capable of passing the design flow, and temporary and seasonal crossings capable of passing all flow during the period of use.

"Watercourse or Lake Transition Line" for a watercourse with a floodplain means the location of incipient flooding (the location where water begins to spill over banks and on to the floodplain). For a watercourse

without a floodplain, it means a line defined by one or more the following features: 1) a change of vegetation from bare surfaces or annual water tolerant species to perennial water tolerant or upland species at least 25 years in age at breast height, 2) physical indicators of scour such as undercut banks, moss lines on rocks, the top of exposed roots along the channels, and 3) a change in the size distribution of surface sediments from gravel to fine sand. For a lake, that line closest to the lake where perennial upland or facultative upland woody vegetation is permanently established.

"Wetted channel" means that portion of a channel immersed with surface water. Its lateral limits change as the stage changes.

"Wildlife Agencies" means United States Fish and Wildlife Service; National Marine Fisheries Service; and the Department of Fish and Game.

"Working days" means days other than Saturday, Sunday, or holidays observed by the Department of Fish and Game.

"Winter period" means from November 15 to April 1.

"yds^3" means cubic yards.

IV. COVERED ACTIVITIES

A. Additional Streambed Alteration Agreements. MRC may conduct the activities identified in this Section IV in support of the HCP/NCCP's covered activities without the need to obtain any additional streambed alteration agreements except as specified in this Agreement, provided the Operator notifies the Department as required in Section VI and conducts the activities in accordance with the measures specified in Section VII (in reference to Attachment A).

B. Activities Identified. The activities this Agreement covers are as follows:

1. Permanent Crossings

   a. Construction of new, and upgrades of permanent crossings on Class I and Class II_L sites covered in a PTHP.

   b. Construction of new, and upgrades of permanent crossings on Class II_s and Class III watercourses.

   c. Upgrades, reconstruction, repair, maintenance, removal, and decommissioning of existing permanent and seasonal watercourse crossings on Class I, restorable Class I, Class II, and Class III watercourses.

2. Temporary Crossings

   a. Construction of new, and upgrades of temporary crossings on Class I and Class IIL sites covered in a PTHP.

   b. Construction of new, and upgrades of temporary crossings on Class IIs and Class III watercourses.

   c. Upgrades, reconstruction, repair, maintenance, removal, and decommissioning of existing temporary watercourse crossings on Class I and restorable Class I, and Class II, and Class III watercourses.

3. Stream-side Roads

   a. Construction of new, and upgrades of stream-side roads on Class I and Class IIL sites covered in a PTHP.

   b. Construction of new, and upgrades of temporary crossings on Class IIs and Class III watercourses

   c. Upgrades, reconstruction, repair, maintenance, and decommissioning of existing streamside roads away from crossings that could adversely affect fish and wildlife resources.

4. Flow re-establishment. Re-establishment of Class II and Class III channels to their original flow channel that was disrupted when historic ground-disturbing activities diverted the flow away from its original channel.

5. Habitat Restoration. Conduct of aquatic habitat restoration practices such as placement of LWD or boulders in channels and on or along banks, and revegetation of banks.

6. Drafting

   a. Construction or development of new drafting sites covered in a PTHP.

   b. Diversion and use of water for road construction, reconstruction, maintenance, dust control, and pesticide mixing provided that MRC is legally entitled to divert and use water for such use. This applies to

      1.) diverting water at existing and new facilities,

      2.) drafting of water by pump or gravity feed directly into water trucks or indirectly through storage tanks.

      3.) maintaining drafting sites, including stabilizing banks, removing encroaching vegetation, and extracting sediment to maintain capacity, and

      4.) conducting monitoring activities.

V. ACTIVITIES NOT COVERED

A. Excluded activities. Activities other than those identified in Section IV, including but not limited to 1) gravel mining [the extraction and removal from the source encroachment to another site, or for commercial purposes], and 2) construction of new, and upgrades of permanent or temporary crossings on Class I and Class II_L sites not covered in a PTHP.

B. Unauthorized Take. Any activity that could take (as defined herein) any species listed under CESA or ESA, except as permitted in the HCP/NCCP, shall not be covered. MRC shall comply with take prohibition requirements of CESA and ESA when activities may take listed species if the HCP/NCCP does not cover 1) that species, or 2) the activity.

C. Feasibility and Review. Where MRC determines that conformance with applicable measures identified in Section VII is not feasible, MRC may propose alternative measures through a separate notification made pursuant to Fish and Game Code § 1602 or 1611.

D. Emergencies. Work undertaken to respond to an emergency shall be in accordance with Fish and Game Code § 1610, subdivision (b). To the maximum extent practical, mitigation measures described in this Agreement shall be employed during or immediately after completing the work (e.g., erosion control, waste and materials removal).

VI. NOTIFICATION FOR AUTHORIZATION TO PROCEED ("SUBNOTIFICATION")

Prior to commencing any of the specific Authorized Activities identified in Section IV, MRC shall notify DFG in writing of its intent to commence the activity ("subnotification") for authorization to proceed.

A. Exceptions to subnotification submittal

1. An informing notice shall be submitted to the Department by email no less than two working days prior to undertaking the following activities.

   a. Reactivation and deactivation of previously approved annual activities (i.e., annual start and termination of water drafting, installation and removal of serial seasonal temporary crossings on the permanent or seasonal road system) consistent with the descriptions and conditions previously approved.

   b.. As per Section E.1 of Attachment A, MRC shall inform DFG prior to Oct 15 of activities being proposed between October 15 and the time when the cumulative precipitation threshold is met.

   c. For an activity not completed during the year the Department receives the subnotification but which is still in the subnotification's valid period, MRC shall submit an informing notice prior to initiating activities during the year of construction.

d. For routine maintenance at sites that are currently permitted under this or another valid Agreement:

1.) that exceed the thresholds in Attachment A, Section II.A.5 do not need to submit a subnotification but must submit an informing notice.

2.) that do not exceed the thresholds in Attachment A, Section II.A.5 need not submit either a subnotification or an informing notice

3.) Although subnotification is not needed routine maintenance of encroachments permitted under this MATO; maintenance of these sites shall adhere to conditions in this MATO.

3. Each informing notice shall include:

a. This LTSAA number (R1-09-0367) and any prior-approved subnotification identification number.

b. Contact information

c. Watercourse name

d. Location information (e.g., road name, road number, or map point for each facility, if any.

e. Projected commencement and completion dates, including all erosion control.

f. For work period extensions, weather forecast information through and 2 days beyond the proposed extension.

B Scope of Subnotifications

1. Each subnotification shall be limited in scope to work that can reasonably be completed within one year, in accordance with conditions of this MATO, unless site-specific project conditions specify otherwise. If work at projects or sites within a subnotification is not undertaken within the subnotification time frames specified in this section B, MRC shall submit a new subnotification and fee for those sites if work is still proposed.

2. Except for the subnotifications addressed below (B.3. through B.6.), subnotifications are valid for three (3) years.

3. A subnotification associated with a PTHP will remain valid for 5 years, or the life of the PTHP, whichever occurs first.

4. Subnotifications for new drafting sites or increased drafting quantity shall be submitted separately, and not included with other types of activities in the same subnotifications. Subnotifications for drafting activities submitted under this MATO are valid for the life of the MATO.

5. Subnotifications for serial, seasonal crossing \under this MATO are valid for the life of the MATO, as long as alignment, materials, capacity, and use patterns remain the same..

6. Subnotification requirements for maintenance activities apply only to sites that are not currently permitted under this or another valid Agreement. Maintenance subnotifications are valid for the life of the structure, or the MATO, as applicable.

C. Subnotification Process

1. For projects associated with THPs, MRC shall provide to DFG a subnotification after CAL FIRE provides a THP (or amendment) Notice of Conformance. For projects not associated with THPs, MRC may submit a subnotification at any time.

2. DFG shall have 15 working days after receiving the subnotification[1] to review the subnotification and to do the following, as applicable: 1) determine if the Covered Activity is subject to this MATO; 2) determine completeness of the subnotification; 3) concur with the subnotification; 4) contact MRC to discuss the subnotification; 5) request more information in the subnotification; 6) propose site-specific conditions to protect fish and wildlife resources; and/or 7) conduct a site visit unless conditions prohibit visiting the site within that time period. If a site visit is requested but it can not be accomplished within the 15 day review timeline, MRC and DFG shall extend the time period to a

[1] The subnotification receipt date is the date the local DFG Office (Northern Region, Attn: Coastal Habitat Conservation, 619 Second St., Eureka, California 95501) receives the subnotification, including fees.

mutually-agreeable date and provide two working days after the site visit for the Department to complete its review.

3. If the Department does not notify MRC within the 15 working days after receipt of the subnotification, MRC may commence operations on the following workday provided MRC proceeds with the subnotification as submitted and complies with the protective measures described in Section VII.

4. Within 5 working days after receipt of a subnotification including associated fees, DFG will provide to the MRC Contact Person, confirmation of both of the subnotification receipt date and 16th Working Day following receipt of subnotification. To assure the subnotification was received, MRC should enquire about its status if the confirmation is not returned.

5. Provided timeframes have not been mutually extended, or DFG does not advise MRC in writing that it does not concur with the project as proposed, MRC may commence proposed activities on the 16th working day following subnotification receipt date.

6. If DFG advises MRC it does not concur with the project as proposed, DFG and MRC shall confer to develop site-specific conditions to address the issue within 30 calendar days. If, following discussions, DFG and MRC cannot come to mutual agreement regarding proposed site-specific conditions, the Parties shall resolve the disagreement in accordance with FGC §1603(b).

7. Any of the timeframes described above may be extended by mutual agreement of both Parties.

D. Content of Subnotifications

Subnotifications shall include:

1. Project Name, and the associated Timber Harvesting Plan (THP) number, if applicable.

2. A description of the Covered Activities, including the type (e.g., construction, reconstruction, repair, decommission, bank stabilization, watercourse reestablishment, aquatic habitat improvement, or water drafting) and the facility (e.g., ford, culvert, bridge, road);

3. The 2010 FPR stream classification associated with the Covered Activity, including whether the stream is a restorable Class I watercourse. Describe the mode of evaluation used for stream classification (e.g., office map evaluation, field evaluation including date field-checked, etc.).

4. Location information including township, range, and section numbers; road numbers; the name of streams the Covered Activity will affect; the planning watershed name and code, and a map to the work site with sufficient detail to enable a person who is not familiar with the area to easily locate the site.

5. The name, address, and telephone number of the Contact Person, and one secondary contact.

6. Detailed work plans that describe the project, including items such as:

   a. Construction drawings, diagrams or sketches, cross sections and dimensions, results of road site assessments, unstable conditions at encroachments (e.g., debris torrents, landslides, unstable fill, and copies of the geology maps that cover the encroachments);

   b. Volumes of materials removed from or added to the channel for the facility

   c. Estimates of the area and vegetation cover types disturbed (project footprint and workareas);

   d. When replacing a facility that has accumulated excess sediment as a result of high culvert inlet placement or deficient capacity, estimates of the volume and channel length of stored sediment upstream of the facility that will need to be excavated or stabilized

   e. Describe downstream excavation, stabilization, and/or grade control needs;

   f. Expected commencement / completion dates for construction, installation, or drafting.

   g. Type of equipment that will be used;

h. For permanent structures, as appropriate:

1.) calculations or other data used to determine 100-year flood flows and sizing of culverts or fords;

2.) calculations and engineering plans or other data used to determine bridge height and flow capacity;

3.) documentation of engineering review and approval for bridge design and placement of proposed permanent bridges (DFG may require separate notification for permanent bridge proposals if detailed engineering specifications are involved); and

4.) disclosure of all Class I watercourse fording sites, where vehicles including all-terrain vehicles (ATVs) and/or heavy equipment cross the wetted stream channel when any life stage of fish is or may be present, which includes a description of expected frequency of use, vehicle type, and site specific measures proposed to protect fish and wildlife resources.

i. Erosion control practices that will be applied as per Section I.G.3. of Attachment A.

j. Intended use of poured concrete.

k. Information specifically identified in Attachment A,

l. Where Attachment A allows alternatives, the alternative to be applied.

m. To help assess and minimize the cumulative impact to aquatic resources in a watershed from water drafting activities, the following information shall be included in the subnotification:

1.) watercourse or lake classification; and

2.) drafting location use parameters, including

a.) Yearly timing;

b.) Estimated daily, weekly, and total volumes needed during season of use;

c.) Available known past flow data during anticipated season of use;

d.) Type of drafting (e.g., direct stream pumping or gravity flow);

e.) Equipment proposed (e.g., trucks, small portable pumps, storage tanks, water bladders, drafting hose diameter, etc.); and

f.) Associated water drafting activities at the site to support other THPs.

n. A certification by the RPF that fish, wildlife, or plant surveys have been completed, or will be completed before the start of activities within the affected areas; any positive findings of sensitive species found at or near the project sites with a completed Natural Diversity Data Base (“NDDB”) form for each encounter with the Department-designated ”Special Animal,” ”Special Plant,” or listed species; and any proposed mitigation measures;

o. Any other information needed to fully convey to DFG the proposed project and existing conditions, including other unusual circumstances that may merit non-standard work or measures or site-specific conditions.

7. a certification that recent pre-project photographs with date stamps of each proposed activity site are available to the Department upon request;

8. if the Department pre-consulted, a copy of the Department’s written findings, if any;

9. for existing sites, repair and maintenance history, including dates of repair or replacement, and the materials and techniques used, as available.

10. for non-PTHP encroachments, a certification by the RPF that no ground subject to disturbance during the proposed activity contains cultural resources.

11. a fee in an amount in accordance with Section XI of this MATO, or identification that the fees are included within a monthly payment as per section XI. B.

12. disclosure about whether the Covered Activity is under a clean-up and abatement Order (CAO) or requires a Wastewater Discharge Requirement (WDR) permit from the North Coast Regional Water Quality Control Board. If yes, state CAO or WDR Order Number.

E. Revisions and Amendments of Subnotifications

1. A subnotification may be revised during the review process prior to receiving authorization to proceed. Amendment fees do not apply to revisions during the subnotification review period; however new encroachments that may be added into subnotifications during the review process require project subnotification fees.

2. Following authorization to proceed, when MRC may freely commence the activity in accordance with the terms of this MATO, changes to proposed projects described in a subnotification are usually considered minor amendments of subnotifications to the MATO. Amendment fees in Section XI.F. apply; and the amendment request must be accompanied by the amendment fee. Review time frames for amendments to subnotifications are the same as for subnotifications in Section 4.0.

3. New or additional sites may not be amended to a subnotification following receipt of authorization to proceed pursuant to Sections 4.0 or 4.1 above. New or additional sites needing MATO coverage shall require a new subnotification.

4. Review time frames for DFG-requested amendments to the MATO shall be determined by mutual agreement of both Parties.

VII. MEASURES

A. Attachment A. The Operator shall conduct all Covered Activities in accordance with the applicable measures specified in Attachment A, and shall otherwise use best efforts to protect fish, wildlife, and botanical resources when conducting a Covered Activity. Attachment A, attached hereto, is part of this Agreement.

B. Additional Measures. If the Department determines that a field review of the activity site(s) is required, and based on that review it determines that additional measures not identified in Attachment A are required to avoid significant impacts, MRC shall incorporate those measures into the applicable activity or activities.

C. Adjustments to Measures

1. MRC may adjust, on its own choice, a measure in Attachment A, infrequently and on a site-specific basis, if:

a. The adjustment provides equal or better protection to the aquatic habitat and biological resources than the measure for which the adjustment is proposed, and

b. A Department representative has reviewed the proposal, in the field as necessary, and concurred in writing that the adjustment at that site provides equal or better protection than the measure for which the adjustment is proposed.

2. MRC shall advise the Department of any adjustments to measures contained in this Agreement that result from an inter-agency review of the activity and its impacts. These adjustments may only be used under this Agreement with the Department's concurrence.

3. If, in the opinion of the Department, an adjustment becomes commonly requested and accepted, the Department will advise MRC to amend this Agreement.

VIII. REPORTS

A. Annual Report

1. As one of the annual reports issued as required by the HCP/NCCP, MRC shall submit to the Department an annual report that tabulates activities undertaken pursuant to this Agreement during the prior calendar year.
2. The annual report shall:
   a. separate its account of activities by MRC Inventory Block and by Planning Watersheds as defined by CALWATER (Version 2.2 or the most current, available at http://www.ice.ucdavis.edu/active_thp/ ;
   b. classify the projects by type;
   c. report the dates of the notices (intent to start, completion) to the Department as well as the actual start and completion dates;
   d. identify and describe any "as-built" conditions that differ from information included in the notices;
   e. note substantive problems encountered, how they were handled, and suggest how this agreement might be modified to prevent such problems during future activities;
   f. list any adjustments to conservation measures (Section VII. C.);
   g. include both before and after photos of each Class I crossing constructed, replaced or upgraded. The as-completed photos should include at least the same photo points identified in the subnotification section (IV.I.2.). As-built photos for other crossings and worksites shall be provided to the Department upon request;
   h. map, by MRC Timber Tract, the location and types of projects included in the report;
   i. tabulate by species the number and condition of animals handled as part of fish salvage operations (Attachment A, Section I.D.1.B.);
   j. identify measures taken to mitigate impacts to special status species (Section VI.E.2.n.);
   k. quantify LWD placement projects by Planning Watershed, activity under which the LWD was placed (e.g., PTHP, road construction, maintenance, LWD enhancement project), and type (e.g., unanchored trees, anchored trees).

B. Four-Year Status Report

1. MRC shall provide a status report to the Department every four years. The status report shall be submitted to the Department no later than 90 days prior to the end of each four-year period. The Department shall review the four-year status report in accordance with Fish and Game Code § 1605, subdivision (g)(3).
2. The four-year status report shall include, at a minimum:
   a. a copy of the original agreement;
   b. the status of activities covered by the agreement;
   c. an evaluation of the success or failure of the measures in the agreement to protect the fish and wildlife resources;
   d. a discussion of any factors that could increase the predicted adverse impacts on fish and wildlife resources, and a description of resources that may be adversely affected;
   e. suggestions for amendments (Section XIII) to modify or improve the conservation measures contained this agreement that will 1) better meet MRC's management needs while providing and equal or better level of protection to fish and wildlife resources, or 2) reduce observed impacts to fish and wildlife resources;
   f. identification of facilities with recurring problems, and proposals for addressing them; and
   g. suggestions for amendments (Section XIII) to remedy process problems and inefficiencies with this Agreement, and proposals for addressing them.

IX. INSPECTION, IMPLEMENTATION, AND EFFECTIVENESS MONITORING

A. Onsite Inspection. MRC shall allow agents of the Department to observe construction, operation, or completed facility for any activity covered by this Agreement. The Department may inspect the work-site at any time, but will seek to provide at least two work-days advance notice. Inspection will enable the Department to evaluate compliance with the agreement and effectiveness of the measures.

B. Access. MRC shall assure access to the Department by whatever means necessary to enable inspection. MRC may provide an escort.

X. DOCUMENT DESTINATION

All subnotifications, fees, and reports shall be delivered by U.S. mail, overnight delivery service, hand-delivery, or email. All informing notices shall be delivered via email, the date of which evidences the prior notice requisite. Each shall reference this Agreement (No. R1-09-0367), and as applicable, a subnotification identifier. Subnotifications shall include both a hard-copy and electronic format (e.g., CD, email with attachments). Any information required for such subnotifications which cannot easily be transmitted by email must be identified and delivered to the Department by other means.

Mail or hand delivery:

Department of Fish and Game
Northern Region
Attn: Coastal Timberland Planning Program
619 Second Street
Eureka, CA 95501

Email delivery:

Email will be submitted to Eureka1600@dfg.ca.gov, and/or other addresses as the Department may advise.

XI. FEES

A. Fees Required. DFG may refuse to process a subnotification or a request for an extension or amendment until DFG receives the proper fee or fees.

B. Payment Schedule. MRC may choose to submit fees with each subnotification or on a monthly basis for more than one subnotification. Because receipt of fees is a standard of subnotification completion, if monthly submittal of fees is in arrears, subnotification receipt date may be after delivery of the subnotification's informational materials.

C. Base Fee. In accordance with §699.5 of Title 14 of the CCR, MRC paid a base fee of $7,500.00 in December 2009 with the submittal of the Notification for a Master Agreement for timber operations..

D. Annual Fee. MRC shall remit an annual fee of $1120.50, due payable with the first subnotification submitted to DFG each calendar year pursuant to this MATO.

E. Project Subnotification Fee. MRC shall remit a project fee of $200.00 for work at each Class I watercourse encroachment proposed in subnotifications submitted pursuant to this MATO. MRC shall remit a project fee of $65.00 for work at each Class II or Class III watercourse encroachment proposed in subnotifications submitted pursuant to this MATO.

1. Subnotification fees are not needed for routine maintenance of encroachments that are permitted under this MATO. Maintenance project subnotification fees only apply to work sites that are not currently permitted under this or another valid Agreement.

2.. Repeating the same activity at the same site in multiple years (i.e., water drafting, installing and removing serial-seasonal crossing) requires a subnotification fee upon the initial installation, but only an informing notice without any fee in subsequent years. Where changes in design or location are needed, fees for repetitive activities shall be charged as a project fee.

3. Postponement of an activity past the period allotted in Section VI.B. requires a new notice and fee.

4. MRC shall remit an annual "urgent" project fee of $1200.00, for up to 6 "urgent" project requests, not including major amendments, in any calendar year. "Urgent" project requests are those where MRC requests DFG review time period is "immediately" and within 1-2 work days or less. "Urgent" requests are for activities that 1) were not, and could not have been, foreseen in a manner that would enable the standard review period, and 2) do not qualify as an emergency as defined in this MATO.

   a. The $1200.00 annual fee for "urgent" project requests is due the beginning of each calendar year, and prior to any such request.

   b. Unused "urgent" project fees will not be refunded or carried over into future years.

F. Amendment Fee. The fee for MRC to amend this MATO or any of its subnotifications shall be that at the time of the request as specified in Title 14 of the CCR §699.5. As of February 18, 2011, the fee is $168.00 for minor amendments and $560.25 for major amendments. Amendments proposed by DFG are not subject to an Amendment fee.

G. Extension Fee. The fee to extend this MATO shall be that specified in Title 14 of the CCR §699.5 at the time of the request. An extension of this MATO is not considered an amendment.

H. Fee Adjustments. The Annual Fee and Project Subnotification Fees, including "urgent" project fees, will be adjusted each year proportionately with amendments to the Master Agreement Fee Schedule in Title 14 of the CCR §699.5.

XII. MISCELLANEOUS

A. Knowledge of Agreement. MRC shall ensure that MRC employees, agents, representatives, contractors, or subcontractors are knowledgeable of the terms and conditions of this Agreement that apply to the activity before they undertake that activity. MRC shall develop appropriate training materials and provide training as necessary to assure the proper application of this agreement. MRC shall confer with the Department in developing training materials.

B. Agreement on Work-Site. A copy of this Agreement, the associated subnotification, and any Department-approved supplemental or site-specific measures shall be readily available at work-sites during any active work period and shall be presented to any Department employee, or employee of another public agency upon request.

C. Annual Meeting. MRC and the Department agree to meet annually between January and March, inclusive, to discuss this Agreement unless mutually postponed. Topics for discussion may include implementation problems, new information regarding special status species, specific measures in this Agreement, proposed amendments, or any other topic that affects implementation of this Agreement.

D. New Information. If new information becomes available that indicates additional special-status species occur or have a high potential of occurring on MRC covered lands and could be affected by a Covered Activity, additional measures shall be developed and amended into the Agreement to protect those species.

E. Photographs. The photographs described in Section VI.E.2.h. do not need to be submitted with a subnotification. However, they shall be made available to the Department upon request during the review, inspection, or monitoring period. Photographs shall include at a minimum the following four vantages: 1) upstream of the project area, looking downstream through it; 2) downstream of the project area, looking upstream through it; and 3) perpendicular to the stream looking across the project area from each bank, along the road alignment for crossings. In addition, important fish or wildlife habitat features (e.g., LWD accumulations and wildlife trees) in the project area shall be photographed.

F. Restorability Determinations. For purposes of this Agreement, a watercourse that currently functions as a Class II may be deemed restorable to a fish-bearing condition (Restorable Class I) after consultation with the Department either through the PTHP process or a consultation initiated by MRC. For activities that are not part of a PTHP process, MRC may request a field review and determination from the Department.

XIII. AMENDMENTS

A. Process. This Agreement may be amended at any time. Any proposal to amend this Agreement shall be in writing and submitted to the other party for its review and concurrence. The amendment will become effective, provided that:

1. for changes that may affect covered species under their jurisdiction, the U.S. Fish and Wildlife Service or National Marine Fisheries Service concur with the changes.
2. the Department and MRC mutually agree on the amendment;
3. the amendment is duly executed by the Department and MRC;
4. the amendment is made part of the Agreement;
5. MRC pays the amendment fee, if the amendment was proposed by MRC; and
6. the Department has complied with CEQA, if such compliance is necessary.

B. Purposes.

1. Among other reasons, either party may propose to amend this agreement to:
   a. refine or clarify any portion of this Agreement,
   b. correct errors and inconsistencies, and
   c. improve notification and review processes.
2. Among other reasons, MRC may propose to amend this Agreement to:
   a. propose measures substantially different than those described in Attachment A that MRC believes are equally or more protective than measures proposed herein; or
   b. add a new activity to be covered by this Agreement.
3. Among other reasons, the Department may propose to amend this Agreement to better protect fish, wildlife, and botanical resources from impacts resulting from the conduct of activities covered by this agreement based upon new research, information, monitoring results, or field observations of approved activities.

XIV. LIABILITY

MRC shall be solely responsible for complying with this Agreement and shall be solely responsible for such compliance by its employees, agents, contractors and their subcontractors, and any party authorized by MRC to complete one or more of the Covered Activities on behalf of MRC.

XV. DISPUTE RESOLUTION

In the event a dispute arises between MRC and the Department regarding the implementation or interpretation of this Agreement, MRC and Department representatives shall meet to attempt to find a mutually agreeable resolution of the dispute. If MRC representatives and Department representatives cannot resolve the dispute, either MRC or the Department may elevate the dispute to a meeting at the level of the signatories of this. The meeting shall occur within forty-five (45) days of a request by either MRC or the Department, unless an extension is mutually agreeable.

A dispute between MRC and the Department related to new or changed measures needed to protect the fish and wildlife resources that the Department determines during review of the four-year status report shall be resolved as specified in regulation [Fish and Game Code § 1605(g)(3)].

XVI. SUSPENSION

A. Circumstances. The Department may suspend the entire Agreement or any activity authorized by this Agreement and being conducted under a subnotification if the Department determines that circumstances warrant suspension. The circumstances that might warrant suspension include, but are not limited to, the following:

1. Failure by the Operator to comply with any of the terms and conditions of this Agreement;
2. Information provided by MRC to develop this Agreement or the information contained in any subnotification is incomplete or inaccurate;

3. New information shows the activities authorized by this Agreement and conducted in accordance with a subnotification may substantially adversely affect fish and wildlife resources;
4. The Department and MRC do not amend this agreement with measures different from those included in this Agreement that are necessary to reduce potentially substantial adverse effects on fish and wildlife resources;
5. Conditions have substantially changed;
6. Activities being performed under the auspices of this Agreement are not authorized by it; and/or;
7. Failure of MRC to pay fees in a timely manner.

B. Scope. At the discretion of the Department, any action to suspend may be limited in scope to address the specific problem resulting in the suspension. Hence, the Department may limit the suspension to specified activities or specified areas covered in this agreement. The entire Agreement may also be suspended. The Department shall notify MRC of any suspension in writing. Any suspension shall take effect immediately upon receipt of such notice by MRC, or in accordance with the instructions contained in the notice unless the work is necessary to address an emergency. Such notice will identify the reason or reasons for the suspension, the actions necessary to correct the problem, and the scope of the suspension.

C. Obligation to Mitigate. Notwithstanding suspension of any privileges under this Agreement, MRC shall remain obligated to mitigate for the adverse effects that occurred from the actions that resulted in suspension by properly performing such actions to correct the deficiencies as set forth in the Department notification to MRC of proposed suspension and the applicable conservation and management measures identified in Attachment A hereto.

D. Reinstatement. The Department may lift any suspension when it has determined that MRC has adequately addressed the problem resulting in the suspension and that reinstatement will not cause harm to fish and wildlife resources. If after 60 days of written notification of suspension, the Department may continue the suspension indefinitely or move to terminate the Agreement (Section XVIII),

XVII. ENFORCEMENT

A. Access. MRC shall allow the Department to enter all work-sites at any time to ensure compliance with the terms and conditions of this Agreement.

B. Enforcement Action. Nothing in this Agreement precludes the Department from pursuing an enforcement action against MRC instead of, or in addition to, suspending the Agreement.

C. Enforcement Authority. Nothing in this Agreement limits or otherwise affects the Department's enforcement authority or that of its enforcement personnel.

D. Failure to Comply. Failure to comply with the provisions of this Agreement and with other pertinent sections in the Fish and Game Code may result in civil liability and/or criminal prosecution of MRC.

XVIII. TERMINATION

This Agreement may be terminated at any time by the Department or MRC by written notice sent by certified mail. The Department may only terminate this agreement if MRC has violated the terms and conditions of this Agreement, has failed to remedy such violation in accordance with a written demand from the Department, and the Department reasonably concludes that suspending the Agreement is an inadequate response to such violation. Termination shall become effective 30 days after receipt of the termination notice by the other party. In the event this Agreement is terminated, MRC shall be responsible for notifying the Department and, if necessary, obtaining a streambed alteration agreement in accordance with Fish and Game Code § 1602 or 1611 before commencing any activity that would otherwise be covered by this Agreement. In the event that this Agreement is terminated, any existing approved subnotification shall remain valid for the calendar year approved.

XIX. TERM

The term of this Agreement shall be 80 years from the date of execution by the Department, or termination of the HCP/NCCP, whichever occurs first. MRC may not perform any work authorized by this Agreement beyond the term unless MRC notifies the Department and obtains an extension or a new agreement. For work covered in a subnotification approved prior to the Agreement's expiration, the Operator shall be responsible for all conditions in this Agreement intended to protect fish and wildlife resource that might require the Operator to take some action beyond the term of the Agreement.

XX. EXTENSIONS

MRC may request one five-year extension of this Agreement in accordance with Fish and Game Code § 1605. The Department will consider the extension request in accordance with § 1605. The Department will comply with CEQA, as necessary, before approving an extension.

XXI. TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned without the prior written consent of the Department.

XXII. COMPLIANCE WITH OTHER LAWS

MRC shall be responsible for complying with all local, state, and federal laws or regulations that may apply to the activities covered by this Agreement.

XXIII. SIGNATURE AND EFFECTIVE DATE

This Agreement becomes effective on the date of the Department's signature and the Department's receipt of the initial fee. The Department shall not sign the Agreement until MRC has signed it and the Department has complied with CEQA.

MENDOCINO REDWOOD COMPANY, LLC

_____ Date: _____

Jim Holmes
Vice President and Chief Forester

CALIFORNIA DEPARTMENT OF FISH AND GAME

_____ Date: _____

Neil Manji
Regional Manager
Northern Region

ATTACHMENT A

MASTER STREAMBED ALTERATION AGREEMENT
Notification Number: R1-09-0367

ATTACHMENT A

MEASURES FOR COVERED ACTIVITIES

I. ALL COVERED ACTIVITIES. The following measures apply to all Covered Activities. In cases where MRC must deviate substantially from these measures due to site-specific circumstances, MRC shall first consult with the Department, at whose discretion the proposed activity will be included in a separate agreement under Fish and Game Code § 1602 or 1611.

A. Project Design. Project design shall employ site-specific information to avoid impacts to fish and wildlife resources whenever feasible, and mitigate them as close as feasible to the point of impact.

B. Habitat Elements. If disturbing or removing boulders, stumps, or logs large enough to be key pieces cannot be avoided during project lay-out and construction, or if these materials otherwise become available during crossing maintenance, landing, or road decommissioning, MRC shall place them in the channel on-site or immediately down stream, on the floodplain downstream of the crossing, or shall stock-pile them for use in an aquatic habitat enhancement project consistent with the Department's California Salmonid Stream Habitat Restoration Manual [2] (or subsequent revisions) and the MRC HCP/NCCP (Section 8.2.3.6)[3].

C. Professional Services and Expertise. The references cited in this Attachment describe methods and techniques employed with success by other practitioners. These represent a starting point for project design and implementation. They are not a surrogate for, nor should they be used in lieu of, a project design that has been developed and implemented according to the unique physical and biological demands of the site-specific landscape. Nor are they a surrogate for acquiring the services of appropriate professional expertise, including but not limited to appropriate Department staff, licensed engineers, or registered geologists where the Business and Professions Code calls for such expertise.

D. Special Status Species

1. Aquatic species impact minimization. Construction, reconstruction, repair, maintenance, or decommissioning in the wetted channel when listed fishes are present shall only be undertaken in such a way that limits exposure of on-site fishes to direct "take," and to mitigate adverse impacts to habitat.

a. During periods when redds may be present and inhabited, the wetted channel shall be inspected by an aquatic biologist. MRC shall avoid redds when using heavy equipment. If redds are present at the project site or downstream and may be active, MRC shall postpone work in the wetted channel until a later date or conditions specified by the Department.

b. Unless the Department [4] approves otherwise, heavy equipment crossing and operation in the wetted channel shall be preceded by MRC efforts to isolate the project area and salvage covered fish and covered amphibians. Salvage operations shall be accomplished by:

1.) Blocking fish and amphibian movement into the project site using natural (dewatered riffles) or installed barriers (e.g., blocknets) as near as practicable to the work site.

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[2] Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual, Third Edition. California Department of Fish and Game, Sacramento, CA. Var. Paging. Available at http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp.

[3] Unless specified as to the HCP/NCCP or the Agreement, any reference in this Attachment to "Section" refers to this Attachment.

[4] MRC may be relieved of salvage efforts if the Department finds that potential covered species on site are 1) recovered, thus making such efforts excessive; 2) extirpated, thus making such efforts meaningless; or 3) more severely impacted by the prescribed salvage operations than by the instream activity.

2.) Removing fish and amphibians by making at least 2 sweeps with block seines, and then at least one with an electrofisher. Additional passes shall be made if a depletion of at least 75% is not realized.

3.) If holding time is expected to be > 2 hours, salvaged fish and amphibians shall be placed into the nearest large pool in the wetted channel from which they can re-colonize the site when the barriers are removed. Cover in these pools shall be enhanced by placing branches into them to increase visual complexity and hiding cover and to reduce competition.

4.) If the holding time is expected to be ≤ 2hours, salvaged fish and amphibians shall be placed into (a) live car(s) held in the nearest well-shaded pool of adequate depth in the wetted channel, from which they shall be returned to the work site upon completion. Live cars shall also have cover added.

5.) Fish and covered amphibians salvaged during these operations shall be tabulated by species and condition (healthy, injured, dead), and reported to the Department in annual reports as specified in the Agreement (Section VIII.A.). Processing animals shall be done to the extent practicable with minimal handling.

c. In-water work with heavy equipment shall be minimized, regardless of listed species presence. Absence of listed fish species may be assumed when the watercourse at the work site is dry at the surface; is above a Department-confirmed barrier to anadromy, and fish on-site are non-listed taxa; or if the watercourse is presently a Class II that is considered to be a restorable Class I. MRC may assert absence when MRC biologists, acting under the appropriate state and federal permits, find through diligent effort [5] that listed species are absent and, if necessary to assure continued absence during work periods, undertake measures (e.g., placement of blocknets) to assure none are present during the in-water work.

2. Terrestrial species impact minimization.

a. As part of project planning, MRC shall scope biological resources at risk from the Covered Activity and perform the analysis necessary to assure that significant impacts are unlikely. The analysis shall follow the guidance provided to RPFs by CALFIRE [6]. MRC shall make these analyses available to the Department, upon request.

1.) If habitat is present for a special status species other than HCP/NCCP Covered Species, MRC shall conduct an analysis to determine if the activity may result in a significant impact, and if so shall develop and apply mitigation measures intended to keep impacts at a level of less-than-significant. Analysis shall consider both impacts of habitat modification (i.e., change in the physical and biological environment after project completion) and disturbance (i.e., noise and commotion during construction). Analysis shall include the project site and associated borrow or spoil areas.

2.) MRC shall advise the Department of positive encounters with special status species by submitting the most current form of a California Natural Diversity Data Base (CNDDB) report in the subnotification (Section VI. E. of the Agreement). . The Department will assure that a copy of the CNDDB record is submitted to the appropriate CNDDB staff.

3.) For species covered by the HCCP/NCCP, conservation measures applied shall be in accordance with the HCP/NCCP. For other species, the subnotification shall detail MRC-proposed mitigation measures for encountered special status species

4.) This Agreement shall not cover the proposed activity if, in the opinion of the Department or the wildlife agencies [7]:

[5] Diligent effort shall be by visual observation in simple and easily observable waters; snorkel surveys in larger waters; and electro-fishing in more complex waters.

[6] See pages 12-15, http://www.fire.ca.gov/ResourceManagement/PDF/THPINST0100.pdf

[7] The Department will communicate with the jurisdictionally appropriate federal wildlife agency regarding take avoidance requirements that are not covered species of the HCP/NCCP.

a.) avoidance measures are not achievable for species that are not HCP/NCCP covered species but are listed under the ESA and/or CESA;

b.) the level of take or impact for covered species, or the type of conservation measures proposed for those species, are not as provided in the HCP/NCCP; and / or

c.) after mitigation, significant impacts remain for special status species.

b. MRC shall not remove vegetation containing bird nests during construction, reconstruction, repair, maintenance, or decommissioning of facilities.

c. If MRC encounters special status species during the conduct of Covered Activity, work shall be suspended, the RPF notified, and conservation measures shall be developed in agreement with the Department prior to re-initiating the activity.

E. Seasonal Work Periods

1. Unless otherwise specified, work in the active channel shall be limited to the following work periods:

a. Class I watercourses – June 15 until the cumulative precipitation threshold is met.

b. Class II_L watercourses – June 1 if the channel contains surface water, or May 15 if the channel is dry until the cumulative precipitation threshold is met.

c. Class II_S watercourses – June 1 if the channel contains surface water or May 1 if the channel is dry until the cumulative precipitation threshold is met.

d. Class III watercourses – June 1 if the channel contains surface water, or April 15 if the channel is dry until the cumulative precipitation threshold is met.

2. Notwithstanding the work periods identified in I.E.1., MRC shall provide an informing notice to the Department about operations (location, expected duration) that continue beyond October 15.

3. Seasonal work periods may be extended to allow completion of work in the active channel during extended, dry, rainless periods when there is a low probability of substantive precipitation and when biological resources are least susceptible to impacts. MRC shall NOT request extensions that into periods with probable rain, nor for encroachments that include activities in the active channel of Class I or Class II_L watercourses once adult salmonids begin spawning migration in plan area watercourses.

a. MRC's request for site-specific work period extensions shall include:

1.) a description why the extension will not increase impacts to biological resources;

2.) a projection of the work period, inclusive of application of associated erosion control; and

3.) precipitation forecasts as described under soil erosion control (Section I.G.6.) that demonstrate no precipitation is expected during a period at least 48 hours after the projected work period, inclusive of erosion control application.

4.) status of salmonid spawning migration in the plan area.

b. Evidence (e.g., the email) of the informing notice for an extension shall be verifiable at the worksite during all subject activities..

c. During work period extensions, erosion control must be applied as specified by Section I.G.5.

4. If the National Weather Service forecasts[7] > 30% chance 0.5 inches of rain during a non-winter period storm event, MRC shall curtail work activity in a way to minimize sediment and delivery to the watercourse, including the application of surface erosion control.

5. Work periods for any Covered Activity shall comply with timing restrictions in the HCP/NCCP when those activities fall within the associated buffers for Northern spotted owls, marbled murrelets, and Point Arena mountain beaver.

F. Hazardous Materials

1. Equipment shall be maintained, stored, staged, and refueled outside the AMZs where spilled or leaked materials will not have access to watercourses.

2. Other hazardous materials shall be a) stored outside the AMZs where spilled or leaked materials will not have access to watercourses and b) used within label directions and limitations.

3. Absorbents and containers large enough to clean potential spills and contain the waste shall be kept and employed at worksites where petroleum products or other toxic materials may be spilled.

4 MRC shall report to the Department as soon as practicable any spill of petroleum or other toxic materials that is delivered or has the potential to deliver to a watercourse.

5. MRC shall take immediate action to fully contain any spill by measures in #3 and/or as guided by label directions.

6. Hazardous materials and contaminated soils shall be disposed at a facility designed and authorized to accept hazardous wastes.

G. Soil Erosion Control

1. Within an AMZ, and further if hydrologically connected to a watercourse, bare mineral soil greater than 100 square feet (exclusive of rocked road surfaces, fill-slope armoring, cut-faces > 65% slope, and alluvium within active channel of the streambed) exposed due to the activity shall be treated to minimize soil erosion.

2. MRC shall assure that any area upslope of the work site and exposed by the activity does not cause or contribute to surface, rill, or gully erosion at work sites. This shall be accomplished by:

a. incorporating a drainage channel with surface armoring (rocks or other treatments described in notices); and/or

b. dispersing water from upslope sources before it has access to the work area via water bars and out-sloping.

3. Surface erosion control treatment, other than that for road surfaces and drainage facilities described in Section I.0., shall be any one or a combination of the following, provided that the method chosen results in conditions (i.e., depth, texture, and ground contact) that provide erosion protection equivalent to mulch applications:

a. Mulch. MRC shall apply straw or locally available mulch. Under conditions of equal cost and availability between standard and weed-free straw, MRC will use weed-free straw. If MRC cannot obtain weed-free straw, MRC shall conduct exotic control during the following spring. Mulch shall be in contact with and cover at least 90% of the surface area to a depth of greater than two inches.

b. Slash. Slash shall be tractor-compacted where feasible, otherwise hand-placed. MRC shall cover at least 80% of the surface area with slash below 6 inches in depth.

c. Seeded. Seed shall be native species or sterile varieties of short-lived or annual non-native species that are known not to persist or spread in the ecosystem, such as barley (*Hordeum vulgare*), buckwheat (*Fagopyron esculentum*), rye (*Secale cereale*), wheat (*Triticum aestivum*), and Regreen®. Annual (or "Italian") ryegrass (*Lolium multiflorum*) or other non-native invasive species may ***not*** be sown for erosion control purposes. Seeding rate shall be stated in subnotifications and shall be as prescribed by the supplier with a goal of achieving > 80% coverage as surviving plants the following May 1. The Department must concur if MRC proposes seeding alone (i.e., not in combination with another measure).

d. Rocking. MRC may apply rock sized and at a coverage that meet or exceed the intent specified in Section I.G.3. The subnotification shall specify intended coverage and rock specifications.

e. Other methods. MRC may apply other methods (e.g., erosion control blankets, erosion matting) that meet or exceed the intent specified in Section I.G.3. if MRC provides to the Department the manufacturer's directions for use, and follows these directions. Geotextiles, fiber rolls, and other erosion control treatments shall not contain plastic mesh netting.

f. Treatment not required. Notwithstanding the methods described above, if there are soils exposed for which there is very little risk of surface erosion reaching a watercourse, MRC may forego treatments ***if*** the Department concurs in advance of the practice. Where possible, the overburden from the site shall be set aside during construction and

then redistributed over the site to enable the pre-existing local flora to reestablish via seedbank release or sprouting of plant parts.

4. Where surface treatments to control erosion will not prevent entrained sediment from entering a watercourse, MRC shall supplement them with sediment barriers (e.g., silt fences, hay bales, fiber mats, wattles, sediment basins, check dams) along concentrated runoff flow paths, on an as-needed basis to enable sediments to settle prior to delivery. The sediment barriers will be maintained in operating condition. If a sediment barrier fails to retain sediment, corrective measures will be immediately employed. Sediment captured behind barriers will be disposed in a location or manner where it cannot discharge into a watercourse.

5. Treatment shall be completed prior to the onset of precipitation capable of generating on-site run-off, and prior to October 15 of the year of activity, unless acting under a seasonal work period extension as provided in Section I.E.

6. For any Covered Activity outside the seasonal work period (see Section I.E), erosion control materials shall be stored on-site and be effectively applied:

a. immediately upon completion of work;

b. before breaks in work at the site that will exceed 1 day; or

c. 48 hours before any 24 hour period during which the National Weather Service forecasts [8] for the project vicinity either:

1.) greater than 30% chance of rain; or

2.) rain exceeding 0.25 inch.

7. Subnotifications shall identify the locations and measures for surface erosion control. After the SUBNOTIFICATION is submitted, MRC may change its intended surface erosion control measures to one or a combination of the others. If changing to "treatment not required," or an alternate not described above, MRC shall acquire the written concurrence of a Department representative.

H. Work Areas, Equipment, and Materials Storage

To the extent practicable, construction equipment and materials (e.g., road rock and project spoil) shall not leave the existing or proposed road way. All equipment and materials storage areas and work areas off the road prism shall be the minimum necessary.

I. Disturbance or Removal of Vegetation

The disturbance or removal of vegetation shall not exceed the minimum necessary to complete the operations. Ground disturbance shall not extend 50 feet beyond the final project's footprint without advising the Department of such needs in the subnotification.

J. Watercourse Channel and Gradient Restoration

If the watercourse has been altered during construction, reconstruction, repair, maintenance, removal, or decommissioning of the facility, its cross-sectional shape and longitudinal gradient shall be returned as nearly as possible to its natural configuration or that which existed prior to the disturbance. The natural channel grade shall be determined by flagging the natural channel bottom upstream and downstream of the affected area and approximating a straight line between the flags. At any point, removal of materials can stop a) above the "straight line" when equipment hits the natural channel as revealed by channel cobbles or parent material that clearly is not fill material, or b) when on-site derived alluvium has been treated as described below (I.M.3).

K. Active Channel Heavy Equipment Use

1. Heavy equipment shall not be operated in the wetted channel except as may be necessary to construct and remove diversion or cofferdams intended to divert stream flow and isolate the work site, or as otherwise specifically provided for in this Agreement. Once a work area has been isolated from the channel, fish salvage has been completed, and water evacuated, operations in water that subsequently infiltrates to work area shall not be prevented by this condition as long as MRC maintains the work area fish-free and prevents delivery of sediment and turbidity downstream.

2. Equipment operated in the active channel and AMZs shall be frequently inspected, and repaired as necessary to be in good operating condition.

[8] See http://www.wrh.noaa.gov/forecast/wxtables/index.php?wfo=eka

3. Equipment used to construct, reconstruct, repair, maintain, remove, or decommission a facility shall be cleaned prior to entering the active channel.

4. Equipment in the active channel or the AMZ that is stationary shall have drip pans placed beneath leak points to capture spills.

L. Temporary Dams / Dewatering

1. Unless infeasible, work in Class II and Class III watercourses shall be postponed until times when the channel is dry. Damming and dewatering only the side of the channel where work is occurring while allowing the flow to pass along the other side uninhibited shall be used to the maximum extent feasible.

2. If turbidity from construction may be transported downstream into Class I or Class II aquatic habitat, the flow shall be diverted around the work area by a temporary pipe, diversion channel, or pumping. Temporary dams to direct the flow into the diversion pipe or channel shall be impervious enough to isolate the work area from downstream habitat.

3. As necessary to retain the turbidity generated onsite and to preclude its mixing with downstream waters, sediment stilling basins or check dams (i.e., gravel-filled sand bags, hay bales, or other type of barriers lined as necessary to collect sediments) shall be installed at the first suitable locations downstream of the work area. Multiple check dams will be installed as necessary to control turbidity.

4. Any temporary dam required during construction shall only be built from clean materials such as screened and washed gravel or other materials that will minimize: 1) turbidity; 2) fining of stream beds; and 3) aggradation of pools.

5. When any dam or artificial obstruction is being constructed and employed, sufficient water shall at all times be allowed to pass downstream to sustain aquatic life below the work area.

6. The area dewatered by any dam or artificial obstruction shall be the minimum necessary to successfully dewater the work area and complete the intended work.

7. Duration of dewatering shall be the minimum necessary to complete the work. MRC shall advise the Department in subnotifications if dewatering for construction is expected to be in excess of two continuous days. The Department may review the proposed construction methods and require an alternative to the extended dewatering.

8. Cross-stream dams shall be breached slowly to prevent stranding potential as the upstream dam-created pool drains, and prevent elevating turbidity and water temperature as water flows across the previously dry channel.

9. Material imported for temporary dams shall be removed as described in Section I.M., and alluvium collected on-site for temporary dams shall be treated as described in Section I.M.3.

10. Sediment check dams and stilling basins shall be cleaned of trapped sediment as necessary to maintain proper function, and upon completion of operations. Recovered sediment shall be disposed where it can not be delivered to a watercourse. Sediment check dams shall be treated as described in Section I.M.5., or completely removed from the channel upon completion of operations.

M. Waste, Debris, and Material Removal

1. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to aquatic life, resulting from the project shall be prevented from contaminating the soil and/or entering the waters of the state, including unintended leakage. Any of these materials placed within or where they may enter a stream or lake by MRC or any party working in its behalf or with its permission shall be removed immediately.

2. MRC or the operator shall not dump any personal litter or trash. All such debris and waste shall be collected daily and properly disposed.

3. River-run gravel that is gathered and used on-site and in the active channel for temporary purposes (e.g., temporary crossings, diversion dams) need not be removed. Rather, it may be spread across the area of origin, or the temporary feature may be breached. For cross-channel dams, the breach shall be greater than or equal to the low water channel width and as close to the low water channel as possible. Side-channel dams shall only be breached at their downstream limits. The remainder of the material shall be modified as necessary to avoid deflecting high flows

into banks, but may otherwise remain in place and allowed to be processed by the impending winter runoff.

4. Equipment, supplies, and materials that are not designed to withstand high seasonal flows shall be moved to areas outside the AMZ before such flows occur.

5. Earthen spoil material shall be disposed in a way that it does not have access to a watercourse either directly or through hydrological connection. It may be stored, drifted over the surfaces of roads or landings near the project area where surface gradient is < 5% and side slope < 30% or it may be hauled to designated spoil areas or quarries. Earthen spoil piles shall be stabilized by tractor contouring to drain water and tractor compacting to stabilize the spoils into the hillside, road prism, or disposal site. Where materials are disposed by drifting them back onto road surfaces, they shall be stabilized with surfacing, erosion control materials, packing with heavy equipment, and/or water.

N. Concrete and Cement

1. Pre-cast concrete shall be fully cured before placing it in a location that may contact surface waters.

2. When poured concrete is used, the work site shall be isolated from flowing or standing water via diversion dams. Flow shall be excluded from poured concrete for ≥ 30 days after it is poured. During that time, the poured concrete shall be kept moist, and runoff from wetting shall not be allowed to contact or enter the wetted channel.

a. Commercial sealants may be applied to the poured concrete surface to shorten the time over which water must be effectively diverted around the site. MRC's representative must advise the Department in the subnotification of intent to use a sealant. The subnotification must include a copy of the manufacturer's guidance regarding the drying/curing time necessary to avoid water quality and fish and wildlife impacts, and a commitment by MRC to meet or exceed those requirements.

b. While poured concrete is curing, the diversion shall be inspected at least daily to assure that it continues to bypass maximum flow (e.g., siphon is not lost, the temporary barrier is not at risk of being overtopped [including consideration of weather forecasts], nor its integrity compromised). Note: Because of the toxicity of uncured concrete in aquatic systems, the temporary barrier and bypass system must be maximally effective.

c. While poured concrete is curing, MRC shall keep a record of daily surface water pH immediately upstream of the diversion and downstream of the diversion outlet. If pH downstream is more than 1.0 unit different than water immediately upstream of the work area, MRC shall take immediate action to further reduce through-flow or underflow of the flow diversion and shall contact the Department within 24 hours. The log shall be made available to the Department upon request.

O. All Road Approaches to Watercourses

1. Road approaches to bridges and drafting sites, and their drainage facilities shall be designed, surfaced, and maintained to minimize sediment discharge to watercourses, and repaired where there currently exists sources of sediment delivery to watercourses (such as road surface rilling, ditch down-cutting, and ditch relief culverts failing). Reductions in the effectiveness of erosion control measures due to any use shall be repaired immediately.

2. Permanent roads. Permanent roads within the inner and middle bands of Class I and Large Class II AMZs or within the AMZ of a Small Class II or Class III watercourses shall be surfaced with high-quality, durable, compacted rock; pavement; or functionally equivalent surface.

3. Seasonal and Temporary Roads. MRC shall stabilize before October 15 the surfaces of seasonal and temporary roads used in any year based on future intended use, as follows:

a. No anticipated winter use. Treat temporary roads from the active channel to the closest drainage facility or natural ground surface that hydrologically disconnects the road surface from the watercourse, but not less than 50 feet with rock, slash and seed, straw, mulch, or a combination of these measures.

b. Anticipated winter use.

1.) Winter hauling of logs, rocks, or heavy equipment. Roads shall be surfaced within 200 feet of watercourses, and within the AMZ. Surfacing shall be at

least 6 inches of high-quality, durable, compacted rock; pavement; or functionally equivalent surfaces.

2.) Winter administrative use by vehicles larger than an ATV. Roads shall be treated from the active channel to the closest drainage facility or natural ground surface that hydrologically disconnects the road surface from the watercourse, but not less than 50 feet with rock.

3.) Winter administrative use only by ATV. Roads shall be waterbarred in the AMZ at no greater than 50 ft intervals for grades over 5%, and at no greater than 75 ft intervals for grades below 5%; have additional filters (straw or slash) placed at outlets of waterbars or installed sumps; be shaped to minimize water concentration; and have a width of road surface wide enough to pass an ATV left along the prism's high point to facilitate access. If, in the determination of MRC or the Department, ATV-only winter access generates excessive sediment delivery, this condition will be replaced by the prior winter administrative access condition (b.).

4. Approaches to drafting locations within a WLPZ shall be surfaced with rock or materials with equivalent erosion control capability. Upon site-specific and time-limited approval of the Department, local river-run gravel may be used if it can be adequately compacted to remain in place during the period of use and prevent erosion into the watercourse.

5. At the time of construction, or when active downcutting is observed, ditches on roads that approach a crossing or drafting site shall be rocked-lined from the discharge point in the active channel or flood prone area to a) on level ground (e.g., floodplains), beyond the change in slope at crest of the bank, or b) on steeper ground, to the nearest effective waterbar or rolling dip that directs runoff away from the ditch. Rock surfacing shall be adequate to prevent the ditch from down-cutting and shall be comprised of rock sufficiently large to remain in place under all projected runoff conditions.

6. Approaches to road crossings and drafting sites shall be aligned, designed, and maintained to a) minimize the length of road surfaces and associated drainage ditches that flow into the active channel, and b) taking advantage of local topography and drainage facilities that directs runoff to discharge where it will not flow into the bankfull channel or onto the bridge deck.

II. CROSSINGS

A. All Permanent Crossings

1. New permanent bridges, culverts, and fords on all watercourses that are to remain in place for at least one winter period shall be designed to pass at least a 100-year flood flow, inclusive of wood and sediment loads. This design flow size shall be determined by the 1) rational method for watersheds less than 100 acres, or (2) the USGS Magnitude and Frequency Method for watersheds > 100 acres, as described in Cafferata et al (2004) 9. If proposed sizing is less than the 100-year event estimated from the applicable methods (Rational, Magnitude and Frequency, and flow transference methods), MRC shall explain and justify in the subnotification.

2. Permanent culverts and bridges shall be kept in a fully functional 10 state year round. MRC is responsible for such maintenance as long as the culvert or bridge remains in the stream and MRC is the current landowner. Crossings with compromised function shall be repaired or reconstructed as soon as possible.

3. Crossings that demand frequent obstruction or sediment removal to remain fully functional shall be prioritized for upgrading no later than the next PTHP that uses it.

4. Sediment removed from the crossing inlet during regular maintenance to regain lost design flow conveyance function shall be disposed as described in Section M5.

5. For the purpose of permanent bridge and culvert maintenance, MRC may remove accumulations of sediment; trunks, branches, and limbs of live, rooted trees and shrubs; and woody debris that

[9] Cafferata, P., T. Spittler, M. Wopat, G. Bundros, and S. Flanagan. 2004. Designing watercourse crossings for passage of 100-year flood flows, wood, and sediment. Calif. Forestry Report 1. 34 pp.

[10] "Fully functional" means that the crossing's ability to convey flood flow -- inclusive of water, sediment, and wood -- is not diminished below the crossing's initial design parameters.

reduce active channel capacity and/or endanger a crossing (i.e., they encroach into the bank-full cross-sectional area). A subnotification is required when any of the following actions are expected:

a. Live branches, stems, and/or trunks ≥ 6" diameter will be severed or removed;

b. Work will extend upstream and/or downstream from the crossing's footprint the lesser of 50 feet or 5 times the active channel's width (as measured in the first upstream channel unaffected by the crossing's backwater influence).

c Equipment larger than hand tools will be positioned off the road prism.

6. MRC may repair, maintain, or replace bank stabilization features such as rip-rap at culvert and bridge crossings. MRC shall confine these activities to an area not to exceed 30 feet beyond the failed or failing feature. The bank stabilization features shall be of the same or better quality than that being replaced. Bank protection features shall be fully described in notices and should be designed using recognized standards of engineering practice (such as the Federal Highway Administration's Hydraulic Engineering Circular No. 11 (FHWA HEC 11) 11, US Army Corps of Engineers Engineering Manual 1110-2-1601 12, or the California Bank and Shore Rock Slope Protection Design Manual, CALTRANS in cooperation with the FHWA, 2000 13). If a structural stabilization method is proposed that differs from that initially constructed, MRC shall gain Department approval before beginning. Stabilization methods authorized by this Agreement include re-sloping the banks, installing rocks, toe trenches, and bio-engineered features.

7. During reconstruction, replacement, repair or decommissioning of existing crossings, MRC shall take precautions to minimize significant sediment from fill and the crossing surface being delivered into the watercourse (e.g., capture on tarps or a straw layer to facilitate removal of sediment).

B. All Permanent Watercourse Culverts (excludes vented fords)

The following measures for all permanent culverts, are derived primarily from Cafferata et al (2004) [6] and Weaver and Hagans (1994) [14].

1. MRC shall advise DFG in a subnotification if culvert sizing as determined by the methods in Section II.A.1 result in a diameter < that which results from the "3 times bank-full stage" method [6].

2. MRC shall size culverts using a HW:D ratio at design flows less than or equal to:

a. 0.67 for unmodified, standard crossings; or

b. 0.75 for culverts with inlets that are beveled, mitered to conform to the fillslope, or with flared metal end sections; and

c. a value disclosed in the subnotification to the Department where field conditions indicate that greater HW:D ratios will perform adequately. MRC is encouraged to pre-consult with the wildlife agencies regarding a proposed reduction in culvert size. Rationale might include measurements of bankfull cross-sectional areas < 0.33 of the proposed culvert cross-sectional area [15].

3. HW:D ratios shall incorporate the design allowances for the culvert being installed below stream grade as per other sections of this Agreement.

4. Where there is greater than 5 feet of fill above the culvert as measured on the discharge end of the culvert, the

a. culvert sizing shall be increased by 6 inches above that calculated for the design flow for every 5 feet of fill above the culvert, or

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[11] Metric version available at http://www.fhwa.dot.gov/bridge/hec11SI.pdf

[12] Available at http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-1601/entire.pdf

[13] Available at http://www.dot.ca.gov/hq/oppd/hydrology/ca_riprap_thru_b.pdf

[14] Weaver, W.E., and D.K. Hagans. 1994. Handbook for forest and ranch roads: A guide for planning, designing, constructing, reconstructing, maintaining and closing Wildland roads. Mendocino Co. Res. Conserv. Dist, Cal Depart. Forest. Fire Prot., and USDA Soil Conserv. Serv.

[15] When using channel dimensions to size a crossing replacement, the channel shall be evaluated at similar gradient near the crossing but away from crossing-caused aggradation or degradation.

b. the culvert shall be sized for both 150 year flood and shall be > active channel width.

5. Notwithstanding the preceding culvert sizing instructions, the minimum diameter of a permanent culvert that experiences flood flows shall be 24 inches. Culverts that may not experience flood flows [16] need not follow this minimum size criterion.

6. Construction of culverts that require activity in the active channel of Class II or Class III watercourses shall be after April 1 if the crossing is dry, or after May 15 if it is not dry.

7. When replacing a culvert that is sized to pass the calculated 100-year flood but still exhibits plugging problems, the culvert's effective cross-sectional area shall be > 3 times the bankfull area.

8. Wherever possible, install culverts at the same gradient as the natural stream channel. Where not feasible, protect road fill and control depth of outlet scour with downspouts (Section II. E. 6.) and/or rock armoring.

9. Install culverts so that they are aligned along the axis of the natural channel to avoid angular deviation.

10. If necessary to construct a channel above the inlet, its width shall be as close to the inlet diameter as feasible.

11. On confined channels where bankfull indicators are absent, culverts shall be at least as wide as the stream's active channel width, as measured outside of the influence of the crossing.

12. Permanent culverts that may experience flood flows shall be designed to be "fail-safe" as per Weaver and Hagans (1994). Wherever feasible, culvert crossings shall have a "critical dip" above the axis of the culvert or at the hinge point of the road. Where infeasible, a subnotification shall describe proposed alternative critical dip alignments or measures (e.g., over-sizing culverts). The critical dip shall be designed with a cross-sectional area at least as large as that of the culvert and be in place during the winter period.

13. Culvert outlets shall extend ≥ 1 culvert diameter beyond the fill, and in no case less than 2 feet.

14. In order to minimize ponding potential upstream of the inlet, the inlets shall extend beyond the fill as little as necessary to a) prevent road materials sidecast by grading from being delivered to the watercourses and b) enable inlet armoring.

15. Fill faces shall be compacted by tractor-walking. If site-specific conditions prevent tractor walking, fill faces shall be compacted with vibra-compacter, knuckle-compacted with excavator, or equivalent methods.

16. Fill faces shall be slashed or mulched, and shall not exceed 80% slope ratio, unless they are armored with rock, riprap, or concrete blocks.

17. Fill faces at inlets and outlets that will be exposed to the design flow shall be protected from stream flow erosion via armoring that consists of graded rock riprap or other non-erodible material and design (e.g., concrete head wall). Where used, riprap shall be constructed to remain in place during 100-year flows, and extend at least as high as the top of the culvert. On inlets, riprap shall extend sufficient distance upstream as "wing walls" to prevent bank erosion. Culvert outfalls shall be riprapped in a U-shaped channel, with clean material of sufficient size to remain in place during 100-year peak flow events. Riprap in the active channel downstream of the culvert shall be set below grade so as to allow the natural accumulation and transport of bedload at stream grade.

18. With the exception of drop inlets, the inlets of all new culverts shall be set to not create backwater effects or to store sediment.

19. Backfills shall be free of rocks > 6", limbs, other woody material (greater than 6 "diameter), or debris that could dent the pipe, cause uneven fill settling, or allow water to seep around the pipe. The crossing backfill base and sidewall material shall be compacted before the pipe is placed in its bed. A minimum amount of fill material shall be used for the bed to reduce seepage into and along the fill. Backfill material shall be compacted at regular intervals (0.5 to 1.0 foot lifts) until at least 2/3 of the diameter of the culvert has been covered.

20. To counter the effects of sag after the culvert is buried, culverts shall be installed with a "camber" or slight hump in the bed centered under the middle of the pipe where feasible. The amount of camber should be between 1.5 to 3 inches per 10 feet of culvert length.

[16] Discharge emanating from a spring or a seep is stable relative to that of watercourses draining basins.

21. Where a crossing is to be replaced and there is evidence of voids or potentially unstable fill, the trapezoidal wedge of existing fill material in the crossing shall be excavated down vertically to the approximate natural watercourse channel and outwards horizontally to the approximate crossing hinge points to remove potential unstable materials and eliminate voids in the old fill prism

22. MRC shall inspect all newly constructed or reconstructed culverts at least five times over the first five years after work completion as directed in Table E-3 of the HCP/NCCP. Inspection of new or reconstructed crossings, inclusive of downspouts and energy dissipaters, will be to assure their functioning as designed and if not to identify and schedule needed repairs.

23. Culverts with perforations or separations shall be repaired or replaced according to the prioritizing scheme described in the HCP/NCCP (Section 8.3.3.2.1). If the repair consists of an insert into a culvert or invert paving[17], the repaired culvert shall a) have an invert roughness comparable to that which existed prior to the repair, b) not inhibit fish passage, and c) not reduce the flood-passing capacity to less than the design flow.

24. MRC is encouraged to pre-consult on a proposal for a permanent crossing that includes multiple culverts. Any multiple-culvert crossing shall have offset pipes such that one pipe conveys all of the low flow.

C. All Permanent Bridges

1. For any new permanent crossings or replacement of an existing permanent crossing for which design flow calculations require a culvert larger than 48 inches, MRC shall install a bridge unless MRC explains and justifies the alternatives and the Department concurs with the alternative.

2. Where possible during installation, bridges shall be suspended across the watercourse using cables and heavy equipment or cables and corner blocks to avoid a) altering bed and bank and b) crossing the wetted channel with heavy equipment.

3. The freeboard (i.e., the distance between the water level and the lowest part of a bridge structure) shall be above design flow stage, unless the wildlife agencies approve an alternative caused by other design considerations (e.g., large amounts of fill for the abutments).

4. Provide effective erosion protection for bridge abutments, piers, and watercourse banks influenced by the hydraulic conditions of the bridge, at least up to the level of the design flow stage or the edge of the terrace or the topographic bench upon which the bridge rests. Abutment fills shall be minimized. Built-up approaches shall be dipped to allow floods to flow over and around them.

5. In removing and decommissioning bridges, the operator shall excavate all loose dirt from the bridge deck and ends prior to yarding the bridge across and above the active channel.

6. Existing abutment material beneath the bridge ends (logs and or rocks) shall be left in place where they are sound and provide stream bank stability

7. Prior to installing or reinstalling any bridge, all loose dirt, petroleum residue, and debris shall be removed to an area outside of the flood prone area.

D. Permanent Class I Watercourse Culverts or Bridges (Including Restorable Class I Watercourses)

1. Bridges shall be installed at all new and replacement crossings at Class I watercourses and restorable fish-bearing streams unless infeasible. Where bridges are not feasible on Class I watercourses crossing replacements, MRC shall provide in the subnotification the rationale for bridge infeasibility and resulting crossing design alternatives. MRC is encouraged to pre-consult where crossings other than bridges are proposed on a Class I crossing.

2. MRC shall construct clear span bridges with abutment fills outside the bankfull channel. Log stringer bridges may be installed, but all surfacing material shall be screened, washed, durable clean rock if the surfacing material is not otherwise planked, plated or paved. Side-boards shall be erected to retain the surfacing materials on the running surface.

3. Structural arch culverts shall have footings outside the active channel.

4. All in-water work with heavy equipment shall be minimized, regardless of listed fish presence.

[17] Invert paving is the act of coating or lining deteriorated culvert barrels to protect them from further corrosion or abrasion. Invert paving has used concrete or liquid and solid mixes of chemical compounds to create a surface capable of quickly hardening and withstanding abrasion.

5. Heavy equipment crossing for construction purposes in surface waters with listed fishes present shall be constrained to a single round trip crossing. If more than the single round-trip is required, MRC shall either isolate the area with temporary dams (Section I.L.) and diverting flow around it or construct a temporary bridge or culvert to support the bridge or culvert installation work. Any fill material within the active channel shall be composed of either washed, clean rock or locally derived river-run rock.

6. In surface waters with listed fishes present, construction, reconstruction, repair, decommissioning, or maintenance activities that mandate more in-stream activity than a single round-trip crossing shall only be undertaken between June 15 and October 15 unless operating under an extension (Section I.E).

7. If bridges are infeasible, culverts shall be in order of desirability:

a. bottomless multi-plate arched culverts;

b. "squashed" pipe arched culverts buried to at least 1 foot in the channel; or

c. round culverts.

1.) Where channel slope is less than 3% and the culvert is less than 100 feet, the bottom of a round culvert shall be buried into the streambed not less than 20 % of the culvert height at the outlet and not more than 40 percent of the culvert height at the inlet.

2.) Where channel slope is less than 6 % or the culvert is equal to or greater than 100 feet, the inlet and outlet of the round culvert shall be buried into the streambed not less than 30 percent and not more than 50 percent of the culvert height.

8. When replacing culverts that, due to insufficient size or inlet placement above the natural channel have stored sediment, MRC shall:

a. Remove all stored sediment to the extent feasible along the channels alignment upstream of the crossing using heavy equipment operating from the road's running surface, or the limits of the road-fill material as it is removed.

b. If all stored sediment upstream of the crossing is not accessible from the road surface or prism as it is lowered with heavy equipment, subnotifications shall identify one or a combination of the following measures to be applied, along with MRC's rationale for its selection. MRC is encouraged to pre-consult with the Department.

1.) Heavy equipment operated not from the road surface or prism, but within boundaries for its use that are described in the SUBNOTIFICATION.

2.) Grade control features such as boulders and log 'v' weirs to meter sediment release. Design specifications shall follow the California Salmonid Stream Habitat Restoration Manual and / or other relevant sources.

3.) Stabilize the banks through the stored sediment with riprap sized to remain place during design flows.

4.) Replacement of the culvert in-place, keeping the remaining sediment in place.

5.) conditions derived through a multi-disciplinary review enabled through incorporating the proposed replacement in a PTHP.

9. Culverts shall be designed, constructed, and maintained such that they do not: a) constitute a barrier to upstream or downstream movement of fish [18], b) significantly disrupt on-going bedload transport dynamics, or c) significantly reduce the active channel's existing or optimum cross-sectional area. Natural, open-bottom crossings or embedded culverts that are sized to pass the design flow and approximate the pre-project active channel width will often ensure that the culvert will not impede movement.

10. For durability and strength reasons, culverts made of plastic shall not be installed on Class I or restorable Class I watercourses without prior DFG approval.

[18] See the California Stream habitat Restoration Manual for fish passage guidance (http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp).

11. Trash racks shall not be constructed at Class I crossings. Existing trash racks shall be removed from Class I crossings upon replacements.

12. Routine maintenance

a. Routine maintenance that does not include work in the active channel is not seasonally restricted. Routine and occasional maintenance that includes work in the active channel and is not necessary for assuring design flow conveyance capacity or the structural integrity of a crossing is restricted according to Section I.E.

1.) Obstruction removal. MRC may remove debris, trash, rubbish, flood-deposited woody and herbaceous vegetation, fallen trees, branches, sediment, and other obstructions that reduce a crossings flow conveyance capacity and / or endanger a permanent crossing at any time. MRC shall inform DFG if obstruction removal extends further than 50 feet or 5 times the active channel width (as measured in the first upstream channel unaffected by any backwater influence from the crossing), whichever is less, upstream and downstream from the facility's footprint.

2.) Non-emergency obstruction removal that requires heavy equipment in the flowing water or off the road's prism requires notice.

b. MRC shall inspect existing Class I and restorable Class I culverts and bridges to identify maintenance needs such as risk of failure; presence of migration barriers caused by corrosion, rust, mechanical damage, or abrasion; and effectiveness and condition of energy dissipaters.

1.) All Class I or restorable Class I watercourses culverts and bridges on permanent roads shall be inspected and maintained annually.

2.) MRC will inspect all Class I and Restorable Class I culverts and bridges on roads at least 5 times over at least 5 years after work completion (Table 1):

Table 1. Inspection schedule for new, reconstructed, and replaced crossings.

Year	*Inspections*
1	*3 inspections* *1st inspection after the first significant and/or cumulative rainfall of 10 in. in the water year.* *2nd inspection after the first storm with a 2-year or greater return interval or after April 1.* *3rd inspection after May 31.*
2	*1 inspection after at least 25 in. of rainfall in the water year.* *Problem sites from previous years that have had rehab work done during the summer will follow the same schedule as Year 1*
3	*No inspections, unless large storm event occurs (>20 year return)*
4	*No inspections, unless large storm event occurs (>20 year return)*
5	*1 inspection after the last significant rain*

TABLE NOTE

If a site fails or requires additional heavy equipment work during the inspection period, the 5-year timeline will be reset.

3.) MRC shall inspect all roads with permanent culverts or bridges with the road inventory update at 10-year interval.

c. Hiding cover (logs, rocks, and overhanging branches) that must be removed for maintenance purposes shall be removed using hand tools to the extent feasible. Logs that may be "key pieces" as described in Table G-9 of the HCP/NCCP's Appendix G or as determined by an MRC or Department biologist or RPF, shall be placed on the floodplain or downstream of the crossing, or made available to a aquatic habitat enhancement

project carried out consistent with the Department's California Salmonid Stream Habitat Restoration Manual [2] and the MRC HCP/NCCP.

d. Sediment removal shall not exceed that needed to achieve the natural channel grade as approximated by sighting or running a straight line between flags set at the natural channel bottom upstream (beyond backwater effects) and downstream of the facility.

13. Repair and Occasional Maintenance of Bank Stabilization at Bridges and Culverts

In-stream work when listed fishes may be present shall be preceded by fish salvage operations (Section II.D.4). Repaired or replaced bank stabilization structures (e.g., rip rap) shall not diminish habitat structure and function and flow conveyance relative to the structure being replaced.

E. Permanent Class II and III Culverts and Bridges

1. MRC is encouraged to pre-consult on all new Class II_L crossings. In addition, MRC is encouraged to pre-consult on new Class II_s and Class III watercourse crossings that pose significant risks to downstream Class I watercourses.

2. In-stream work when covered aquatic species may be present shall be preceded by salvage operations including blocking the work area with seines, multiple pass removal of captives until inter-pass decline is >75%, and captives are placed into the nearest, preferably upstream suitable habitat.

3. Culverts that, due to insufficient size or improper placement of its inlet above the natural channel have stored > 10 yds^3 sediment shall be replaced with a culvert only under the following options. MRC is encouraged to pre-consult in these situations. The subnotification shall identify and justify which option below is selected.

a. The new inlet is placed at the original stream channel elevation and the stored sediment is removed from the deposit by the heavy equipment operating from the road's running surface or in its prism as the road is lowered.

b. The new inlet is placed at the original stream channel elevation and heavy equipment operates off the road prism as necessary to remove stored sediment.

c. The position of the original culvert inlet remains unchanged so that stored sediment is not released.

d. The new inlet is placed at a lower level, and the stored sediment is removed as in 3. a. and remaining sediment is allowed to pass through during subsequent high flows.

4. Culverts that, due to insufficient size or improper placement of its inlet above the natural channel have stored sediment shall be replaced with a bridge only under the following options.

a. Remove stored sediment upstream of the crossing using heavy equipment operating from the road's running surface, or the limits of the road-fill material as it is removed.

b. If all stored sediment upstream of the crossing is not accessible from the road surface with heavy equipment, MRC is encouraged to pre-consult with the Department. The subnotification submitted for the project shall identify and justify the method to control excessive release of sediments that may include:

1.) heavy equipment operated not on the road surface or prism, but within prescribed boundaries for its use; and/or

2.) Install grade controls such as boulders and log 'v' weirs to meter sediment release. Design specifications will follow the California Salmonid Stream Habitat Restoration Manual [2].

5. Culverts not placed at natural stream gradient shall prevent erosion at the outfall by building downspouts and/or energy dissipaters. If half-round downspouts are installed, they shall be at last one size larger than the culvert; be sized to accommodate the entire design flow from the associated culvert, be in line with the culvert, be securely attached more than two ribs into the culvert, and shall not be cut or otherwise modified to create a hinge. All downspouts (full-round or half-round) shall be anchored to the fill slope using dead-man posts or cable-anchor assemblies adequate to operate through the life of the crossing; placed in contact with soil or the fill slope to the degree feasible, and constructed with large rocks at the outfall to dissipate energy and prevent erosion.

6. Sites where MRC intends to install or replace trash racks shall be identified in subnotifications to the Department, and the site and design shall be subject to review by the Department prior to (re)construction.

7. To minimize the potential for Class II culverts creating barriers to amphibian and macroinvertebrate movement and where the natural channel slope is:

a. 3 percent or less, closed-bottom culverts shall be embedded below the natural channel grade as feasible to facilitate substrate deposition on the culvert floor. The gradient of the culvert shall be sufficiently flat to accumulate sediment of not less than 10 percent of the culvert's diameter at the outlet. The effects of the cross-sectional area reduction shall be accounted for when selecting the culvert size for the design flows.

b. greater than 3 percent, the culvert shall be placed at the base of the fill and the grade of the original watercourse channel. If culverts cannot be properly embedded within the watercourse or along the base of the fill, MRC shall install an alternative crossing such as bridges, floorless culverts, or arched culverts that provide for natural bottoms. Where any of these are infeasible, including excessive costs, MRC will install a standard culvert through the fill with erosion protection as described in Section 6. If unable to select a method that results in a natural bottom, MRC shall identify the alternative chosen and reason for not using a natural bottom alternative in the subnotification to the Department.

8. Routine Maintenance / Obstruction Removal

a MRC may remove debris, trash, rubbish, flood-deposited woody and herbaceous vegetation, fallen trees, branches, sediment, and any obstructions that reduce active channel capacity immediately upstream, at, or downstream of a crossing at any time.

b. Routine maintenance not necessary for assuring design flow conveyance capacity or the structural integrity of a crossing is restricted to the work periods described in Section I.E.

c. Maintenance and obstruction removal shall be performed with hand tools whenever possible; however, heavy equipment such as excavators or backhoes may be employed if hand tools are not practicable. Heavy equipment shall operate to the maximum extent practical from the running surface.

d. Outside the standard work period, heavy equipment is authorized within the bankfull channel only when the channel is dry, except that the bucket of any excavator or backhoe may be employed within the wetted channel. Obstruction removal shall be spatially limited upstream and downstream of the facility's footprint to the lesser of: 50 feet, or 5 times the active channel width as measured in the first upstream channel unaffected by the crossing's backwater influence.

e. Final channel grade after maintenance shall be the same as the design channel grade. Where the facility's design grade is that of the natural channel, final grade shall be determined by flagging the natural channel bottom upstream and downstream of the facility and sighting or running a straight line between the flags.

f. Culvert / bridge-bank stabilization structures (e.g., rip rap) shall be repaired or maintained such that aquatic habitat structure and function is not diminished relative to the existing structure.

g. Trash racks shall be cleaned or maintained on an annual basis and more frequently as necessary to prevent scour, bank erosion, stream diversion, or overtopping of the crossing.

F. Temporary and Seasonal Crossings on Class I Watercourses and Restorable Class I Watercourses

1. MRC is encouraged to pre-consult with the Department on new temporary and seasonal Class I crossings.

2. Temporary and seasonal crossings shall be installed after June 1 if all work can be accomplished without heavy equipment or crossing features (e.g., fill or culverts) in the wetted channel, or if the channel is dry.

3. All temporary and seasonal crossings shall be removed by October 15, or before the cumulative precipitation threshold is met.

4. Temporary and seasonal culverts shall be sized to convey all flows expected during the period of deployment.

5. Temporary and seasonal crossings shall be bridges or ½ round culverts, natural-bottomed culverts, or culverts placed such that their inverts are below stream channel grade and thus be "natural bottomed."

6. Within active channels, fill materials for temporary and seasonal crossings shall be cleaned, screened gravel where it contacts surface water. On top of the cleaned gravel, local river-run gravel, logs (Humboldt), or a combination can be employed. Gravel may be skimmed from nearby exposed (dry) gravel bars. Skimming shall not create depressions which might trap aquatic organisms should the water rise and fall. Skimming shall result in a taper (2% or steeper) rising from the water level of the low flow channel.

7. Temporary bridges may be flatcars, log stringers, plate, or other designs. Fills for abutments below high water mark shall be log and/or rock. Log stringer bridges shall be surfaced with clean rock surface on top of filter fabric or straw to prevent surface material from entering the active channel during use.

8. Operation of heavy equipment for installing or removing temporary and seasonal crossings (bridges and culverts) in surface water shall follow equipment minimizations (Section II.D) and fish salvage (Section II.D.4) criteria.

9. Temporary bridges, culverts, fill, and surfacing materials at temporary and seasonal crossings shall be removed (Section I.M.5.), temporary fill material shall be treated (Section I.M.), and stream channels and banks (except road approaches outside the active channel) returned to approximate pre-project condition (Section I.J.).

10. Upon removal of a temporary or seasonal crossing, erodible surfaces of the disturbed bank at elevations below the bank-full level when discernable, or the active channel if bank-full is not discernable shall be rocked to prevent erosion. The rock cover shall:

a. consist of particles that are from the gravel bar at the crossing if the disturbed area will not be exposed to erosive flows; or

b. average greater than the ≥ 75 percentile diameter of adjacent undisturbed active channel surface.

11. Approaches shall be treated to prevent surface erosion from delivering sediment to the watercourse as above (Sections I.O. and I.G.).

12. Multiple half-round or other bottomless culverts may be installed at temporary or seasonal crossings only in locations where they do not create a barrier to upstream or downstream movements of aquatic organisms. No round culverts or "squashed" pipe arch culverts shall be installed for temporary or seasonal Class I watercourse crossings. Where used, multiple half-round culverts shall be offset so that low flows are conveyed by only one pipe.

13. Upon their removal in the fall, temporary or seasonal crossings shall be isolated from potential subsequent vehicle traffic by strategic placement and installation of effective barriers. Existing gates between the crossing and a public road, if effective, will satisfy this requirement. Approaches treatments as per Section I.O.1. shall remain functional.

G. Temporary or Seasonal Crossings on Class II and Class III Watercourses

1. MRC is encouraged to pre-consult with the Department on new temporary or seasonal crossings in close proximity to Class I waters or with large amounts of fill.

2. Temporary or seasonal crossings that require activity in the active channel shall be reinstalled after April 1 if the crossing is dry, or after May 15 if it is not dry. They shall be removed before the cumulative precipitation threshold is met.

3. Temporary or seasonal crossings installed prior to June 1 shall have pipes sized to convey the runoff a 50 year storm, those installed after June 1 shall be sized to pass the runoff of a 25 year storm.

4. Temporary or seasonal crossings include bridges (e.g., flatcars, log stringers, plate, or other designs), fords, culverts with local river-run fill, culverts with imported fill, and crossings with log fill, and combinations of all three types of crossings. Fill for abutments below high water mark shall be log and/or rock. Log stringer bridges shall be surfaced with a layer of rock upon filter fabric or straw to prevent surface material from entering the active channel during use.

5. Culverts with rock or log-fill shall be installed when it may be difficult to remove all fill material from locations that will deliver to the watercourse (e.g., deep, incised, steep, or rough channel bottoms, or when flows would transport other fill downstream). Culverts shall be of

sufficient size to accommodate the largest flow during the period of intended use. Rock fill shall be clean or washed and be free of soil material. Log fill crossing shall be constructed to enable removal with minimal disturbance to bed and banks. Log fills shall be covered with filter fabric and straw mats or rock, with a local topfill for road surfacing. Prior to removal, the top fill shall be excavated using mechanized equipment and/or hand tools, as necessary, and placed where it will not enter the channel. The logs shall be removed while minimizing further disturbance to the banks. An alternative process that meets the same goals may be employed if approved in advance by the Department.

6. Portions of road approaches that slope toward and may deliver sediment to the active channel shall be treated to prevent surface erosion from delivering sediment to the watercourse as described above (Sections I.O., and I.G.).

7. Upon their removal in the fall, temporary or seasonal crossings shall be isolated from potential subsequent vehicle traffic by strategic placement and installation of effective barriers. Existing gates between the crossing and a public road, if effective, will satisfy this requirement and still enable administrative access. The erosion control function of approach treatments (Section I.O.1.) shall remain intact after crossing removal.

8. Aquatic habitat features (e.g., LWD, boulders) removed during installation of temporary crossings shall be restored or replaced in equal quantities on- or near-site after removing the crossing.

H. Fords on All Watercourses

Fords are the preferred crossing type where frequency of vehicle and equipment crossing is rare, the site is remote and thus not amenable to timely inspection and maintenance, aquatic habitat value is absent on-site (Class III) or minimal (dry watercourses), or the channel is expected to be subject to mass wasting hazards.

1. MRC is encouraged to pre-consult with the Department on all new Class I and Class II_L fords.

2. Class I fords

a. Construction, reconstruction, repair, and timber management use of fords is limited to times when listed salmonid species are absent on site. If general use of a ford exceeds 2 crossings per day, or if use results in sediment plumes or persistent turbidity, a temporary bridge or culvert shall be installed. If general use is less, or if used for administrative purposes, MRC shall maintain the vehicle path free of large rocks and logs that may attract salmonids.

b. Construction, reconstruction, repair, and use of fords intended for timber management access with heavy equipment (employed because alternative, existing crossings are unable to bear or pass the load) is limited to times when listed salmonid species are absent on site (Section I.D.4.) or after fish salvage operations (Section I.D.1.b.).

c. Regardless of absence of listed salmonids, timber management access over Class I fords shall be constrained to the period between June 15 and October 15, unless the channel is dry or the period of use is extended (Section I.E.2.).

d. Class I fords shall not interfere with movement of salmonids.

3. Timber management access over Class II fords is limited to conditions where the watercourses are dry during hauling periods. If not dry, then use is either limited to ATVs and pick-ups, or the running surface shall be made dry by installing a vented ford or rocking over temporary pipe.

4. The fill of fords shall be composed of competent rock, generally greater than 3 inches in size with less than 20% fines for crossings where: a) drainage area is greater than 75 acres (measured at the crossing); b) large amounts of fill (> 100 yds^3) are required; or c) other onsite factors that require a higher level of concern (such as high likelihood of mass wasting or a highly unstable channel above the crossing).

5. Without the Department's review and concurrence, fords shall not be constructed, reconstructed, or replaced at steep-gradient (> 50%) watercourses that 1) require relatively large amounts of fill (> 500 yds^3).

6. MRC shall place a culvert, rock drain, or other water conveyance facility in Class II or Class III fords to convey sub-surface flow through the fill of the rocked ford if there is evidence of significant subsurface flow (exposed soil pipes above, at, or below the crossing), or evidence of year-round water flow via upstream seeps or springs.

7. MRC shall construct fords by sub-excavating the roadbed to form an exaggerated dip and spillway through the crossing. The dip shall employ the maximum feasible grades to allow the desired access (ATV, pick-ups, log trucks), thereby minimizing the fill needed for the crossing. The dip in the final road alignment will provide a cross-sectional area greater than would be required for a culvert at the same location (Table 2):

Table 2. Minimum outlet sizing for passing design flows at permanent fords.

100-year pipe diameter (inches)	Equivalent area (square feet)	Design average depth (feet)	Design width (feet)
18	2	0.33	10
24	4	0.33	20
36	8	0.50	25
48	13	0.50	30
54	16	0.60	35
60	20	0.75	40
72	29	0.75	45
80	35	1.00	50
92	47	1.00	55

8. Where approaches outside the channel fall away from the channel, backup rolling dips will be constructed to assure that the road does not capture stream flow diverted by debris torrents.

9. MRC shall construct a key and place large rocks sized to remain in place during design flows at the downslope toe of the fill.

10. MRC shall dish-out the outside face of the fill material to concentrate flows in the spillway and direct them into the channel, and armor the face with rock large enough to withstand a 100-year flood. Size the rock to be non-transportable by using rocks that exceed the non-transportable substrates in similar gradients up- and down-stream of the crossing. Generally, the rock should be 6–24 inches with an average diameter of at least 12 inches. Voids between the larger surface rocks shall be filled with smaller rock.

11. The running surface of fords shall be placed over a layer of rock that can withstand erosion by expected flow velocities (i.e., the 100-year recurrence storm), placed in a U-shaped channel to create a drivable crossing that contains surface flow and minimizes sieving through the crossing. The channel and approaches to the ford shall be surfaced with durable, angular rock at least 4 inches in size to a depth of at least a 6 in (15 cm). Approaches in both directions from the channel shall be surfaced for a distance of at least 5 times the channel width across the road surface. Crossings on well-traveled roads shall be rock-surfaced the greater of 25 feet or the 5-times channel width. Compact the rock into the channel at the crossing.

12. MRC shall armor the road surface, road edge, and fill face wide enough to prevent flows from circumventing the channel and armored face, and from back-cutting through the road. The width should include the full extent of the outside edge of the road that may receive flow if the channel adjusts after operations. Rock armoring may extend 2-6 in. above the outside edge of the road surface, but the design should include a low point to control channel movements at the spillway thalweg.

13. Where available, viable redwood stumps may interspersed within the armoring of the fill face and keyway.

14. When repairing or reconstructing an existing ford, excavate only the amount of fill necessary unless subsurface piping is evident.

15. If use of the ford results in substantial sedimentation or turbidity downstream, a permanent or temporary bridge or culvert shall be installed.

16. Permanent concrete fords shall not be constructed under this Agreement.

17. Native soil shall not be pushed into the high flow channel of a stream.

18. Ford materials that reduce the channel's cross-sectional area or are not designed to withstand high flows shall be removed to areas above the normal high water mark before such flows occur.

19. Upon completion of the PTHP, temporary fords shall be isolated from potential subsequent traffic by strategic placement and installation of effective barriers.

20. In addition to other requirements above, vents in fords:

a. shall be sized to minimize the fill volume in the crossing while allowing for conveyance of at least a 10-year storm through the embedded culvert;

b. may be multiple culverts, each no less than 12 in. in diameter, rather than a single culvert in order to minimize fill in the crossing;

c. shall discharge onto rip-rap or other stable materials, with energy dissipaters installed as needed to prevent erosion from the outlet of the pipe or pipes;

d. shall not be considered when sizing the ford's surface flood conveyance design (i.e., the vents are assumed to carry negligible flood flows).

e. shall not dam water behind them.

21. Maintenance of vented fords shall follow the schedule set forth above (Section II. D.14.).

III. NON-CROSSING ROAD ENCROACHMENTS

This section applies to the construction, reconstruction, repair, and maintenance of stream-side roads away from crossings that involve bed, bank, channels, or aquatic habitat, or threaten sediment input to the bankfull channel.

A. Work Season. In surface waters with listed fishes present, MRC shall only conduct construction, reconstruction, repair, decommissioning, or maintenance activities 1) between June 15 and October 15 unless operating under an extension (Section I.E.), 2) with the work area isolated (Section I.L.), and 3) after fish salvage operations (Section I.D.1.b.).

B. Bank Stabilization

1. MRC is encouraged to pre-consult on new bank stabilization measures or expansion of existing bank stabilization measures (e.g., riprap).

2. Maintenance of riprap shall be restricted to replacement in kind, using hand tools or heavy equipment operating from the road surface unless the work area is dry or meets conditions in III. A. Gabions shall not be replaced in-kind, but with bioengineered bank stabilization, riprap, and/or viable redwood stumps.

C. Construction, Reconstruction, or Repair of AMZ Roads

Where roads parallel a watercourse and are in sediment delivering position (e.g., proximity, unbroken slope, or poor intervening filtering capacity):

1. The RPF shall evaluate the tradeoffs between rebuilding the road on-site as opposed to other access options (e.g., different alignments or routes), and shall explain and justify the decision in the notice.

2. Road construction, reconstruction, or repair activities shall not sidecast material into the Watercourse or Lake Transition Line. As necessary to avoid erosion or sediment delivery, materials shall be disposed of as described above (Section I.M.5.).

3. All bare mineral soil exposed by construction, reconstruction, or repair that is in a position to be delivered to the active channel shall be treated to minimize erosion as described above (Section I.G.).

4. Running surfaces of AMZ roads that can deliver sediment either directly or through inadequate filter strips shall be rocked or paved to prevent sediment delivery

D. Maintenance of AMZ Roads

Where existing roads parallel a watercourse and are in sediment delivering position (e.g., proximity, unbroken slope, poor intervening filtering capacity):

1. Continued repair of sloughed road beds does not require a notice, but the volume of fill required to repair the road and the site location shall be disclosed in annual reports if any road material was delivered to the active channel.

2. Road maintenance shall not sidecast material into the Watercourse and Lake Transition Line. As necessary to avoid sediment delivery, materials shall be disposed as described above (Sections I.M.5., and I.G.).

3. All bare mineral soil exposed during road maintenance that is in a position to be delivered to the active channel shall be treated to minimize erosion (Section I.G.).

4. Running surfaces of AMZ roads shall be rocked or paved as necessary to prevent sediment delivery (Section I.O.).

IV. ROAD, CROSSING, AND LANDING DECOMMISSIONING

This section applies to the decommissioning of roads at watercourse crossings; at locations where the road parallels and is in proximity to the watercourse, but not necessarily associated with a crossing; and for landings bisected by (channeled) or adjacent to watercourses.

A. All Road and Landing Decommissioning

1. Noticing is required when there is a risk of impacts to bed, bank, active channel, or aquatic habitat, including risks of elevated sediment delivery to the bankfull channel. If there is not such a risk in the RPF's opinion, noticing shall not be required, but the work shall be described in the annual report.

2. The banks of the channel shall be laid back to an angle equivalent to that of adjacent banks not affected by roads, or 50 %; whichever is flatter. Laying back the banks into native ground (non-fill) material, where it can be discerned, shall not be required.

3. Large logs and stumps large enough to be key pieces unearthed from fill removal shall be treated as described in Section I.B. Smaller logs and stumps and inorganic materials shall be placed where it will not enter the watercourse.

4. MRC shall create a barricade effective against access to the watercourse by all motor vehicles.

5. Roads and landings shall be treated to assure effective, maintenance-free water drainage; e.g., outsloping with dips, installing crossroad drains.

6. Within the AMZ where erosion has likely access to watercourses, erosion control measures as described in Section I.G. shall be applied. Outside of the AMZ, where there is direct connection of disturbed soils with a receiving watercourse, erosion control measures shall be applied at least as far as the first natural break or drainage facility.

7. Based on the vegetation immediately surrounding the project area, MRC shall also plant on disturbed areas where erosion has access to the watercourse a mix of native hardwood and conifer trees appropriate for the site at the same density applied for reforestation purposes (conifer sites) or naturally present (hardwood sites). Sections of old road bed not requiring decommissioning treatments or excessively shaded roadways need not be replanted.

B. Crossing and Channeled Landing Decommissioning

1. Decommissioning of crossings and channeled landings that require in-water heavy equipment operations on Class I watercourses when listed fishes are present shall employ fish salvage operations (Section II.D.4.).

2. To enable the Department to adjust measures to site-specific conditions, MRC is encouraged to pre-consult with the Department on projects that propose to:

a. remove crossings or landings on Class I waters that are greater than 60 feet in length as measured along the channel; and

b. remove old fill or Humboldt Crossings on any class watercourse where fill or dirt caps are greater than 200 yds^3.

3. During removal of old fill or Humboldt Crossings, MRC shall minimize delivery of fill and road cap soils from the crossing to the active channel by prevention (excavation away from the watercourse before soils enter the channel) and rehabilitation (removal of delivered sediment to the original watercourse surface) (Section II.A.8.).

4. If surface water is present at the work site, to limit sediment and turbidity delivery to downstream habitat,

a. the work area shall be isolated with diversion or cofferdams Section I.L.), and

b. check dam(s) shall be constructed, as necessary, to capture released sediments downstream of the worksite (Section I.L.)

5. Large logs resulting from the crossing decommissioning (e.g., log stringers, log abutments Humboldt fills) shall be treated as described in Section I.B.

6. Longitudinal profile of the channel shall be reestablished as per Section I.J., except that sediment and woody materials accumulated by large logs, other than the log stringers and log abutments, in the active channel may remain in place along with the logs.

7. Bare mineral soil in a position to be delivered to the active channel shall be treated to minimize erosion as described in Section I.G. immediately upon completing removal of the facility.

V. RE-ESTABLISHMENT OF CLASS II AND III WATERCOURSES

This section applies to re-establishing the flow paths of Class II and III watercourse channels obstructed and diverted by past logging (i.e., tractor and skid trail crossings) with evidence of substantial potential or current active erosion of soil placed in the channel.

A. Findings and Pre-Consultation

1. During PTHP preparation, MRC shall evaluate for repair potential existing skid trails and tractor roads within the proposed harvest area that a) are diverting a watercourse, b) have a potential to divert a watercourse, or c) are not properly draining.

2. MRC is encouraged to pre-consult with the Department at sites where:

a. greater than 10 yds^3 will be excavated to reconnect the original watercourse; or

b. there are upstream or downstream diversions into or out of the channel that may cause a channel to exceed its natural hydrologic regime.

3. MRC shall make a determination that the potential repair will correct a current or impending problem, and that the proposed correction in total will result in a net benefit to watercourse conditions. The determination will be detailed in any required subnotification to the Department.

B. Measures

1. Flow path re-establishment shall be undertaken when the channel is dry, or water is effectively diverted around the site as described in Section I.L., and only the periods described in Section I.E.

2. The banks of the channel shall be laid back to an angle less than that of adjacent, non-road bed affected banks, or 50%, whichever is flatter. However, laying back the banks into native ground (non-fill) material where it can be discerned shall not be required.

3. Logs or stumps that may become available shall be treated as per Section I.B.

4. Bare mineral soil exposed in conjunction with reestablishing flow channels shall be treated to minimize erosion immediately upon completing the construction at of the facility following measures in Section I.G. Treatment shall extend to the first natural break in slope or drainage facility that directs overland flow away from the watercourse.

VI. AQUATIC HABITAT IMPROVEMENT PROJECTS.

A. Department Guidelines. MRC shall follow the guidelines of the Department's California Salmonid Stream Habitat Restoration Manual [2] or MRC's HCP/NCCP (Section 8.2.3.6) for aquatic habitat improvement projects such as LWD or stream-side vegetation enhancement. For aquatic habitat improvement projects other than felling individual trees or placing individual stumps into a watercourse as provided by the HCP/NCCP, MRC shall describe in the subnotification proposed actions and the measures derived from the Department's manual that will be followed. If MRC proposes to differ from the guidance in the Department's manual, MRC shall include in the SUBNOTIFICATION the rationale, and how the intended functions of the measures will otherwise be achieved.

B. Heavy Equipment Operations. Heavy equipment shall preferentially be limited to road surfaces and crossings. Where necessary to be off-road, the area and intensity of ground disturbance shall be the least possible.

C. LWD Demand. LWD placement projects other than the placement of individual trees felled for cable corridors or safety will not be undertaken in locations with low LWD demand, as defined in the HCP/NCCP (Appendix G *Watershed Analysis: Background and Methods*).

D. Erosion Control. In addition to following the erosion control practices described in Section I.G., if the work site and immediate vicinity was vegetated with riparian shrubs and trees prior to the activity, or the area is barren for reasons other than the present work but otherwise capable of revegetation, then the work site will be revegetated by installing seedlings, cuttings, or wattles that will result in a density, distribution, and species mix of vegetation similar to that existing prior to disturbance.

E. Work Periods

1. As described in the HCP/NCCP (Section 8.2.3.6), individual trees may be felled into watercourses and left unanchored for the purpose of enhancing LWD loads coincident with an adjacent PTHP at any time.

2. Without written approval from the Department, the work period for aquatic habitat enhancement projects that require in-stream heavy equipment operations shall be as described in Section I.E.

3. Planting of seedlings and installation or cuttings and wattles shall take place when soil moisture conditions are suitable, generally between December 1 and April 1. If sites are inaccessible during that time due to road closures, plantings shall be installed as late in the fall as feasible.

VII. WATER DRAFTING

A. General Water Drafting Procedures

1. For proposed new drafting sites, or for proposals to increase drafting rate at an existing site, to help assess the cumulative impact of water drafting in any given watershed, the following information shall be included in an associated PTHP:

a. a description and map of proposed drafting sites, and existing water drafting locations in the Planning Watershed;

b. the watercourse or lake classification;

c. water body condition at the intake (e.g., in wetted channel pool, excavated sump in gravel bar);

d. the diversion parameters of the site, and as available other drafting locations in the Planning Watershed (i.e., maximum instantaneous, daily, weekly, and yearly diversion rate and volumes; dates of diversion, estimated filling time, and associated water drafting from other PTHPs).

e. A water availability analysis, the design of which is acceptable to DFG[19].

2. Limitations and restrictions are by drafting site, not by PTHP.

3. Water diverted into trucks shall only be dispensed for the purposes of dust abatement; road maintenance, repair, reconstruction, construction, decommissioning, removal; and pesticide mixing.

4. Water may be drafted year-round, but after a seasonal hiatus > 2 months or a change in Licensed Timber Operator (LTO), MRC shall conduct a pre-operational meeting with the LTO responsible for field operations. The meeting shall take place at a representative sample of drafting sites (e.g. Class I watercourse, Class II watercourse, Class I and Class II ponds, and gravity fed storage tanks) and any other drafting sites with unique, site specific conditions. The LTO shall fully inform all water truck operators of their responsibilities stipulated within this plan.

5. Water shall not be drafted by more than one truck simultaneously at the same site.

[19] An analysis of the impacts to aquatic habitat and species resulting from the proposed diversion both individually and cumulatively with drafting at other sites in the watershed. One example is: Anonymous. 2010. Policy for Maintaining Instream Flows in Northern California Coastal Streams. Water Res. Control Board (Div. Water Rights) and Calif. Environ. Prot. Agency. 33 p + 12 Apps. Available at: http://www.swrcb.ca.gov/waterrights/water_issues/programs/instream_flows/docs/ab2121_0210/adopted050410instreamflowpolicy.pdf

6. Except for sumps above the water level on the active channel, streambed or bank material shall not be excavated for intakes prior to June 1. Excavated areas shall be refilled prior to the day the cumulative precipitation threshold is met.

7. All water drafting vehicles shall be checked each day used, and shall be repaired as necessary to prevent leaks of deleterious materials from entering the Watercourse and Lake Protection Zone (WLPZ) or watercourse.

8. Where overflow run-off from water trucks or storage tanks may enter the watercourse; effective erosion control such as water bars, gravel berms, or hay bales shall be installed and serviced as necessary to remain effective.

9. Road approaches to all drafting sites shall be effectively treated to eliminate the generation and transport of sediment to watercourses. Treatment locations shall include, but not be limited to road surfaces, fill faces, cut banks, and inboard ditches.

10. MRC shall measure stream flow to assure compliance with Tables 3 and 4 prior to the initial drafting during each season and as frequently as necessary, but no less frequently than specified in the tables.

11. Pumps used for drafting shall be capable of being adjusted to comply with specified withdrawal rates.

12. Drafting for gravity fed storage tanks shall:

a. Regulate flow with a valve, or other means, as necessary to comply with diversion restrictions (Tables 3 and 4).

b. Drain overflow, if present, from tanks with pipes properly sized and designed to effectively return all excess water to the source stream.

c. Not spill excess water onto the drafting pad or road surface.

d. Armor or otherwise prevent erosion of the outfall location of water storage tank return pipes.

e. Screen or close all points of ingress to the tank to effectively prevent wildlife entry or entrapment.

13. Pesticide mix trucks shall not directly draft water from any watercourse or pond. Pesticides shall not be mixed where runoff may enter a watercourse directly or indirectly through a hydrologically connected drainage facility.

14. As soon as is practical, upon discovery and verification of any waterborne pests or pathogens by either MRC or the Department in any planning watershed that encompasses MRC lands, or is hydrologically adjacent to MRC lands, MRC and the Department shall meet and confer as to additional measures that might be needed to amend into this agreement to prevent undue water-truck mediated dispersal. Upon such discovery, measures such as the following shall be developed and applied:

a. Limitations on location of application. To prevent the transmission of water-borne pathogens, water must be applied within the same watershed (defined herein as either the ‘planning watershed’ or the ‘positive flow’ watersheds). Moving waters upstream into the immediately adjacent contiguous planning watershed is permitted; however, water shall not be applied upstream more than 1 planning watershed.

b. Water truck operators drafting water from within or downstream of an infestation area or adjacent watersheds of a known infestation area for water-borne pathogens shall disinfect truck water tanks before leaving the area. Disinfection procedures for Sudden Oak Death are:

1) Fill the tank with a mixture of water and Clorox (or equivalent) to a capacity that agitation caused by driving will wet all exposed surfaces, then driving for a minimum of 5 minutes. The disinfectant shall be at a concentration of 1 gallon of Clorox with 1000 gallons of water (50 ppm available chlorine).

2) Completely discharge the water tank’s contents within the watershed of the watercourse where its final load was drafted. For the protection of fish, amphibians, and other aquatic organisms, the operator shall dispose of rinse water by spreading (not just dumped in one location) on a bare mineral surface area (i.e. a rocked or native-surface road surface) no closer than 100 feet from

any lake or watercourse at a rate and over enough area to ensure rapid absorption and evaporation on the target surface.

15. Screens shall be kept in good repair and shall be employed wherever water is drafted. Intakes shall be inspected periodically and kept clean and free of accumulated algae, leaves, or other debris which could block portions of the screen surface and increase approach velocities at any point on the screen.

16. Intakes shall be at least 6 inches above the bottom of the channel and away from submerged vegetation, where practicable. Where not practicable, intakes shall maximize these clearances.

17. Channels may be modified (e.g., pools excavated, riffle crest raised) for the purpose of enhancing drafting capacity, limited to the following:

a. Class I Drafting Sites

1) New sites shall be selected to take advantage of channel conditions that will not require modification during site development or for site maintenance, as possible.

2) Subnotifications for new sites shall describe the amount of excavation that may necessary to accommodate drafting and / or structures (e.g., boulder or log placement) proposed to yield conditions that are self-maintaining through scour resulting from annual flow.

3) MRC shall self-monitor and report excavations at existing sites. Where frequency of excavation exceeds once every six years, or the volume exceeds 1 yd3, MRC shall submit a subnotification proposing to install structures to promote pool scour.

4) Flow controls (e.g., riffle crests) shall not be raised or otherwise modified for the purpose of enhancing drafting capacity.

5) Materials spoiled from any drafting site excavation shall be disposed as directed in this Attachment (Section I. M. 3.).

b. Class II and III sites.

1) For channels where the active channel is less than 5 ft wide, up to 1 ft^3 of alluvium may be excavated from, or filled onto the channel to accommodate placement and watering of the diversion intake. For each additional 5 ft in active channel width, an additional 1 ft^3 of alluvium may be excavated from, or filled onto the channel.

2) Fill shall not include soil.

3) Unconsolidated fill (e.g., not placed in sandbags) derived from excavation of the intake site shall be spread over the channel to approximate the pre-diversion conditions. Imported fill (e.g., sand bags) shall be removed from bankfull channel. Treatment of fill shall be the earlier of :

a) within 2 weeks after the completion of drafting, or

b) prior to the start of the winter period.

18. At the end of drafting operations for the season, intakes shall be incapacitated (e.g., plugged or removed from the flood prone area) to terminate water drafting during the winter period.

19. Unless otherwise approved by the Department, MRC shall measure the unimpeded flow, diversion rate (both absolute and proportion of unimpeded flow) and times, and water body metrics to assure the drafting conditions are fulfilled. Methods and equipment of measurement shall be approved by DFG.

a. Wherever possible, unimpeded flow shall be estimated using a flow meter capable of measuring flows down to a minimum of 0.1 feet per second, and is accurate to + 2 % of the streamflow reading.

b. Elsewhere, MRC shall document conditions, equipment, and procedures used to estimate unimpeded flow.

c. The unimpeded flow shall be measured at the nearest suitable location upstream of the diversion; if unable to do so, MRC shall explain why and describe the conditions where flow was measured.

d. A stream flow measurement shall be the average of at least two estimates.

e. Absolute diversion rate shall be estimated as either the maximum difference between unimpeded and impeded flow, or the time required to fill a known volume in a tank.

f. DFG encourages MRC to install low flow gauging stations at stable channel sections near water drafting sites to facilitate use and monitoring of the sites. When installing permanent gauging stations, MRC shall obtain DFG concurrence with the site selection and plan.

g. Water temperature shall be measured midway in the water column, near the center of the channel, and near where flow measures are taken. A pocket thermometer is acceptable for temperature measurements.

20. At least 5 working days prior to the start of yearly operations at any drafting site, MRC shall measure streamflow. Information from this measurement (i.e., date and time, drafting site location, Agreement No., and measured streamflow) shall be provided to DFG by email prior to beginning drafting. These emails qualify as informing notices.

21. DFG may increase or decrease site-specifically, the monitoring frequency, metrics, or reporting requirements for diversions if monitoring or other information shows a change is warranted.

22. MRC shall not grant permission to other parties to divert or use water drafted under this permit for purposes other than MRC's covered activities without first advising the Department of the dates and identification of their permitted diverter. MRC shall remain responsible for adhering to the agreement, and to assure the conditions of this agreement inclusive of monitoring and reporting are followed individually and collectively by all parties using the site.

23. If the Department determines water drafting from any Class I or Class II site is resulting, or may result in significant adverse impacts to sensitive aquatic resources, drafting operations shall cease until a site-specific plan to feasibly reduce the impacts is implemented.

24. Follow the stream class appropriate ELZ and EEZ guidance of the HCP/NCCP (Section 8.2.3).

B. Procedures for Class I Watercourses

In addition to the General Water Drafting Procedures, the following shall apply to water drafting from Class I watercourses.

1. Water drafting from Class I watercourses shall adhere to all requirements in Table 3.

Table 2. Requirements for Class I watercourse drafting.

Unimpeded flow in cfs (gpm)	**Requirement**			Range of estimated rate (gpm)	Estimated time to draft 3,500 gallons (minutes)
	Removal Rate (% of unimpeded flow)	**Compliance Flow Measurement [a, b]**	**Drafting Logs**		
>7.8 (3505)	**<10%**	As necessary	No	350	10
> 6 to 7.8 (2691 – 3505)	**<10%**	**Biweekly**	No	270 - 350	13
>2.2 to 6 (987 – 2691)	**<10%**	**Biweekly**	**Yes**	100 – 270	35
>1.0 – 2.2 (449 - 987)	**< 5%**	**Weekly**	**Yes**	35 – 50	53
≤ 1.0 (449)	**DRAFTING PROHIBITED**	Not required	Not applicable	Not applicable	Not applicable

[a] Flow must be measured within one week prior to a drafting site's intial use each season.

[b] The time lapse between measurements shall not be any longer than the stated value.

a. MRC shall measure water temperature and stream flow, and shall provide the results to the DFG by email:

1.) When unimpeded flow is between 2.2 and 7.8 cfs and MRC is drafting, MRC shall measure unimpeded flow and water temperature at least once every two weeks and shall report these to the Department by the last day the month of measure.

2.) When unimpeded flow is between 1.0 and 2.2 cfs and MRC is drafting, MRC shall measure unimpeded flow and temperature at least once per week, and shall report these to the Department by the 15th and the last day of each month during which water was drafted.

b. Water truck operators shall be in possession of a drafting log book that contains the following information and kept current during operations as specified (Table 3):

1.) Operator's name
2.) Drafting site location
3.) Date
4.) Diversion start and end time (24 hour clock)
5.) Diversion directly from stream or from a tank
6.) Diversion by pump or by gravity flow
7.) Truck capacity in gallons, and estimated gallons of water drafted
8.) Drafting rate
9.) System inspection notes (screen, tank, line conditions and cleaning).

c. MRC shall deliver water truck operator log books to the Department by the end of each calendar year, or sooner upon request.

2. In addition to Section VII.A.13., drafting intakes on Class I watercourses shall be screened such that the:

a. approach velocity is no more than 0.33 feet per second;

b. screen has at least 12 square feet of wetted, unobstructed screen per each cfs of diversion (i.e. 12 square feet of screen for a rate of 449 gpm or one cfs). For this condition, points of contact of a clean screen on larger channel substrate particles (i.e., unable to pass > 1 inch mesh sieve) is not considered obstructed.

c. screen material be wire mesh, perforated plate, or pipe with at least 27 percent open area. Round openings in the screen shall not exceed 3/32 inch (2.38 millimeters) in diameter, and slotted openings shall not exceed 1/16 inch (1.75 mm) horizontally. The 1/16 inch horizontal mesh provides a diagonal opening of 3/32 inch.

3. In addition to Section VII.A.14., to the extent feasible, intakes shall be placed at least 1/3 the distance between the pool's deepest point and its downstream riffle crest.

C. Procedures for Class II Watercourses

In addition to the General Water Drafting Procedures, the following apply to water drafting from within Class II waters.

1. Drafting for gravity-fed storage containers shall conform to the following:

   a. Intakes shall be designed (e.g., valves) to prevent diversion > 25% of surface flow;

   b. If water returning to the source stream from water storage tanks is more than 3˚ F warmer than water in the stream at the point of return, water storage tanks shall be modified to preclude excess water from leaving the tank while it is full;

   c. If water in the source stream at the point of diversion is >72 ˚F, drafting shall be prohibited from the site until water temperature falls below this limit.

2. Water drafting from flowing Class II watercourses shall adhere to all requirements in Table 4.

   a. All water drafting from Class II watercourses shall cease when streamflow drops to 0.01 cfs (4.5 gpm).

   b. If the rate of change in flow between two subsequent biweekly measurements indicates that flow will drop below 0.1 cfs (45 gpm) before the next scheduled biweekly measurement, the frequency of measure shall be increased to weekly.

   c. When flow ceases, see #3 below.

Table 3. Requirements for Class II Watercourse drafting.

Unimpeded flow in cfs (gpm)	**Requirement**		Approximate Time to draft 3,500 gallons (minutes)	Range of estmated drafting rate (gpm)
	Maximum Drafting Quantity (% of unimpeded flow)	**Compliance flow measurements**		
> 2.0 (898)	**25**	**Biweekly[a]**	18	220
> 1.0 – 2.0 (449 -898)	**25**	**Biweekly[a]**	35	110-220
> 0.5 – 1.0 (224 – 449)	**25**	**Biweekly[a]**	70	55-110
> 0.25 – 0.5 (112 - 224)	**25**	**Biweekly[a]**	140	28-55
> 0.1 – 0.25 (45 – 112)	**25**	**Biweekly[a]**	350	11-28
> 0.05 – 0.1 (22 – 45)	**25**	**Weekly**	700	5-11
> 0.025 – 0.05 (11 - 22)	**25**	**Weekly**	1420	2.5-5
>0.01-0.025 (>4.5-11)	**25**	**Weekly**	3550	1-2.5
≤ 0.01 (4.5)	**WATER DRAFTING PROHIBITED**	Not required	Not applicable	Not applicable

[a] Frequency will be weekly if the rate of change between two biweekly measurements indicates the fow will be less than 0.1 cfs prior to the next scheduled biweekly measrue. See condition VII. C. 2. b.

3. Where flow in the watercourse is intermittent or discontinuous (i.e., there is no apparent flow to measure at or near the drafting site),

a. direct drafting shall not reduce pool depth by more than 10% of the maximum depth of the pre-drafting pool, as measured immediately prior to and after drafting.

b. intakes for gravity feed systems shall be physically fixed in place such that they cannot reduce the residual pool depth by more than 15%.

c. At least once per week if the site is in use, MRC shall assure the conditions (3.a.) are met during withdrawal, or the intake (3.b.) is functioning as designed. If use is less frequent than once per week, MRC shall monitor withdrawal rate or intake structure at each drafting event.

4. For sites actively used for drafting via gravity flow into a tank or other storage facility, MRC shall evaluate and document in a log book at the frequency stated in Table 4 the condition of the diversion intake and the following parameters:

a. unimpeded streamflow and temperature immediately upstream of diversion influence;

b. diversion flow (either by direct methods where it enters the tank or indirectly by subtracting a flow measurement immediately downstream from that taken above the diversion);

c. calculated rate of diversion; and adjust the rate of diversion (e.g., a valve) as needed to meet the requirements of Table 4; and

d. temperature of any water overflow from the storage tank.

MRC shall make the log book available to DFG following the drafting period.

5. Bypass flows from blocked culverts shall be from the bottom of the pool, achieved by installing boards above the floor of the culvert or through holes cut near the bottom of the boards.

6. In addition to Sections VII.A.13. and 14., intakes to diversion and bypasses for gravity diversions shall be maintained functional, shall be screened with openings not to exceed 1/8 inch diagonally (slotted or square openings) or 3/32 inch diameter (round openings).

D. Procedures for Class I and Class II Ponds

In addition to the General Water Drafting Procedures, the following shall apply to water drafting from Class I and Class II ponds.

1. Screening appropriate for the Class of waters affected shall be applied to intakes as described above.

2. Drafting rate shall not exceed 350 gpm.

3. Drafting from Class I ponds shall not reduce maximum pool width or depth by more than 10%, whichever occurs first.

4. Drafting from Class II ponds hydrologically connected to watercourses (including subsurface flow) shall not reduce residual pool maximum width or depth by more than 50%.

5. Relative to the pond's dimensions at the end of the winter period (April 1), drafting from hydrologically isolated Class II ponds shall not reduce either the maximum pool width or depth, whichever occurs first by more than 50% prior to July 1 or 80% on or after July 1.

6. Benchmarks shall be placed in the pond to identify the draw-down thresholds as specified in D3, D4, and D5 (10%, 50%, and 80%) for the purpose of signifying to the pump truck operator and inspectors to terminate water diversions. Benchmarks shall be maintained as necessary while actively drafting.

7. Pond bottoms and bank excavation/enlargement activities shall occur only after July 1.

8. At each documented red-legged frog breeding site:

a. water shall not be drafted when red-legged frog egg masses are present.

b. vegetation management shall be limited to

1.) no more than 50% of the pond's perimeter,

2.) after July 1 within any calendar year, and

3.) no more frequently than once every three years.

E. Site-specific Drafting Requirements

1. Lower Albion River, above the confluence with Duckpond Gulch (Section 14 T16N R16W MDBM).

    a. After July 1, water drafting may only occur within three hours (before or after) of high tide.

    b. A minimum of 15 minutes shall separate each diversion.

2. Ray Gulch Marsh (tributary to the lower Navarro River)

    a. Total amount of water drafted from the site shall not exceed 100,000 gallons per day.

    b. A staff gauge shall be placed at the start of the season. MRC shall notify the Department if the pool depth falls by 10% during drafting.

Appendix U

Inventory Strategy

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U. INVENTORY STRATEGY

For landscape planning, MRC uses a suite of inventory databases, forest growth models, habitat models, and Geographical Information System (GIS) programs to analyze and present current and projected forest conditions. All of these components reflect actual *on-the-ground* conditions and constraints. They enable planners to assess and report the effects of a wide range of management activities at various levels: stands, watershed units, and ownership.

U.1 Stands

Stands are the smallest geographic units in landscape planning. The size and extent of a stand is based on vegetation, topography, and sensitivity attributes, as well as regulatory considerations. Critical information stored in the relational databases for each stand includes

- Stand identifier.
- Acres.
- Vegetation codes.
- Sensitivity (watercourse buffers, old growth stands, spotted owls, etc.).
- Site class.
- Harvest timing.

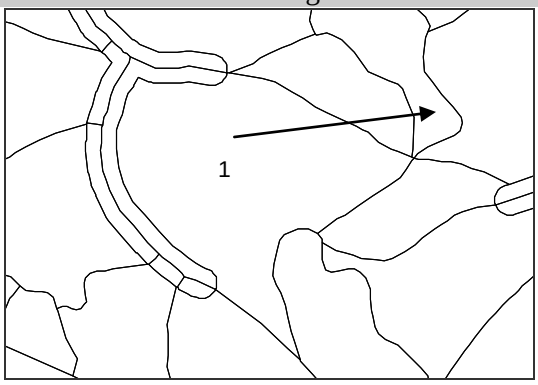
Riparian stands are a sub-set of all the stands across the plan area. By definition, some portion of a riparian stand is adjacent to a Class I, Large Class II, or Small Class II watercourse. In effect, riparian stands may contain Class I, Large Class II, and Small Class II AMZ.

U.1.1 Stand delineation and identification

MRC identifies stands using aerial photos, draws stand boundaries on a base map, assigns a unique identifier to each stand, and encodes the stand information in our inventory databases. Stands are manageable units, bounded by roads, ridges, or watercourse buffers. Our GIS contains stand boundaries, along with a stand identifier. This unique stand identifier allows tables with that same identifier within a relational database to be joined to the GIS stand coverage. Coverage is a geographic data set representing a specific feature on a map, e.g., vegetation coverage. Generally, the minimum size or mapping unit for a stand is 20 ac, unless the stand has a particular sensitivity (such as watercourses) or a sharp contrast in vegetation. Sensitivity constraints may reduce the minimum stand size to less than 1 ac, while a sharp contrast in vegetation could result in a minimum stand size of 10 ac or less.

Figure U-1 shows the relationship between stands in the GIS and stands in a relational database. The GIS image on the left displays a stand with a unique identifier of 1. A relational database stores information about the stand, such as number of acres and duration between harvests. In this example, the vegetation code, CH2D, is a combination of species code, size code, and density code; stand 1 consists of a conifer hardwood mix (CH), predominantly in size class 2 (8-16 in.), with 60-80% canopy cover (density class D).

GIS Image



Information in Relational Database

Stand	Acres	Vegetation	Sensitivity	Site Class	Harvest Timing (years)
1	25	CH2D	00010	III	10
2	14	RD3L	10001	III	5

Figure U-1 GIS and Relational Database

U.1.2 Stand acres

The GIS calculates the number of acres in a stand and exports this information to the relational database. Acres are gross acres (i.e., the total acres within the GIS polygon) and net acres (i.e., an adjustment in stand acreage due to roads and landings within the stand). In calculating net acres, MRC reduces the stand acreage by 3% for roads and landings since these features represent approximately 3% of all the ownership. We use net acres to extrapolate per acre estimates of volume, habitat, and other parameters to larger scale units such as watersheds and ownership.

U.1.3 Stand vegetation

Each stand has a vegetation label or *strata*. MRC assigns a vegetation label for each stand from aerial photos or field visits. We update vegetation labels when stands are harvested or at least every 20 years if a stand is not harvested. The vegetation label consists of a size code, a species code, and a density code. Figure U-2 shows vegetation labels assigned to various stands.

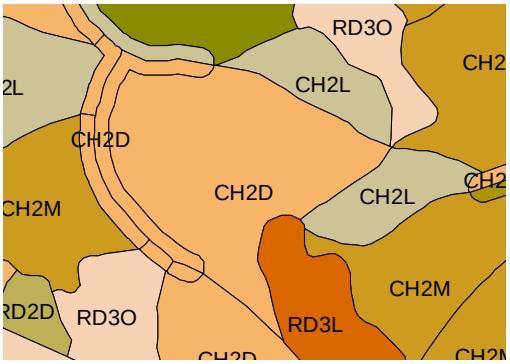


Figure U-2 Vegetation Labels in Stands

U.1.3.1 Size Code

Tree size is the first component of vegetation classification. We assign a dbh class to each of the GIS polygons representing a forested stand (Table U-1).

Table U-1 DBH Classes

Class	DBH (in.)
1	0- 8
2	8-16
3	16-24
4	24-32
5	>32

Figure U-3 shows a basic decision diagram to determine the dominant dbh in a stand.

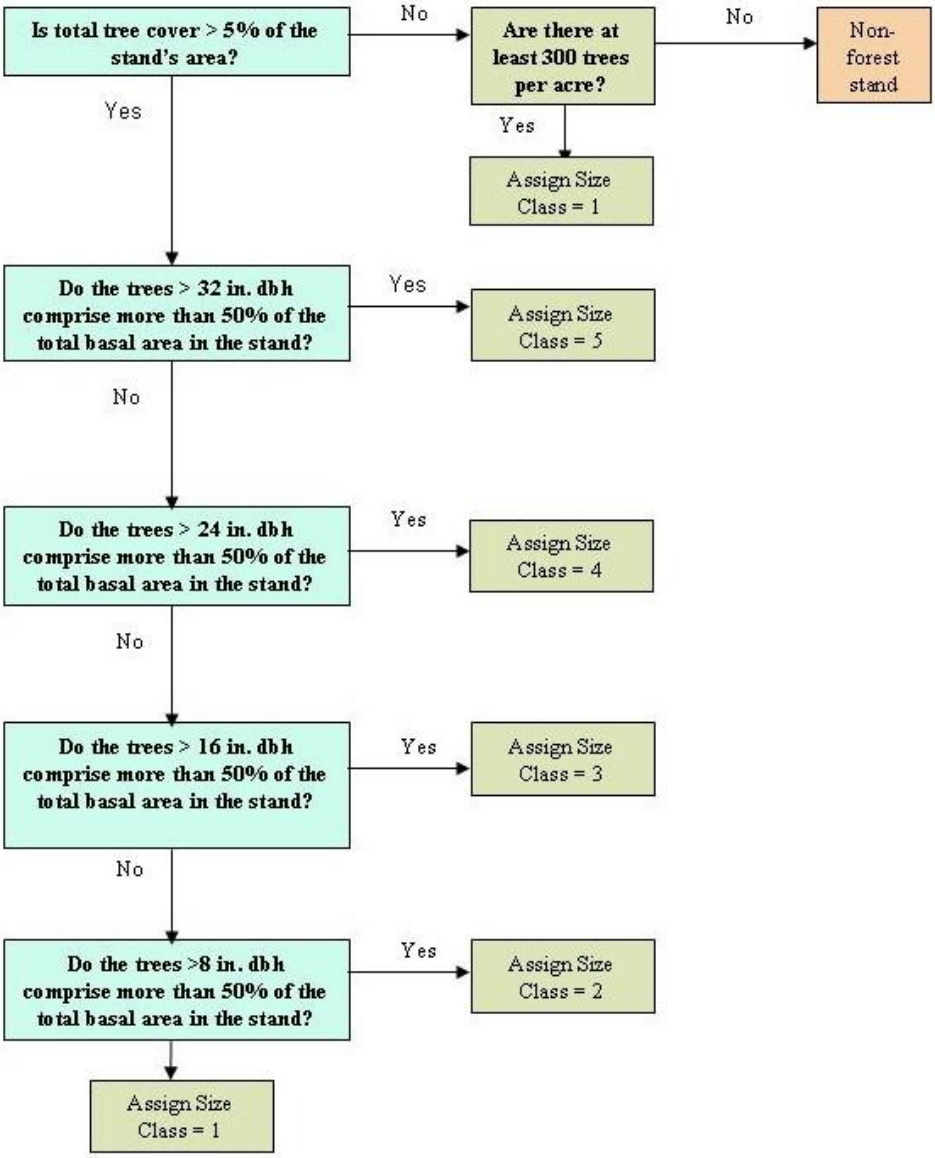


Figure U-3 Rules for Assigning DBH Classes to Stands

U.1.3.2 Species code

GIS vegetation polygons that have 5% or more of their area covered by tree crowns are classified as forest.

U.1.3.2.1 Forest polygons

MRC labels a forested polygon as conifer when 70% or more of the basal area in the dominant size class of the stand is conifer. Similarly, we label a forested polygon as hardwood when 70% or more of the basal area in the dominant size class in the stand is hardwood. If there is not a single species in the dominant size class that accounts for 70% or more of the basal area, we label the polygon as either mixed conifer species or mixed hardwood species, depending on whether conifers or hardwoods account for 70% or more of the basal area of the stand. Tables U-2 through U-5 lists the codes for conifer and hardwood species.

Table U-2 Conifer Codes

Code	Species
RW	Coast redwood
DF	Douglas-fir

Table U-3 Hardwood Codes

Code	Species
AL	Alder
TO	Tanoak
LO	Live oak
BO	Black oak
MO	Madrone

Table U-4 Multiple Conifer Codes

Code	Conifer Species
RD	Redwood/Douglas-fir
RE	Redwood/Eucalyptus
RM	Redwood/Monterey Pine

Table U-5 Multiple Hardwood Codes

Code	Hardwood Species
CH	Conifer/Hardwood mix
MH	Mixed Hardwood

U.1.3.2.2 Non-forest polygons

GIS vegetation polygons that do not have 5% or more of their area covered by tree crowns are classified as non-forest. Table U-6 lists the codes for non-forest vegetation.

Table U-6 Non-forest Vegetation

Code	Vegetation
BR	Brush
GR	Grass and meadows
BG	Bare ground, including rocks and watercourse beds
WA	Water
PG	Pygmy Forest
GX	Oak woodland
RK	Rocky Outcrop

U.1.3.3 Density code

Density classes are based on the canopy closure of all trees greater than 8 in. dbh, i.e., Size Class 2 and above. In stands that are Size Class 1, MRC estimates canopy closure based on all the trees in the stand. All canopy estimates of cruised inventory stands will use a vertical sight tube with protocols based on recommendations from Berbech et al (1999 and Robards et al (2000). Tables U-7 and U-8 list the density codes for overstory and understory.

Table U-7 Density Codes

Code	Coverage %	Description
Overstory		
O	0 – 20	Open
L	20 – 40	Low
M	40 - 60	Medium
D	60 – 80	Dense
E	80 – 100	Extremely Dense
Code	**Coverage %**	**Description**
Understory		
O	0-20	Open
L	20-40	Low
M	40-60	Medium
D	60-80	Dense
E	80-100	Extremely dense

U.2 Sampling Method

The MRC ownership is divided into sustainability units. Sustainability units are the basis for sampling and for confidence targets. MRC also uses them to assess timber sustainability. The size of a sustainability unit depends on the planning watershed boundaries that contain similar characteristics. Generally, sustainability units do not exceed 20,000 ac. Our sampling goal is to be within 10% of the net board foot volume within a sustainability unit at the 90% confidence interval. Figure U-4 shows the sustainability units within the plan area.

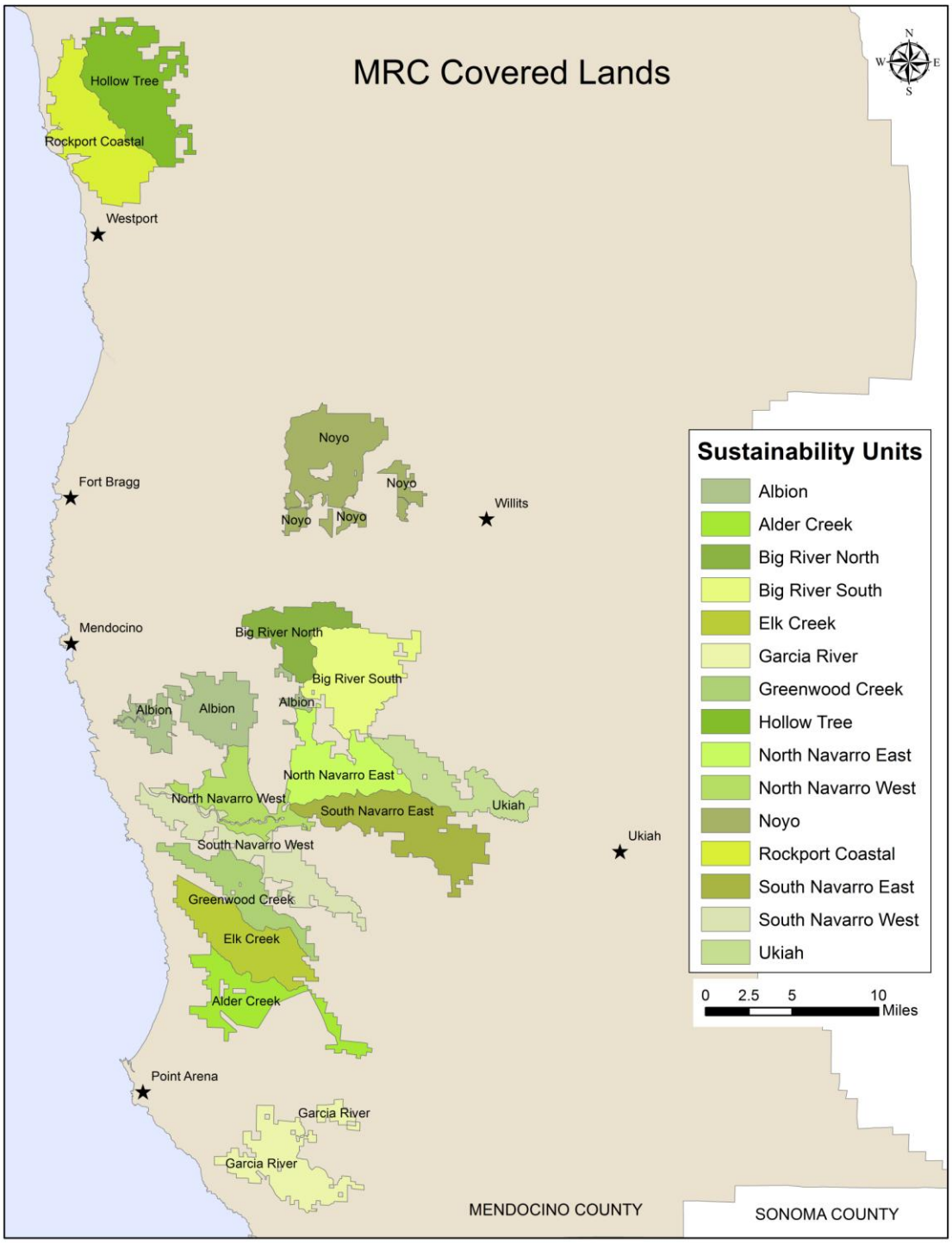


Figure U-4 MRC Sustainability Units

U.2.1 Stratified sampling

Vegetation labels are the basis for a stratified sampling system to acquire vegetation data. MRC samples more stands in strata types with higher expected volumes, since the principal goal of sampling is to derive confidence in volume estimates.

U.2.1.1 Selecting stands for sampling

MRC randomly selects stands for sampling across a sustainability unit or planning watershed. When sampling, we do not make any effort to separate sensitivity classes within a vegetation stratum.

U.2.1.2 Sampling procedure

MRC creates evenly distributed plot points on a stand map. Using this plotted stand map in the field, a forester determines the entry point to the first plot. The entry point is the anchor point for all cruise lines. A forester takes its GPS coordinates and writes directions to the first plot on flagging displayed at the entry point. Subsequent flagging will identify additional plot locations, giving the plot number and directions to the next plot.

U.2.1.3 Variable radius sampling

A definitive method of determining the basal area of an acre of forest would be to cut all the trees, leave stumps that were 4.5 ft high, and then measure, in square feet, the area covered by the flat stumps. Obviously, there needs to be a method for estimating basal area of a forest acre without cutting any trees. Among the available methods, MRC use variable radius sampling (Avery and Burkhart 1994, p. 217f).

Variable radius sampling selects trees for tally by size not by frequency. Using an angle gauge (i.e., a relascope, a prism, etc.) with a calibrated BAF (*basal area factor)*, a forester can estimate basal area in square feet per acre. The BAF might be, for example, 10, 20, or 40 for 10, 20, or 40 square feet. In our example, we will assume the BAF is 10. Also, for this simplified discussion, we can say that the sampling method focuses on 2 variables to determine what trees to count and what trees to ignore: (1) the diameter of the tree (dbh) and (2) the distance of the tree from the sampling point.

Inclusion or exclusion of a tree from the sampling count depends, for example, on how the tree appears to the forester when viewed through the selected BAF prism. If a forester, standing at the designated sampling point, looks at a tree through a BAF prism and sees the center portion of the tree trunk offset from the portion above and below, the tree is “out” or not counted (Figure U-5). On the other hand, if the forester sees that the center portion of the tree trunk overlaps the sections above and below it, tree is “in” and is counted in the sampling plot (Figure U-5).

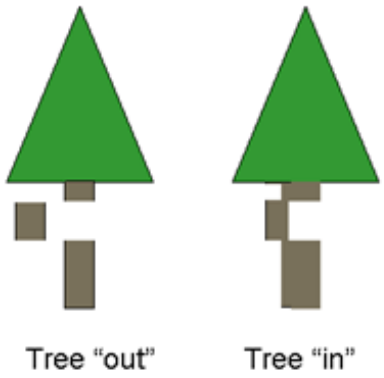


Figure U-5 Tallying Trees with BAF Prism

In the field, the forester actually stands at a sampling point and turns 360 degrees, all the while looking through the prism and counting the trees that are "in". The number of trees counted multiplied by the BAF equals the estimated basal area in square feet.

In some cases, smaller trees closer to the sampling point will be excluded from the count, while larger trees at a greater distance from the sampling point will be included in the count.[1] In our example, if the distance of the tree from the sampling point is within 33 times its diameter,[2] the tree will be counted (Avery and Burkhart 1994, p. 219). Conceptually, all trees are encircled in imaginary zones that are 33 times the diameter of each tree stem. If a tree's imaginary zone encompasses the sampling point, the tree will be counted. In Figure U-6, the trees in Zone A and Zone B will be counted. The tree in Zone C will not be counted.

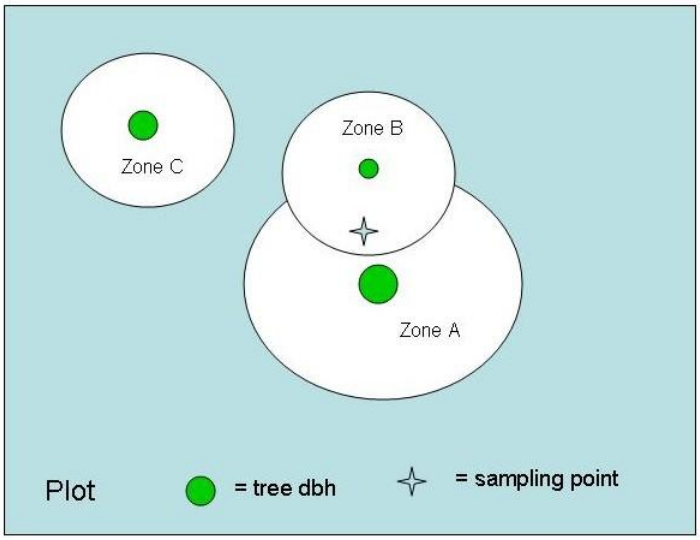


Figure U-6 Tally Zones

[1] According to Avery and Burkhart (1994), the probability of a tree being tallied is proportional to the basal area of its stem so that a stem with a 12 in. dbh has 4 times the probability of being counted as a stem with a 6 in. dbh (p. 220).
[2] For a BAF 10, the ratio of the tree diameter to the plot radius is 1:33.

U.2.1.4 Data collection at plots

Data collection is for inventory; evaluation of northern spotted owl habitat; effectiveness monitoring of riparian stand conditions; trend monitoring of snags, wildlife trees, and recruitment trees; and trend monitoring of downed wood. MRC tallies tree species and measures trees greater than 6 in. within a variable radius plot, moving in a clockwise direction beginning at a north line. The procedure for data collection at plots is as follows:

1. Measure dbh at 4.5 ft above the ground level (or root collar) on the uphill side of the tree. Accuracy is to the nearest inch. In the case of irregularities, such as swelling, bumps, depressions, and branches, the forester measures immediately above the irregularity where it ceases to affect the stem.
2. Measure total height on all trees in every third plot, starting with the first plot. If the angle from level to the point of measurement exceeds 45^0, the forester must increase the distance from the measured tree to reduce the angle. At least 30% of the total trees should have height measurements. Measured trees should represent a good distribution throughout the diameter classes.
3. Measure canopy cover using a vertical site tube with sampling guidelines from Berbech et al (1999) and Robards et al (2000).
4. Measure height-to-crown-base (HTCB) on every tree measured for height. This measurement, which provides an estimate of the total crown area, is taken from the base of the tree to the visually balanced base of the crown.
5. Enter a status code for each sampled tree, recording features such as live, snag, old growth, broken top, dead top, forked top, recruitment tree, and wildlife tree.
6. Measure downed logs on each plot in a fixed 0.10 acre plot (37.2 ft radius).
7. Ensure that sampled logs meet the following criteria:
   - A log must have an average diameter of at least 6 in. (the large end diameter + the small end diameter divided by 2).
   - A log must have a length of at least 10 ft, for average diameters less than 16 in., or a length of at least 6 ft, for average diameters greater than 15.9 in.

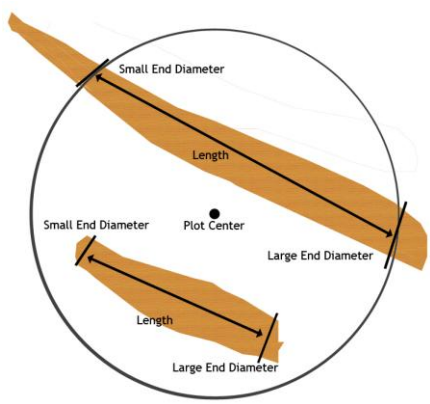


Figure U-7 Measuring Downed Logs on a Plot

8. Determine if downed logs are hard (i.e., no material gives way when kicked) or soft (material falls of when kicked). Hard logs generally have an intact top, bark, and sound wood. Soft logs usually have a broken top, sloughed bark, and decaying wood.

9. Measure trees less than 6 in. on every plot. The sample area measured for regeneration is a fixed 0.01 acre plot (11.8 ft radius). Record all conifers and hardwoods by species and tally seedlings and saplings in 2 size classes: 0-2.9 in. dbh and 3-5.9 in. dbh.
10. Measure shrubs. Shrubs are any plant species less than 10 ft tall with crown diameters at least 75% of the height. The measurement is based on an ocular estimate of the shrub cover within a 0.10 ac plot (37.2 ft radius). The dominant shrub species is recorded along with the density codes.
11. Note any further information about the cruised stand such as location of skid trails, springs, watercourses, historical artifacts, woodrat nests, bird nests, owls, raptors, mountain lions, and bears.
12. Calculate the basal area of a stand using at least 6 trees per plot.
13. Calculate the basal area of a stand using 5-10 trees per plot.

U.2.1.5 Site class sampling

The procedure for effectiveness monitoring of riparian stand conditions is as follows:

1. Select approximately 3-5 trees per stand as site trees. Selected site trees should represent conifer trees that display no deformities and are in a co-dominant position in the stand.
2. Measure the site trees for species, dbh, height, htcb, and age.
3. Extrapolate the estimated site class from the sampled trees to other stands within the planning watershed based on soil stratification.

U.2.1.6 Measuring tolerance standards

Table U-8 shows the tolerance standards MRC uses to evaluate the accuracy of field measurement.

Table U-8 Tolerance Standards

Measurement	Tolerance
Percent slope	±10%
Percent brush cover	±20%
Species identification	±1% of the total trees recorded
Diameter at breast height	±1.0 in.
Total tree height	±5 ft
Height to crown base	±10 ft
Breast height age	±5 yr

U.3 Estimates of trees and downed wood

U.3.1 Snags, wildlife trees, and recruitment trees

MRC records snags, wildlife trees, and recruitment trees as part of routine inventory using variable plot samples. The process that MRC also uses to monitor trends of snags, wildlife trees, and recruitment trees is the same for all 3 habitat elements.

To estimate the number of snags per acre, we use a 10 BAF and the dbh of all snags within the plot. With a 10 BAF, a 12 in. dbh snag would have a plot radius of 33 ft. The plot radius, in turn, determines the acreage of the plot (e.g., a 33 ft radius is a 0.0785 ac plot). If the plot, in this example, were expanded to an acre, there would be 12 snags per acre. We estimate the total number of snags in a stand by dividing the sum of the estimated number of snags per acre by the total plot count. So, again, in our example, we would estimate there were 1.2 snags in the stand (i.e., 12 snags/ac divided by 10 plots).

To estimate average snags per acre for the plan area [AS(pa)], we take the estimated number of snags/ac in each stand [ES(ac)] multiplied by the acreage of each stand [S(ac)] and sum the product for all stands in the plan area.

$$\sum S(ac.) \ X \ S(ac) = S(pa)$$

The sum of all the snags for the plan area [S(pa)] is then divided by the total acreage of the plan area (213,244 ac) to estimate average snags per acre [AS(ac)].

$$S(pa) \ / \ 213{,}244 \text{ ac} = AS(ac)$$

U.3.2 Downed wood

As part of routine inventory, MRC also records downed wood with the same process used to monitor downed wood. We measure downed logs on every plot. The sample area for downed logs is a fixed 1/10th acre plot (37.2 ft radius). Initially, we compute the number of downed logs per ac [DL(ac)] for a stand by multiplying the number of downed logs per plot [DL(plot)] by 10 since the plot size is a 1/10th ac.

$$DL \ (plot) \ X \ 10 \ = \ DL(ac)$$

To estimate average downed logs per acre for the plan area, we take the estimated number of downed logs/ac in each stand [DL(ac)] multiplied by the acreage of each stand [S(ac)] and sum the product for all stands in the plan area [DL(pa)].

$$\sum DL(ac) \ X \ S(ac) \ = DL(pa)$$

The sum of all the downed logs for the plan area [DL(pa)] is then divided by the total acreage of the plan area (213,244 ac) to estimate average downed logs per acre (ADL(ac)].

$$DL(pa) \ / \ 213{,}244 \text{ ac} = ADL(ac)$$

U.4 Inventory Updates

Estimates in the forest inventory change with time because of forest growth, harvesting events, and natural disturbances. MRC updates the inventory in December and January of each year and produces annual reports.

U.4.1 Method of updating inventory database

Growth

Using CRYPTOS, MRC "grows" all sampled plots 10 years of age or less on an annual basis and produces 5-year growth estimates. Any plot older than 10 years is removed from the pool of plots that is used to provide estimates for a given stratum. This is to minimize an over-reliance on the growth model for maintaining the inventory.

Harvested stands

We generally cruise a percentage of harvested stands to compare actual retention levels with desired retention levels. Our goal is to sample at least 30 plots in 3 different stands estimated to have at least 100 ft^2 of conifer basal area. For stands estimated to have less than 100 ft^2 of conifer basal area, the goal is 20 plots in 2 different stands. We sometimes cruise harvested stands after a

harvest to compare actual retention levels with desired retention levels. This sample data becomes part of the stratum estimate.

Natural disturbances
A natural disturbance has a similar effect on a stand as a harvest. As a result, MRC treats natural disturbances similar to a harvest, making adjustments to strata assignments and applying the appropriate tree lists.

Creating tree lists
Using visual evidence from aerial photos, MRC initially places stands into 1 of more than 40 vegetation classes. In a given planning watershed, MRC samples a subset of stands in each vegetation class for tree data according to the data collection protocols in section U.2.1.3. We then enter the data from the sampled stands into a Microsoft Access database and create a tree list. Next we assign tree lists from sampled stands to un-sampled stands of the same vegetation class. For example, there are 20 RD3D (vegetation class) stands in a planning watershed. Of these, 3 are sampled stands and 17 are un-sampled stands. Applying a set of queries in the main inventory database extends the tree lists from the sampled stands to the un-sampled stands within the same vegetation class and the same planning watershed. The net effect of this process is that the un-sampled stands have a tree list which reflects the average of the sampled stands for a particular vegetation class within a planning watershed.

U.5 Growth and Yield Modeling

The growth model commonly used in the redwood region is called CRYPTOS. The growth and yield projections used in the HCP/NCCP are based on CRYPTOS. Projected inventory, harvest estimates, and growth estimates are output every 5 years.

U.6 Stand Sensitivity Attributes

MRC assigns each stand a code that indicates any special management considerations for the stand. With the code, we can generate maps that display the geographic extent of the sensitive areas. The codes associate the stands to silviculture strategies in growth and yield modeling that are consistent with management policies. Figure U-8 shows a set of stands with their respective sensitivity codes.

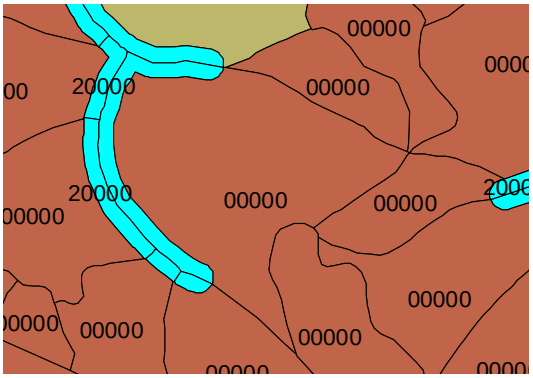


Figure U-8 Sensitivity Assignments

The sensitivity code consists of 5 digits. For example, a stand with a sensitivity code of 20000 has watercourse sensitivity (Large Class II) but no visual observations, special considerations, wildlife, or vegetation sensitivities. Table U-9 explains the key to the sensitivity codes.

Table U-9 Key to Sensitivity Codes

Key to Sensitivity Codes									
Watercourse		**Visual Observations**		**Special Considerations**		**Wildlife**		**Vegetation**	
0	No Concern	0	No Concern	0	No Concern	0	No Concern	0	No Concern
1	Class I	1	Special View shed	1	Special Treatment Area	1	Spotted Owl – High	1	Old Growth – Type I
2	Large Class II			2	Deeded Conservation Easement	2	Spotted Owl – Moderate	2	Pygmy Forest
3	Class I Floodplain			3	Non-deeded special conservation	3	Spotted Owl – Limited	3	Old Growth – Type II
4	Class II Floodplain			4	Carbon Management	4	Marbled Murrelet	4	Rock and Talus
5	Floodplain					5	Point Arena Mountain Beaver	5	Oak Woodland
6	Small Class II					6	Spotted Owl – High/Marbled Murrelet/Point Arena Mountain Beaver	6	Old Growth Buffer
						7	Spotted Owl – High/Marbled Murrelet		
						8	Marbled Murrelet Buffer		
						9	Spotted Owl – High/Point Arena Mountain Beaver		

U.7 Structure Classes and Habitat Inferences

MRC uses sampled data to make inferences about sampled stands and strata for each sustainability unit. The types of inferences include estimates of timber volume, basal area, tree density, and species composition. We use the sampled data to place stands in structural classes based on species composition, dominant dbh, and canopy closure. With these structural classes, we assess the quality and quantity of habitat conditions across our land.

After obtaining sampled data, MRC re-classifies stands and strata into structure classes using empirical evidence. We compile these structure classes from actual tree lists for each stand using data collected from the stand or using the recompilation process described above. With a crosswalk between structure classes and habitat types, we then assign habitat types for northern spotted owls (see Table 10-8).

Table U-10 lists the various structure classes.

Table U-10 Structure Classes

Structure Classes			
Structure Class	**Tree Type**	**Dominant Size Class**	**Min. Canopy**
0	Non-forested	0	0
1	Mixed Hardwoods	<8”	<40%
2	Mixed Hardwoods	>16”	<40%
3	Mixed Hardwoods	<16”	>40%

Structure Classes			
Structure Class	**Tree Type**	**Dominant Size Class**	**Min. Canopy**
4	Mixed Hardwoods	>16”	>40%
5	Mixed Hardwoods	<16”	>60%
6	Mixed Hardwoods	>16”	>60%
7	Mixed Conifers/Hardwoods	<16”	<40%
8	Mixed Conifers/Hardwoods	16-24”	<40%
9	Mixed Conifers/Hardwoods	<16”	>40%
10	Mixed Conifers/Hardwoods	> 8”	>40%
11	Mixed Conifers/Hardwoods	<8”	>60%
12	Mixed Conifers/Hardwoods	16-24”	>60%
13	Conifer	<8”	<40%
14	Conifer	16–24”	<20%
15	Conifer	24–32”	<40%
16	Conifer	>32”	<40%
17	Conifer	<16”	>40%
18	Conifer	16–24”	>40%
19	Conifer	24–32”	>40%
20	Conifer	>32”	>40%
21	Conifer	<16”	>60%
22	Conifer	16–24”	>60%
23	Conifer	24–32”	>60%
24	Conifer	>32”	>60%

U.8 Monitoring Riparian Stands

MRC samples riparian stands in the same manner as upslope stands but we categorize them separately in order to manage aquatic habitat. Many riparian stands currently have characteristics (basal area, canopy cover, species mix) similar to upslope stands due to legacy harvests. This will change as we promote distinct stand characteristics within AMZs.

MRC currently has samples for 65 separate riparian stands throughout the plan area. Table U-11 lists them by planning watershed and includes the stand ID.

Table U-11 Riparian Stands in the Plan Area

Riparian Stands in the Plan Area	
Planning Watershed	Stand ID
Middle Albion River	AM00059A
Middle Albion River	AM00090A
Middle Albion River	AM00033A
Upper Albion River	AU00021A
Upper Albion River	AU00022A
East Branch North Fork Big River	BE00005A
East Branch North Fork Big River	BE00059A
East Branch North Fork Big River	BE00025A
East Branch North Fork Big River	BE00003A
East Branch North Fork Big River	BE00041B
Lower North Fork Big River	BL00007B
Lower North Fork Big River	BL00005A

Riparian Stands in the Plan Area	
Planning Watershed	Stand ID
Lower North Fork Big River	BL00007A
Martin Creek	BI00056A
Martin Creek	BI00025A
Martin Creek	BG00001A
Mettick Creek	BM00070A
South Daugherty Creek	BS00059A
South Daugherty Creek	BS00254A
South Daugherty Creek	BS00145B
Dutch Henry Creek	ED00067A
Dutch Henry Creek	ED00135A
Dutch Henry Creek	ED00131A
Dutch Henry Creek	ED00144A
Dutch Henry Creek	ED00143A
Dutch Henry Creek	ED00062A
John Smith Creek	EJ00035A
Little North Fork Navarro River	EN00250A
Little North Fork Navarro River	EN00014A
Little North Fork Navarro River	EN00006A
Little North Fork Navarro River	EN00208A
Lower South Branch Navarro River	EL00085A
Middle South Branch Navarro River	EM00028A
Middle South Branch Navarro River	EM00144A
Middle South Branch Navarro River	EM00116A
Middle South Branch Navarro River	EM00135A
Middle South Branch Navarro River	EM00102A
Middle South Branch Navarro River	EM00045A
Middle South Branch Navarro River	EM00137A
Upper South Branch Navarro River	EU00060A
Hendy Woods	WH00015A
Hendy Woods	WH00042B
Hendy Woods	WH00042A
Hendy Woods	WH00023A
Hendy Woods	WH00025A
Hendy Woods	WH00012B
Lower Navarro River	WL00068A
Lower Navarro River	WL00081B
Lower Navarro River	WL00084A
Lower Navarro River	WL00126A
Middle Navarro River	WM00129A
Middle Navarro River	WM00052A
Middle Navarro River	WM00047A
Middle Navarro River	WM00056A
North Fork Navarro River	WN00058A
Hayworth Creek	NH00166A

Riparian Stands in the Plan Area	
Planning Watershed	Stand ID
McMullen Creek	NC00029A
McMullen Creek	NC00009A
Olds Creek	NO00056
Olds Creek	NO00012A
Cottaneva Creek	RC00002A
Lower Hollow Tree Creek	RL00001B
Upper Hollow Tree Creek	RU00130A
Lower Greenwood Creek	CG00075B
Upper Ackerman	UU00014

Appendix V

Science Panel Recommendations

Contents

V. SCIENCE PANEL RECOMMENDATIONS **V-1**

V. SCIENCE PANEL RECOMMENDATIONS

Summary of Science Panel Recommendations for MRC HCP/NCCP August 2003	
Science Panel Recommendation	MRC Response
1. Q. *What are the necessary components and rationale for a conservation plan? What other options will insure long-term conservation strategies? What adjacent land uses could impact the conservation measures proposed in the MRC HCP/NCCP?*	
A. A conservation plan must address the potential threats to biodiversity and ecological processes. Apart from the HCP/NCCP programs, there are few options for insuring long-term management and conservation of natural resources on private lands. A habitat-based approach to conservation planning would modify many of the current practices of MRC.	A. Our HCP/NCCP proposes habitat-based conservation measures, e.g., for wildlife trees, downed wood, and riparian function, as well as species-specific measures, e.g., for northern spotted owls and marbled murrelets.
B. There is a need to monitor (1) the populations of a few select species that may best represent the species assemblage for a habitat type or (2) species known to be declining or at high risk of regional or global extinction	B. Our HCP/NCCP proposes monitoring for all covered species.
C. Adaptive management should be built into any conservation strategy, as additional species will be listed over time and catastrophic events may alter the landscape.	C. Chapter 13 of our HCP/NCCP describes the proposed monitoring and adaptive management. We have included side boards for the adaptive management to give us economic certainty and to give the agencies the ability to assess potential impacts. Our HCP/NCCP does have provisions to alter or add conservation measures and monitoring, with MRC and agency concurrence. The process for minor modification addresses low impact changes, while the process for major modifications includes an opportunity for public comment on any proposed changes.
D. Appropriate conservation planning should ensure the protection of listed and other vulnerable species and provide for the enhancement and recovery of their populations while integrating, at a landscape level, the land management objectives of various ownerships... In addition, the long-term management plan should be a covenant to the land and not become void when ownership changes.	D. Our HCP/NCCP can only ensure conservation measures on MRC property. Other than that, we can purchase additional lands to include in the HCP/NCCP or encourage other landowners to develop similar plans.
E. An HCP/NCCP should include an articulation of the objectives of the plan; review of applicable laws, regulations, and ordinances; inventory of biological resources; review of the biology and ecology of species and communities; review of the geography,	E. ▪ Chapter 1 gives the purpose and scope of the plan. ▪ Chapter 2 reviews the applicable laws and regulations. ▪ Chapters 3-6 provide species accounts for all the covered species.

Summary of Science Panel Recommendations for MRC HCP/NCCP August 2003	
Science Panel Recommendation	MRC Response
ecology, and land-use history of the planning area; review of management plans of the landowners in the planning area; identification of conflicts between economic management objectives and conservation; identification of opportunities for the protection and enhancement of species and communities; development of management prescriptions to address specific populations of species and communities of special interest; development of a monitoring program and a set of prescribed feedback loops to modify prescriptions and plans if conservation objectives are not being met.	▪ Chapters 1 and 3 provide an overview of the geography, ecology, and historical land use in the planning area. ▪ Chapters 7-12 identify opportunities for the protection and enhancement of species and communities and propose detailed conservation measures. ▪ Chapter 13 proposes a monitoring program and a set of feedback loops to modify conservation measures if objectives are not met.
2. Q. *Is the current list of species and communities addressed by the HCP/NCCP comprehensive enough to achieve the plan's biological goals?*	
A. There are several communities in the MRC plan that need more attention, including fens and bogs, coastal prairie, and coastal scrub. A proactive approach would map these communities, briefly assess their condition, and conduct a survey for rare plants in the appropriate habitats for each community.	A. MRC addresses fens and bogs in our watercourse or wet area protections. Coastal prairie and coastal scrub are not covered communities in this plan.
B. The list of species addressed by the plan is fairly comprehensive and the treatments are often thorough. However, the plan does not present a comprehensive list of plant species based on actual surveys of the property. The current list of plant species is not comprehensive enough to achieve the plan's biological goals.	B. For more recent drafts of our HCP/NCCP, botanists from CDFG and Garcia and Associates have helped MRC develop our covered plant list and our conservation measures for rare plants.
C. MRC should address several vertebrate species more thoroughly in the plan, including the Pacific fisher, the California tiger salamander, and the Pacific giant salamander (now called coastal giant). Two or three invertebrate species may warrant mention in the plan, including the Lotis blue butterfly, Behren's silverspot butterfly, and the California freshwater shrimp.	C. ▪ Conservation measures for old growth, wildlife trees, and LWD will benefit this species. ▪ MRC has revised the boundaries of the adjustment areas since the science panel completed its review of Draft1. In the current draft of the HCP/NCCP, potential habitat for the tiger salamander is not included in plan or adjustment areas. ▪ MRC finds that coastal giant salamanders are relatively common in the plan area and are habitat generalists. As a result, they are not good indicator species for determining impacts of timber operations. ▪ Proposed conservation measures for pygmy forest will protect the Lotis blue butterfly. Dr. Gordon Pratt conducted surveys in summer 2004 with no detections. To avoid take, MRC will seek the technical assistance of USFWS before pursuing any actions that may affect this species. ▪ The proposed covered activities are unlikely to have any impact on Behren's silverspot butterfly as this species occurs in coastal prairie, a community type

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	which the HCP/NCCP does not cover. The primary impacts to the species are commercial and residential development, over grazing, fire exclusion, competition by non-native plants, and trampling by off-road vehicles and horses. ▪ The range of the California freshwater shrimp is not within the plan area or adjustment area. Nevertheless, if it were, the proposed conservation measures for watercourses would provide this species significant protection.
3. Q. *Does the plan address physical properties and processes that shape species and community dynamics?*	
A. We do not feel that physical properties and processes were adequately addressed, although MRC has made a start in this direction. The MRC HCP/NCCP appears to address the standard set of watershed physical processes, but avoids questions pertaining to the role of disturbance, including fires, landslides, and bank erosion in habitat creation. Likewise there is a lack of analysis of habitat-forming processes over large spatial scales.	A. MRC has considered these critiques in preparing subsequent drafts of the HCP/NCCP. Many of the conservation measures address disturbances. Canopy retention in unstable areas will provide wood for recruitment if mass wasting occurs. Conservation measures for basal area and large tree retention also ensure that when stream banks collapse there will be recruitment wood. Retaining wildlife trees and downed wood will create snags and habitat on the forest floor. Changed and unforeseen circumstances will trigger additional conservation measures.
B. The HCP/NCCP would benefit from inclusion of principles of disturbance ecology and larger-scale drivers of physical heterogeneity in river systems. We also suggest that MRC give greater attention to riparian zone protection and roads.	B. MRC has proposed in the current draft a detailed strategy to protect and restore the functions of riparian zones (including wetlands, wet areas, seeps, and springs). We believe the HCP/NCCP sufficiently conserves natural communities, as well as threatened and rare species within the plan area. To consistently mimic natural disturbances would be difficult for a timber management company maintaining an economically sustainable business. MRC has proposed a detailed road management plan which includes ▪ Guidance on road construction and layout. ▪ Objectives and timelines for ▫ Treating controllable erosion. ▫ Monitoring road features. ▫ Evaluating potential hazards. ▫ Prioritizing road restoration treatments.
C. The primary logic for riparian zone protection is to maintain the integrity of the physical and biological riparian environment. This requires a variable distance of streamside buffer, depending on the shape of the land.	C. MRC has variable width “bands” or buffers in the riparian zones based on terrain slope and stability.

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D. An effective conservation plan must anticipate and plan for the consequences of large and infrequent events, such as large storms, floods, and landslides, while considering the shorter-term consequences of intervening conditions.	D. MRC conservation measures for canopy, large tree retention, downed wood, and basal area, in addition to the proposals in Chapter 14, *Changed and Unforeseen Circumstances*, consider large infrequent events as well as current conditions.
E. Roads are generally the most ubiquitous and influential human-made feature affecting physical and biological processes in managed forests. Hence, the discussion of road use and design should be more comprehensive.	E. Appendix E of the HCP/NCCP, drafted after the science panel review, proposes a detailed plan for road management, including construction, reconstruction, maintenance, decommissioning, and guidelines for road use.
4. *Should any species and natural communities be added to the conservation strategies (e.g., species with no special protection status but that could be useful in planning conservation strategies or as monitoring indicators)?*	
A. Some additional species and natural communities that might be addressed are discussed in the science panel's response to Question 2. Terrestrial animal species that might be considered for conservation planning and monitoring, though not necessarily as a covered species, are the red tree vole, the ringtail, the bobcat, and the mountain lion.	A. Unlike the covered species, bobcats and mountain lions are relatively common in the plan area and, therefore, have a low level of concern. Moreover, as "habitat generalists," they are not good indicator species. Land management under the HCP/NCCP and PTEIR will continue to provide viable habitat for all of these species.
B. There are no bats or passerines mentioned in the plan, although MRC is currently conducting point-count surveys for passerines. This is acceptable unless some bat or passerine species show up in the "grouping species process" discussed in Question 6 below. Sensitive bat species are known to occur on adjacent lands (Navarro State Park).	B. FESA and CESA do not list any bats or passerine species occurring in the plan area. If such species appear on future listings, MRC will follow no-take measures with technical assistance from the wildlife agencies. Conservation measures, such as those for old growth and rocky outcrops, while not specifically targeting these species, will benefit them.
5. *Should any species be removed from the HCP/NCCP as highly unlikely to be found in the plan area or affected by the plan?* We do not recommend the removal of any species at this time. The choice of species to be covered by the plan seems logical (albeit incomplete) based either on the current federal and/or state status of the species or the likelihood of impacts on their habitat and associated populations by MRC land management activities.	

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6. *(a) Are there any new or pending taxonomic revisions or other issues that would affect the list of species addressed? (b) What are the most effective ways of grouping species to assist in designing, managing, or monitoring conservation strategies?*	
A. None are currently known.	A. No response is required.
B. There are several ways to group species that might be useful. One logical approach would start by grouping species into habitat guilds by the major habitat types they depend on. This habitat-based approach can be further refined to a "focal species approach," where managers identify, for each major habitat type, groups of species whose vulnerability can be attributed to a common cause, such as loss of area or fragmentation of a particular habitat type or alteration of a disturbance regime. Species in each group then can be ranked in terms of their vulnerability to those threats. For each group the focal species are the ones most demanding for the attribute that defines that group. They serve as the umbrella species for that group. The aquatic species may not be effectively grouped and probably require monitoring (and adaptive management) on a species-by-species basis.	B. MRC concluded that it was not possible to efficiently group species for monitoring. The plan proposes monitoring for specific species and habitat. Northern spotted owls, marbled murrelets, Point Arena mountain beaver, and salmon and frogs in the streams can be used as umbrella species to monitor habitat and estimate community health.
7. *Do current data-gathering methodologies provide a mechanism to develop biological and physical information as sufficient scientific foundation for conservation planning?*	
A. For the most part, the methods used to measure the habitat components in the plan are well described and the metrics chosen are appropriate. However, the lack of a well-defined botanical survey protocol presents a serious problem for the development of this HCP/NCCP.	A. MRC subsequently retained a botanical consultant to develop the conservation and monitoring plan for rare plants.
B. For most other species, the data gathering methods appear to be well described. However, we provide a number of suggestions concerning definitions and methodology, for example making clearer the definition of old-growth trees for each species earlier in the HCP/NCCP, referring to the literature for the specific field methods that will be used to monitor populations of plants and amphibians, and describing how it will be decided whether portions of a LACMA will need "improving" for marbled murrelet habitat.	B. Old growth definitions have been revised. Chapter 13, *Monitoring and Adaptive Management*, refers to the literature as much as possible. Any improvement of LACMA will be done in a very conservative approach with agency approval.

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C. We also have some concerns about the treatment of Class III streams and the proposed watershed analysis, described in our detailed comments in this report. Additional data gathering on terrestrial ecological processes is also needed.	C. In subsequent drafts of the HCP/NCCP, MRC addressed these concerns of the Science Panel.
▪ Make clearer the definition of old-growth trees for each species of conifer and deciduous trees earlier in the HCP/NCCP document so that when the retention of old-growth trees is discussed in the conservation measures for Class I and Large Class II AMZs, readers will know what is being referred to.	▪ MRC has made this change.
▪ Define what a "screen tree" is when discussing the retention of screen trees around individual old growth trees.	▪ MRC has made this change.
▪ Make clear that not all the characteristics described for old-growth trees are needed to define a tree as old growth, for example, Douglas-fir trees often have little or no moss since they grow on drier sites, and old-growth redwood trees often have little moss.	▪ MRC has made this change.
▪ If rare plant surveys are planned, refer to the literature and methods that will be used to conduct these surveys.	▪ MRC has made this change.
▪ Refer to the literature for the specific field methods that will be used to monitor populations of red-legged frogs, foothill yellow-legged frogs, and coastal tailed frogs.	▪ Sections 13.5.2 through 13.5.4 propose monitoring for red-legged frogs and coastal tailed frogs. Experts in the field identified and, in some cases, developed the methodologies. Since the Science Panel review, MRC, in consultation with the wildlife agencies, has decided not to cover the foothill yellow legged frog (see section 7.4).
▪ Specify targets or a percentage in the methods used to describe the densities of egg masses that would indicate a significant decline of foothill yellow-legged frogs. Specify how an egg-to-metamorph survival ratio will be calculated for the foothill yellow-legged frog, when the survey method indicates that the survey is complete after the first metamorph is observed within each stream index reach.	
▪ For the coastal tailed frog surveys, describe in more detail how data will be gathered to describe their distribution—how many streams will be surveyed? How will the stream indexes to be surveyed be defined? What percentage of streams or stream reaches will be surveyed?	▪ MRC will survey 10 streams per planning watershed as detailed in section 13.5.4.
▪ Describe how it will be decided whether portions of a LACMA will need "improving" for marbled murrelet habitat.	▪ MRC will make decisions on improving marbled murrelet habitat within LACMA only with agency consultation and concurrence.
▪ Change the definition of a potential murrelet nesting platform from "nearly horizontal" to ±45 degrees; murrelets are not limited to nesting on perfectly horizontal limbs.	▪ MRC changed the definition to ±45 degrees after consultation with the wildlife agencies
▪ Describe the methods for the collection of all canopy closure data.	▪ Refer to Appendix U, *Inventory Strategy*, and Appendix G, *Watershed Analysis Protocols*.
▪ The definitions of murrelet habitat types (High, Medium, and Low) should perhaps be	▪ For factors, MRC uses: (a) number of potential murrelet trees within 100 ft of each other; (b)

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converted into trees/acre so that the metric is more clearly standardized.	proximity of these murrelet trees to the coast; (c) and position of these murrelet trees on a slope. ▪ MRC re-worked this section to calculate the number of trees within 100 ft of each other per habitat zone.
▪ Better describe how the percent of ground cover disruption will be calculated in order to determine if rare plant surveys will be done prior to the management activity-taking place. For aquatic organisms, we recommend determination of their distributions and abundance, tracking their changes through time (and space), and relating these changes to environmental conditions.	▪ MRC completely re-worked the plant conservation measures and monitoring.
▪ (a) We have some concerns about the treatment of Class III streams. On page 37 of the Management Plan, the table estimates 720 miles of Class III streams, whereas on page 5-40, the area in Class III buffers, assuming a 25-foot buffer on each side of stream was 9732 acres, which translates to 1606 miles of Class III stream. This buffer area also translates into 4.2% of the total ownership. (b) We could not find in the documents a discussion of the criteria by which the head of a Class III stream was determined. At Caspar Creek, Class III streams often begin in areas having a drainage area of 3 to 5 acres. (c) Pipe flow is the dominant mechanism of water delivery in these small watersheds.	▪ (a)The buffer is 25 ft for slopes <30% and 50 ft for slopes >30%. There was a difference in the data gathered for the Management Plan (2000) and for Draft 1 of the HCP/NCCP. (b) The definition of Class III covers the criteria for determining the head of a stream, i.e., where a channel that can transport sediment to a higher order water course no longer exists. (c) We have included conservation measures for soil pipes
D. Open channel surface flow generally occurs as a discontinuous gully formed by collapse of piping channels. The drainage area at the upper location of Class III channels depends on the "maturity" of the piping tunnels, with mature piping development resulting in Class III streams occurring in smaller drainage areas than recently developing piping networks. The important point is that water and sediment are being transported down slope by both classic open channels and by piping. If headwater-piping networks are disturbed and collapsed by heavy equipment, large increases in sediment delivery would result. In this terrain, the definition of a Class III (provided in Table 5-1) should be modified to read, "Shows capability of transporting sediment ... timber operations, whether by surface channel or pipe flow." One could argue that substantial protection is needed in the swale immediately above the channel head, because the channel head could migrate upslope dramatically, with commensurate increases in sediment transport, if subsurface pipes are collapsed by heavy equipment.	D. The combined conservation measures for Class III streams, TSUs, and soil pipes afford adequate protection for these areas.

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E. (i) There is an inconsistency in the stated size of Class III buffers. Page 5-40 uses a 25-foot buffer on either side of the stream, whereas page 5-2 states a no-harvest zone within 10 feet of all Class I, II, and III streams, and page 5-4 indicates no inner or middle AMZ Band and a 25-foot AMZ for Class IIIs on slopes <30% and 50 feet on slopes >30%. (ii)There also needs to be some consideration of buffers and equipment exclusions in areas up-swale from the top of the designated Class III. (iii) Regarding the watershed analysis, page 29 of the Management Plan states that intensive field watershed analysis will be completed on all 303d listed watersheds (70% of ownership) by the end of 2001. We find little reference to the result of this analysis in the documents that we received.	E. (i) MRC corrected the inconsistency pointed out. (ii) The conservation measures for soil pipes and TSUs cover these concerns. (iii) MRC has included the requested data as well as the watershed analysis documents.
F. The information developed from these analyses would have been useful to the Science Advisors. As mentioned above, the HCP contains numerous methods for data collection on small-scale attributes of hill slopes and rivers. This is the conventional approach contained within "watershed analysis" which forms the basis of MRC's approach. The problem with relying solely on a watershed analysis (WFPB 1997) is that it has somewhat failed in its applications across the region. From all of the various small-scale data on substrate sizes, pools, logs, fine sediment, bank erosion, etc., it is hard to put humpty dumpty (i.e., the ecosystem) back together again. Nevertheless, this is the conventional approach and MRC should not be faulted for incorporating it into their plan. However, if they conducted a review of the scientific merits of certain types of analyses (i.e., an epistemological analysis of the various watershed disciplines—see Benda et al. 2002) this limitation might become more apparent and could motivate some larger-scale analysis of landscape controls on riverine ecosystems (see response to Question 1 above) in addition to providing further defensibility regarding recognition of the scientific limitations of any HCP/NCCP. Additional data gathering on terrestrial ecological processes is also needed. Systematic study of fire history would provide important information necessary for the development of strategies for the maintenance of some plant communities. No mention is made of any collection or use of climatic data. Incorporating the existing network of relevant weather stations and adding new stations if needed could provide useful information to better understand future fluctuations in species population levels as well as patterns of forest growth.	F. Collecting fire and climatic data would be optimal; however, MRC has limited resources and has chosen to use the resources where there are more pressing needs. For this reason, we did not include outcomes and assessments from the 2008 Mendocino Lightning Complex fires in our HCP/NCCP. We do have 10 rain gages located throughout our property; however, the data from these gages is being collected independent of the HCP/NCCP.

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8. Is there a body of scientific information sufficient to provide a foundation for conservation planning?	
A. Components with reasonably complete information include large woody debris recruitment processes, mass wasting and erosion processes, road inventory data, mapping of the different stream classes, and the amounts and distribution of particular habitat types including mature and old-growth coniferous forests, deciduous forests, and riparian communities. However, there appears to be considerable uncertainty regarding the distribution and amounts of Type II old growth.	A. MRC cannot easily define Type II old growth from aerial photos; positive identification requires field visits. When foresters encounter these stands for the first time, their locations are recorded. About 20 years into the HCP/NCCP, MRC will have a clearer picture of the amount of Type II stands on our covered lands as we make harvest decisions on all available stands.
B. These stands could be more abundant on the ownership than recognized, and could be important for many species. Unless it appears in other portions of the document that we did not have access to, there seem to be large information gaps regarding the presence, amounts, and distribution of unique habitat types, including near coastal communities (coastal prairie, coastal scrub), bogs, fens, wetlands, vernal pool, major rock outcrops, and chaparral plant communities.	B. MRC conserves all Type II stands and uses silviculture to enhance old-growth qualities of a stand. The HCP/NCCP does not cover coastal prairie and coastal scrub, both of which are very limited on MRC land. MRC does provide specific conservation measures for wet features (bogs, fens, wetlands, and vernal pools); When they occur, MRC maps them and records them in our GIS database. MRC has also recorded the few major rock outcrops in the plan area. Chaparral, as a climax community (not a brushy successional stage in the life of a forest) does not occur in the plan area.
C. From a species perspective, sufficient survey information and presence/absence data appears to be available for the northern spotted owl and foothill yellow-legged frog. As recognized in the plan, more information on the presence, distribution and habitat use of the Point Arena mountain beaver, red-legged frog, coastal tailed frog, and marbled murrelet needs to be collected. The distributions of the red-legged frog and coastal tailed frog are largely unknown	C. (i) During the development of the HCP/NCCP, MRC has collected additional data on the Point Arena mountain beaver; however, there are a very limited number of burrow systems on our land. We will continue to collect data as THPs are developed for an area. (ii) Since the science panel reviewed Draft 1, MRC has implemented presence surveys for red-legged frogs and coastal tailed frogs. (iii) We have chosen not to cover foothill yellow legged frogs. (iv) We realize that data needs to be collected on marbled murrelets; however, they are known to exist in a very limited portion of the plan area. We will complete surveys as we encounter potential habitat during THPs and assess the likelihood of marbled murrelets occurring at a site. Since 1994, ground detections of marbled murrelets generally have been limited to the Lower Alder Creek area. Ground surveys will be ongoing; we will focus radar surveys on following population trends in Lower Alder Creek.
D. (i) The plan needs to better define the species of rare plant that may be present in the unique communities that exist on the ownership and conduct surveys to describe their distribution, abundance, and habitat	D. (i) MRC will conduct surveys when there is a proposed disturbance to a site. Employing both large scale plant surveys and project specific surveys is financially unfeasible. (ii) For Draft 3, we have added discussions on

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associations. (ii) Regarding watershed processes, we believe sufficient scientific understanding exists for providing a general foundation for conservation planning. We recommend that MRC address several key issues, including scientific certainty/uncertainty over a range of scales, dynamics of landscapes (i.e., disturbance ecology); and large-scale sources of physical heterogeneity and biological productivity and diversity. (iii) Other gaps in information involve insufficient knowledge of the fire history of the area and other components of the disturbance regime.	QA and QC. We have added a discussion on QA/QC to Chapter 13, *Monitoring and Adaptive Management.* (iii) For Draft 5, we have added information related to fire frequency and disturbance regime, as well as information on the Mendocino Lightning Complex of 2008, including fire intensity, acres burned, and number of fires.
9. *Are there other data sources or articles pertaining to the biological resources of the plan area that MRC should consider during planning and analysis?*	
We suggest several additional data sources, including information on the experimental research in Caspar Creek (Jackson Demonstration State Forest) and work published by the Redwood Sciences Lab and the Pacific Southwest Research Station. The HCP/NCCP needs to make better use of existing technology to map the presence, distribution, and abundance of the community types present on the ownership. In addition, literature pertaining to the survey methodologies for particular species needs to better referenced. Appropriate technology for mapping vegetation includes low-elevation aerial photography and Landsat imagery. It might be useful to examine the Wieslander (1935) vegetation maps to determine the potential locations of unique habitats and plant communities.	These are just a few of the additional sources MRC used for Draft 5 (see HCP/NCCP References for full details): ▪ Cafferata, P. H., and T. E. Spittler. 1998. Logging impacts of the 1970s vs. the 1990s in the Caspar Creek watershed. ▪ CDFG (California Department of Fish and Game). 1996c. 1996 Wildlife monitoring on Jackson Demonstration State Forest. ▪ Lisle, T. E., and R. E. Eads. 1991. Methods to measure sedimentation of spawning gravels. ▪ Lisle, T. E., and S. Hilton. 1991. Fine sediment in pools: an index of how sediment is affecting a stream channel. ▪ Welsh, H. H., Jr., and A. J. Lind. 1991. The structure of the herpetofaunal assemblage in the Douglas-fir/hardwood forests of northwestern California and southwestern Oregon. ▪ Welsh, H. H., Jr., A. J. Lind, L. M. Ollivier, and D. L. Waters. 1992. Habitat associations of the southern Olympic salamander *Rhyacotriton variegatus* in northwestern California. ▪ Welsh, H. H., Jr., A. J. Lind, L. M. Ollivier, and D. L. Waters. 1993. A hierarchical analysis of the habitat associations of the coastal tailed frog (*Ascaphus truei*) in the mixed coniferous/hardwood forests of northwestern California. ▪ Zielinski, William J., Kucera, Thomas, E., Barrett, Reginald, H. 1995a. Current distribution of the fisher, Martes pennanti, in California. ▪ Aerial photography, going back to the 1960s, stored at MRC. ▪ Published photos showing forest conditions back to the early 1900s. ▪ General Land Office (GLO) maps describing forest conditions in the 1800s.

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10. *What gaps in existing information create the greatest uncertainties for planning, analyzing, managing, and monitoring conservation strategies in this setting?* This question is largely addressed in our response to Question 9.	
11. *What are the most effective methods for addressing these information gaps?* The most effective methods for addressing information gaps in the distribution and amounts of certain plant communities (outlined in our response to Question 9) would be the uses of technology such as low-elevation aerial photography and Landsat imagery across the ownership. Effective methods for addressing the information gaps in the distribution and abundance of particular species (see responses to Questions 2 and 10) would be the planning and implementation of survey protocols already available in the literature for these species. We recommend a change in the underlying approach to field studies, including rejecting the primacy of the "watershed analysis" approach to the study of watersheds and focusing on broader-scale processes.	Refer to the responses in #2 and #9, above. MRC decided to stay with watershed analysis rather than start a new process and possibly preclude data already recorded. Watershed analysis addresses the geologic variability within our major watersheds. Landscape planning directs our forest operations across the plan area. Both in combination will model habitat characteristics for the entire plan area over an 80-year horizon, without downplaying location variations.
12. *Are habitat suitability models or other models recommended for predicting species ranges where distribution data is sparse?* Spatially explicit habitat-suitability models developed with the use of geographic information systems are proving very useful in conservation planning, especially for wide-ranging animals. These models can be based either on empirical data or on natural-history information from the technical literature or expert opinion. Because the development of spatially explicit habitat-suitability models is time-consuming, we would not expect new models to be developed and validated by MRC for the HCP/NCCP. However, we strongly recommend that MRC search the literature to find models for sensitive animal species (e.g., Pacific fisher) that are known to occur or may occur in the region, and apply them to the planning area.	MRC searched the scientific literature for applicable models. We investigated the use of two specific models for northern spotted owls (Zabel et al. 2003) and fisher (Freel 1991). Unfortunately, applying these models in the plan proved difficult. Research for the owl model (Zabel et al. 2003) was conducted in a different bioregion, where nesting characteristics differed from those in the redwood region. Likewise, the fisher model was built for USFWS and does not use the same parameter scale that MRC uses. In the USFWS model, for example, the minimum stand size for fisher is 60 acres; very few of MRC stands are that large. Moreover, our use of uneven-aged silviculture makes it difficult to apply models built around even-aged techniques.
13. *Are there physical process models recommended for predicting relationships between physical and biological communities?* There is a paucity of physical models that predict relationships between physical watershed conditions and in-stream biological communities, and a distinct lack of models for predicting channel, floodplain, and valley morphology given inputs of water,	

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sediment, and wood. We recommend an epistemological analysis of what is known and not known about watershed processes.	
14. *If models are used, what standards for formatting, creating parameters, testing, or monitoring can you recommend?*	
The only (physical) model described in the Plan is SHALSTAB, which is used for predicting locations and relative likelihood of shallow land sliding in steep and convergent zones of hill slopes. SHALSTAB predictions need to be tested using landslide inventories over decades. We were unable to find sufficient details to determine how the predicted landslide risk was generated. Regarding models of surface erosion, it is stated, "surface erosion estimates will be developed by use of a surface erosion model." Unfortunately, there is no description of that model. With respect to long-term channel monitoring, it is useful to select appropriate monitoring periods based on the timing of geomorphically significant events (large storms, wet years, etc.) rather than on pre-selected years.	MRC has described the surface erosion model in Appendix G, *Watershed Analysis: Background and Methods.* We will examine habitat change due to stochastic events in the focus watershed studies.
15. *What basic tenets of landscape management are pertinent to conservation planning in this area and how should these tenets be translated into measurable standards and guidelines for landscape management design?*	
A. By appealing to well-accepted planning principles, decisions can be reasonably defensible despite limited data. The conservation planning principles developed by the Scientific Review Panel (SRP) for the NCCP program are: 1. Conserve target species throughout the planning area. 2. Opt for larger reserves. 3. Keep reserve areas close to one another. 4. Keep habitat contiguous. 5. Link reserves via corridors. 6. Keep reserves diverse. 7. Protect reserves from encroachment. 8. Maintain natural processes. (An 8th principle, well supported in the ecological literature, was added for the Southern Orange County NCCP.)	A. MRC will conserve covered species throughout the plan area. We have chosen not to follow the reserve philosophy of other NCCPs, since we are not permanently eliminating any habitat. MRC believes that our management approach is preferable to a standard reserve that, in effect, is created to mitigate impacts from development. Our reserves are diverse, including pygmy, oak woodland, Type I and II old growth, riparian areas, and easements. Our HCP/NCCP allows for sustainable forest management that includes necessary maintenance and restoration.
B. Because the MRC HCP/NCCP is based more on maintaining the suitability of the landscape matrix ("the working forest") rather than a network of reserves to accomplish its conservation goals, the SRP planning principles (i.e., not including #8) are	B. Implementing a prescribed fire plan is problematic: 1. There is potential liability for broadcast burns, since a large portion of the plan area is near residential areas. 2. Using fire in multi-aged timber management may

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generally less relevant than, for instance, in coastal southern California, where the NCCP program was initiated. Nevertheless, the principles still apply, albeit in modified form. Principle #8 is one we address most extensively in this report. Maintaining (or mimicking) natural processes, such as fire and hydrologic regimes within a historic range of variability, is fundamental to sustaining biodiversity across the ownership.	retard stands by burning the advanced regeneration. As part of our conservation strategies for riparian communities, closed cone forests, oak woodlands, and Type I and II old growth, MRC will consult with the wildlife agencies on any restorative burns in the plan area.
16. *What theoretical or empirical support is available for designing necessary and sufficient biological core area, linkages, wildlife/fish movement corridors or other aspects of design?* See our answer to #17.	
17. *Are explicit reserves or buffers recommended and is existing data sufficient for their design and implementation?*	
A. There is abundant theoretical and empirical support for the efficacy of well-designed reserves in maintaining biodiversity. Reserves are especially important for species and other resources sensitive to human exploitation, persecution, or harassment. The role of reserves becomes somewhat less critical as the surrounding landscape matrix becomes more suitable for the native species. However, there are still species so sensitive to human activities (e.g., even to the presence of recreationists) that refugia secure from human access are recommended. Specific reserves have been designated in some cases (e.g., old-growth redwood) on MRC land and should be designated in other cases for the protection for listed plant species and plant communities of special interest (e.g., serpentine balds). It would be also appropriate to select and set aside future "old growth" areas for each of the natural plant communities in the conservation planning area to serve as refugia for species requiring these habitats.	A. MRC has designated specific conservation measures for pygmy forest and oak woodlands, although these natural communities are very limited on our land. We encourage future old growth indirectly through our conservation measures for watercourses as well as our management of Type II stands, core areas for northern spotted owls, and habitat recruitment stands (MHRS) for marbled murrelets.
B. For salmon and other anadromous species, the requirement of stream habitat connectivity is critical. Explicit dimensions for riparian buffers and the types of harvest activities that can occur within them are outlined in the HCP/NCCP. The size of the buffers in the plan is substantially smaller than that considered adequate to protect anadromous habitat in the Northwest Forest Plan. Insufficient information exists to know how these particular widths and the management activities prescribed in	B. MRC has included our rationale for salmon in Chapter 10, *Conservation Measures for Fish and Wildlife*, and for wetlands, bogs, and seeps in Chapter 8, *Conservation Measures for Aquatic Habitat*. As mentioned earlier, we have specific conservation measures for unique habitats, such as pygmy forest, and potential or occupied marbled murrelet trees. Also, the science panel concluded that the AMZ band widths appear sufficient for Class I, Large Class II, and Small Class II watercourses (see Science Panel comment #25C).

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each band within the buffers will affect fish and other riparian and stream-related species and in-stream processes. This is also true for the buffers specified for wetlands, bogs, seeps, and other unique communities. Reserves and buffers should also be established in the case of known nesting trees used by marbled murrelets. Buffer designs for the Point Arena mountain beaver appear to be a best-guess approach due to a lack of specific information. A substantial number of studies have been completed on the northern spotted owl. Since the plan will collect demographic information on a large sample of pairs each year over time, the effects of the owl reserves designed to protect breeding pairs can be assessed.	
18. *How can MRC arrive at conservation strategies which are functional across multiple environmental gradients (e.g. topographic, climatic, and vegetational considerations)?*	
By using a habitat-based approach to conservation planning, conservation strategies can be derived that are functional across multiple environmental gradients. The protection of plant communities and their natural variation (due to position in relation to the coast, topographic, climatic, and elevation factors) can be provided by accurately mapping and documenting the distribution and abundance of these communities. Since protection is designed to occur across the MRC landscape, the natural variation of these communities associated with environmental factors will likely be incorporated into the conservation strategy. For the rare plant communities that may make up a small proportion of the MRC landscape, accurate mapping of these communities appears to be needed.	MRC maps different natural communities (pygmy forest, oak woodlands) by community type and composition; we have also begun recording rare plant occurrences. As other sensitive habitats are encountered (old growth, wet areas, rocky outcrops) we map these as well and record their location and characteristics in our database.
19. *Does existing information reveal specific geographic locations or landscape positions that are critical for landscape design (e.g. biodiversity "hotspots", crucial linkages, rare microhabitats, refugia, genetically unique population areas)? If not, how should that information be collected and inventoried?*	
Hotspots and other areas of concentrated biodiversity value can only be identified on the basis of accurate map-based (e.g., GIS) information. The maps we were provided did not contain any biological information; hence, they are inadequate for the identification of hotspots. Maps are essential for the identification of biodiversity hotspots, crucial linkages, rare microhabitats, refugia, and genetically	MRC has chosen to rely on ground field identification of "hotspots:" and areas of biodiversity value during THP preparation. At that time, we identify, for example, concentrations of snags and wildlife trees, as well as rocky outcrops and wet areas. MRC has mapped natural communities in Appendix B, *HCP/NCCP Atlas* (MAPS 8A-C).

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unique populations. We recommend that the plant communities on the ownership be mapped and their distribution and amounts described, including those rare plant communities that make up a small proportion of the MRC landscape. Then, a more detailed assessment of potential biodiversity hotspots, rare microhabitats, and refugia could be made. From an aquatic perspective, the term "biological hotspots" refers to habitat-forming processes and habitat development that is non-uniformly distributed across the landscape at scales larger than simply pools, riffles, and logjams. Hotspots might include unconstrained valley segments, canyon-floodplain transitions, upstream or downstream of large landslides, and near certain tributary confluences. Additionally, watershed disturbances can contribute to the formation and maintenance of biological hotspots preferentially at those locations.	MRC acknowledges that large-scale disturbances (anthropogenic and natural) often lead to the formation of habitats that are not uniformly distributed throughout a landscape. We monitor these habitats in conjunction with other programs (such as THPs and owl surveys) and protect them with aquatic or terrestrial conservation measures. The stochastic nature of these habitat-forming processes makes conservation planning difficult. MRC applies protections when habitat is identified and assessed.
20. *How can the plan address unique areas that are significant in a broader regional context?*	
The biological and aquatic-habitat hotspots referred to above qualify as areas significant in a broader regional context. It is important to determine whether the MRC property contains unique areas or areas that are common throughout the region. This requires an analysis that considers a geographic area substantially beyond the boundaries of the MRC ownership. The concept of regional context should eventually include assessing the demographic contributions of populations of rare or sensitive species on MRC land to regional populations or metapopulations. Species requiring such regional-scale analysis include the northern spotted owl, marbled murrelet, red-legged frog, foothill yellow-legged frog, coastal tailed frog, Pacific fisher and other species covered by the plan or suggested to be covered.	Chapter 3, *Environment and Habitat*, does address the plan area within a regional context. In addition, the conservation measures and collected data for northern spotted owls does take into consideration "off property" owl territories and "nearest neighbor distances."
21. *How can long-term processes or cycles (e.g., population dynamics, disturbance cycles, ecological migration) be effectively addressed?*	
A. Long-term processes are difficult to predict and to plan for, yet intelligent consideration of their roles in the ecosystem is probably crucial to the long-term success of a conservation plan. A longer-term perspective in the HCP/NCCP, even if mostly qualitative, would aid in placing bounds on landscape and riverscape dynamics over multiple decades. A 40-year record of rainfall, streamflow, and sediment transport is available from Caspar	A. Chapter 14, Changed and Unforeseen Circumstances, examines the impact of changing events upon the landscape, including "unprecedented events."

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Creek. Studies at Caspar Creek have produced a good understanding of the effect of logging on hydrologic processes in second-growth coastal redwood and fir forests. MRC has used the research from Caspar Creek to develop much of the discussion of hydrologic processes presented in the HCP/NCCP. Still, a 40-year climate and hydrologic record, though rare, represents a short window into variability that can be expected during the life of the HCP/NCCP. Fortunately, research and monitoring is expected to continue at Caspar Creek for the duration of the HCP/NCCP, which will provide a context to responses of the MRC landscape to climatic and hydrologic stresses. The plan should assume that unprecedented events are likely to occur.	
B. From the perspective of maintaining terrestrial ecological diversity, perhaps the best strategy for dealing with the long-term processes and cycles is to maintain a diverse landscape in terms of successional stages of each of the natural vegetation types, within a historic or natural range of variability.	B. MRC uses various silvicultures from selective harvest to variable retention and high retention harvests.
C. Fire and floods play a major role in the ecology of the redwood region. Most of the listed plant species in the region are in the herbaceous understory and many are dependent on disturbance events.	C. Our ability to re-introduce fire is limited, as we indicated in our response to Question 15. We have planned for routine floods in the conservation measures and for large floods in Chapter 14, *Changed and Unforeseen Circumstances*.
D. Logging operations do not mimic natural disturbances such as fire precisely and, in some cases create habitat for invasive exotics which outcompete native early-successional species.	D. Section 9.7 of the HCP/NCCP addresses goals, objectives, and conservation measures for invasive exotics.
E. Also needed is a robust adaptive management strategy that is flexible and contains strong feedback loops to managers.	E. Chapter 13, *Monitoring and Adaptive Management*, does provide for management feedback, while balancing our own need for economic certainty with the need of the wildlife agencies to assess impacts. Major modifications to the HCP/NCCP will adhere to a standard process agreed upon by the wildlife agencies.
22. *How could climatic variation affect this landscape ecosystem and the target species? How can these effects be addressed (e.g., plant populations, higher intensity weather events, frequency of events, etc)?*	
Watershed-scale stochastic simulation models could be constructed and the climate probability	MRC has a redwood clonal program, through which we locate and reproduce redwood cultivars adapted to a variety

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distributions could be altered to reflect the predictions coming from global climate models. Several models suggest this area of California will most likely experience increased temperature and decreased precipitation. This change could have a major impact on the redwood forest. One strategy to address this issue would be to begin now to identify redwood trees growing on the drier sites on the property and initiate a program of seed orchards or cloning to provide a supply of these more drought-adapted genotypes for replanting in the more eastern stands. A combination of stump sprouts from existing trees and planted seedlings from drought-adapted genotypes might provide a means of maintaining the redwood habitat in areas further from the coast. Very little is known about the biology and ecology of many of the listed plant species, so it is not possible to make suggestion for management of these species in relation to climate change. The higher intensity of weather events and the frequency of these events have already been incorporated into the redesign of stream crossing and the replacement of culverts. A monitoring of high-intensity weather events could provide a better database for the prediction of future of stream discharge	of climatic conditions. We plant these climate-adapted redwoods in areas where the parent tree thrived to determine the effect of climate change. Chapter 14 describes climate-change strategies for other species.
23. How should the plan address exotic species?	
A. At a minimum, those exotic species that may affect the viability of the species covered by the plan should be addressed. Changes in the presence and distribution of these exotic species over time could indicate potential problems. Exotic animal species also pose a threat to native biodiversity. An aggressive program of the control of exotic predators, such as bullfrogs, needs to be developed as a part of the plan. Populations of some native corvids (crows, ravens, Steller's jay) have increased substantially over the last few decades due to human urbanization (e.g., campground development) and other factors.	A. The HCP/NCCP proposes controls for bull frogs (C§10.2.2.3-6 and C§10.2.2.3-7) and barred owls (section 10.3.1.2.5).
B. These increases have likely had a large negative impact on marbled murrelet nesting success in some areas. The cost to collect information on problematic exotics should be minimal if the data are collected simultaneously with the monitoring effort for the species covered by the plan.	B. MRC will limit human activity in Lower Alder Creek.
24. What monitoring actions are necessary and sufficient to evaluate the plan's effectiveness in meeting the conservation objectives?	

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MRC's monitoring and adaptive management strategy is one of the most comprehensive and detailed we have seen in a NCCP/ HCP. To make the monitoring program even more defensible, the strategy should outline the specific kinds of monitoring that will take place, clearly state what the objectives are for each kind of monitoring, discuss the assumptions of the monitoring plan, define what assumptions will be tested over time using the adaptive management approach, clearly state definitions of terms to avoid confusion, explain how the data will be collected, explain the specific sampling and survey methods used for the monitoring and adaptive feed-back mechanisms, define clearly what thresholds or relative changes in parameters will be used to trigger changes in management direction, and outline the interactions that will take place with the agencies over time.	MRC revised Chapter 13, *Monitoring and Adaptive Management*, to include some of these recommendations, as well as recommendations of the wildlife agencies.
25. *Are the management actions proposed sufficient to meet the plan's conservation objectives?*	
A. The proposed management actions are not adequate for the sensitive plants and plant communities. In the MRC presentation to our team, a plan for conversion of a portion of the broadleaf upland forest to conifer forest was discussed. This plan should be included in chapter 5, so that it can be critically reviewed. Conversion to conifer forest could endanger some populations of sensitive species. More specific information is needed on the current distribution of the plant species in order to evaluate the proposed management actions. Prescribed fire may be a management action necessary to maintain some of the areas of chaparral, pygmy forest, and bishop pine forest.	A. In subsequent drafts, MRC developed an entire chapter devoted to rare plants—Chapter 11, *Conservation Measures for Rare Plants*. We propose to restore the conifer-to-hardwood ratio in upland broad leaved communities to its proportionality prior to forest management. In addition, we will not attempt to convert forest land unsuitable for growing conifers or land which could potentially grow conifers, as indicated in Chapter 9, *Conservation Measures for Terrestrial Habitat.* Our plan allows MRC to work with the wildlife agencies to institute prescribed burning for maintenance of some natural communities. In an effort to re-construct earlier forest conditions, MRC researched aerial photos stored in our vault, published photos, GLO records, and anecdotes from individuals alive in the early 20th century. Refer to our response to Question 9. We also examined pre-European evidence, such as stumps and old trails. Visits to nearby preserves, like Hendy Woods, Montgomery Woods, Armstrong Woods, and Mailliard Reserve, reinforced our photographic and written evidence. From all this data, we concluded that currently there is a greater hardwood-to-conifer ratio in our plan area than existed before European intervention. Tanoak, in particular, has proliferated. We cannot determine the exact composition of these early forests since slight variations in site conditions can favor one species over another. Consequently, we have built into our conservation measures safeguards to ensure that hardwoods will remain throughout the plan area.

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B. One aspect of the proposed management actions that concerns us is the potential impact of group selection as a silvicultural technique on the extent and distribution of "edge" and "interior" habitats in the north coast forest type. If a two-acre "checkerboard" of group selection openings develops over the forest landscape as a result of the application of group selection, forest-interior habitats may be reduced to a non-functional size for some interior species.	B. Group selection is only one of our silvicultural choices. In such cases, prescribed groups are rarely larger than 2 acres. Conservation measures for AMZs, northern spotted owls, marbled murrelets, and TSUs, for example, will retain large forest blocks that provide interior habitat. This will prevent a "checkerboard pattern" across the forest landscape in which small stands are adjacent to large openings.
C. Regarding aquatic resources, although the AMZ band widths appear sufficient for Class I, Large Class II, and Small Class II watercourses, the AMZ widths proposed for Class III watercourses appear minimal and may not be effective in reaching their objectives.	C. In subsequent drafts of the HCP/NCCP, MRC and the wildlife agencies bolstered the effectiveness of the aquatic conservation measures, particularly with regard to seeps, springs, soil pipes, and harvest within Class III AMZ.
D. The conservation measures for the marbled murrelet are problematic and probably insufficient. Similarly, the management objectives for protection of northern spotted owl pairs may not sustain the population.	D. MRC and the wildlife agencies do not believe the protection measures proposed in the current draft are problematic or insufficient for either the northern spotted owl or the marbled murrelet. The conservation measures for marbled murrelets and northern spotted owls have changed since the Science Panel reviewed early drafts of our HCP/NCCP. For example, the draft reviewed by the Science Panel did not include barred owl measures.
26. *Does the HCP/NCCP appropriately provide a framework for adaptive management within the plan area? What specific management principles or hypotheses are most important to test in the adaptive management program?*	
A. In order to test specific management principles or hypotheses with regard to sensitive plant distributions and the impacts of invasive exotics, baseline data need to be collected as a basis for comparison with management treatments applied in an adaptive management program.	A. Collection of baseline data on plants is cost prohibitive. MRC has chosen to survey for rare plants on a project basis. If we identify rare plant occurrences, we will implement our rare plant conservation measures, which include provisions for "invasive exotics."
B. Otherwise, we are impressed with the framework built for adaptive management. The timeline and details provided are well thought out. Among the most important hypotheses to test in the adaptive management program are those that relate to changes in the reproductive rate of species and/or population sizes/densities. A general concern with adaptive management relates to the long-term institutional will to carry it out.	B. As a requirement of the HCP/NCCP, MRC must initiate a monitoring and adaptive management program and persist in its execution.

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27. *Which species, habitat, and ecosystem indicators can monitor species viability and other ecological characteristics important to the NCCP? Are the proposed species, habitat, and ecosystem indicators adequate to meet this objective? If not, what other species, habitat and ecosystem indicators should be considered?*	
A greater range of indicators of the structure, function, and composition of the ecosystems on MRC property should be considered. The animal species chosen are appropriate (albeit possibly incomplete) and the protocols for monitoring their habitat conditions are well justified (see our response to Questions 2 and 24 for additional species and indicators to consider). A similar program needs to be developed for the plants and plant communities. It would be useful to monitor climatic condition and the impacts of wild and prescribed fire on the various plant communities and habitats. Landscape-level indicators should also be added.	In the current draft of the HCP/NCCP, Chapter 13, *Monitoring and Adaptive Management*, contains sections on *Monitoring Rare Plants* and *Monitoring Natural Communities*.
28. *What are the indicators that should trigger a change in management strategy?*	
Indicators (or indications) that should be considered include the collapse of a population of a rare or listed species; a significant change in climate that appears to be changing the vegetative mosaic; major invasion of exotic species; emergence of new plant pathogens and/or insects; extensive stand-replacing wildfire; and collapse in the lumber market that could essentially terminate timber harvesting for 10 years or more. As noted in our response to Question 26, a change in a particular demographic parameter for a sensitive species would be an obvious indicator for triggering a change in a management. For ecological processes, those indicators that are most closely tied to the life history and viability of species covered in the HCP would be the most appropriate to monitor and trigger a change in management strategy (e.g., stream temperatures for salmon).	MRC has proposed contingency strategies for northern spotted owls should their numbers fall below objectives. Chapter 14, Changed and Unforeseen Circumstances, address significant and unexpected changes in climate, as well as invasion of exotic species, emergence of new pathogens, stand-replacing fires, and a collapse of the lumber market. MRC will monitor whether harvests fall (a) below 37% of average allowable harvest for the year or (b) below 75% of average allowable harvest for the year (Tables 13-7 and 13-8).
29. *Does the HCP/NCCP have sufficient scientific information to identify biological and physical variability (and/or central tendencies or mean values) for monitoring species or ecosystem processes?*	
The limitations of the watershed analysis approach should be recognized. We encourage MRC to pursue questions and answers pertaining to spatial heterogeneity and temporal variability over broad	Because of limited monitoring resources, MRC does not propose to ask or answer these specific questions. However, through watershed analysis and tracking of larger scale disturbances (mainly outside of the HCP/NCCP and within

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spatial and temporal scales. The plan has done a reasonably good job of reviewing the known scientific information on the species and communities (with exceptions regarding plants, as noted). The sampling intensity for most species and processes (number of sites, streams, and/or watersheds) is impressive, as is the planned frequency of data collection.	our GIS), MRC may be able to make rough "cause and effect" correlations in the future.
30. *Are the proposed monitoring protocols sufficient to detect changes in species populations or processes?*	
A. In general, the proposed monitoring protocols are sufficient to detect changes in sensitive animal populations (there are no protocols described for plant inventory work or for monitoring plants.	A. Chapter 11, *Conservation Measures for Rare Plants*, and Chapter 13, *Monitoring and Adaptive Management*, propose protocols to detect changes in sensitive animal and plant populations.
B. The monitoring protocols are perhaps minimally adequate to detect changes in processes. The amount of change detected before a management strategy is modified may need to be re-examined and clarified. Regarding riparian and stream monitoring procedures, it is not clear how the described measurements will be used and how they are related to changes in species populations or hydrologic processes. Since most measurements are to be made over several decades, with intervening years having no measurements, consistency of procedure is a serious challenge. For a number of the variables being measured, there is a lengthy lag between cause and effect.	B. Focus watersheds will have more frequent annual monitoring. MRC will use the lessons learned from this monitoring in other watersheds. MRC will develop, in consultation with the wildlife agencies, a QA/QC program that will ensure consistency of data, even if methods changes. As in all our programs, we are balancing the need for monitoring and adaptive management against our ability to operate as a sustainable business. Operation of a sustainable business is what makes our various conservation programs possible. For Draft 5, MRC and the agencies have agreed to increase the long-term channel monitoring reaches from 40 to 60 and have shortened the time lag between monitoring.
31. *Does the science panel have any additional advice?*	
Despite our criticisms of portions of the draft HCP/NCCP, the plan has many strengths and good ideas. Given the overarching objectives of limiting human disturbance in the area covered by the plan and steadily increasing the amount of old forest over time, there is little doubt that many aspects of terrestrial and riverine ecosystems will be on upward trajectories.	

Appendix W

Summary of MRC Conservation Measures

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W. SUMMARY OF MRC CONSERVATION MEASURES

This appendix contains a summary of all the conservation measures proposed in the HCP/NCCP. The summary has sub-divisions for aquatic habitat, terrestrial habitat, fish and wildlife, and covered rare plants—the four topics of Chapters 8-11.

Indicates one of the four major sub-divisions in the summary.
› Indicates a conservation table from Chapters 8-11.
AC Indicates alternative conservation measures (section 7.8).
LD Indicates limits of deviation from standard conservation measures (see section 8.3.3.1.1).

W.1 Summary of Conservation Measures for Aquatic Habitat

Aquatic Habitat

› **Band Widths - Class I and Large Class II AMZ**

C§8.2.3.1.1-1 Establish AMZ widths by watercourse class and slope class.

Watercourse	Slope Class (%)	AMZ Band Widths***		
		Inner	Middle*	Outer
Class I	0-30	0-50	50-100	100-130
	30-50	0-50	50-130	130-150
	>50	0-50	50-150**	150**-190
Large Class II	0-30	0-25	25-50	50-100
	30-50	0-25	25-75	75-130
	>50	0-25	25-100**	100**-150

TABLE NOTES

* Flood-prone and channel migration zones on Class I watercourses can adjust these dimensions. The middle band starts on the outer edge of the flood prone or channel migration zones.

** Adjust 20-25 ft for cable and helicopter yarding operations adjacent to Class I and Class II AMZ, respectively. In effect, as the outer edge of the middle band "shrinks", the inner edge of the outer band "expands" (see Figure 8-7).

***Measured along the slope distance from the bankfull channel or channel migration zone boundary.

› **Canopy Retention - Class I and Large Class II AMZ**

C§8.2.3.1.2-1 Develop or retain canopy in the inner, middle, and outer band of the AMZ.

- Inner band: 85% canopy.
- Middle band: 70% canopy.
- Outer band: 50% canopy.

NOTE

MRC will use these AMZ canopy targets during PTHP compliance monitoring to assess canopy cover after harvesting. Timber inventory monitoring, however, will assess canopy cover by planning watershed and will set a target of 70% canopy across all 3 bands rather than stratifying the target by AMZ band. The un-weighted average of the 3 bands is approximately 70%. See Appendix U, *Inventory Strategy*.

› **Basal Area Retention for Inner and Middle Bands - Class I and Large Class II AMZ**

Pre-harvest condition for Site Class I: ≥ 300 ft^2/ac of conifer basal area

C§8.2.3.1.3-1 Retain in Site Class I, post harvest, 240 ft^2/ac or 75% of the pre-harvest basal area, whichever is greater.

Pre-harvest condition for Site Class II or III: ≥ 260 ft^2/ac of conifer basal area

C§8.2.3.1.3-2 Retain in Site Class II or III, post harvest, 200 ft^2/ac or 75% of the pre-harvest basal area, whichever is greater.

Pre-harvest condition for Site Class IV or V: ≥ 220 ft^2/ac of conifer basal area

C§8.2.3.1.3-3 Retain in Site Class IV and V, **post harvest**, 160 ft^2/ac or 75% of the pre-harvest basal area, whichever is greater.

NOTE

If a pre-harvest condition does not apply, MRC will not harvest in the bands of the AMZ. In addition, these conservation measures only apply to the inner and middle bands of the AMZ; the outer band does not have basal area targets. In most cases, when pre-harvest conditions are met or exceeded, harvest will occur in the middle band rather than the inner band.

Largest Tree Retention - Class I and Large Class II AMZ

Large Tree Retention

C§8.2.3.1.4-1 Retain a percentage of the largest trees based on channel sensitivity to LWD.

- High sensitivity: retain 30% in inner band, 15% in middle band.
- Moderate sensitivity: retain 20% in inner band, 10% in middle band.
- Low sensitivity: retain 10% in inner band, 5% in middle band.

NOTE

- MRC identifies the sensitivity of stream channels within watershed analysis. For areas in which we have not conducted a watershed analysis, we will identify sensitivity on a site-by-site basis with the assistance of staff hydrologists, geomorphologists, or aquatic biologists.

- MRC will calculate, prior to each entry into an AMZ stand, the percentage of large conifer trees for retention. The percentage applies to trees with at least a 12 in. dbh. Selection of the largest trees will progress systematically through size classes demarcated at 4 in. (dbh) intervals, beginning with the largest size class. For example, if the largest tree retention standard is 20% and 100 trees are ≥ 12 in. dbh within the band, then MRC will retain the 20 largest trees in addition to all other AMZ requirements. In determining the largest trees retained, MRC will start with the largest size class and work backward to the next largest size class and so forth. In addition, MRC will retain all trees leaning across the plane of the channel zone, even if they are not one of the largest trees. In effect, this means that the stem of the tree (from the point where it reaches 6 in. in diameter and above) crosses the plane of the bankfull channel.

Exchanging Retention Trees

C§8.2.3.1.4-2 Apply the following rules if 2 or more potential retention trees are within the same redwood clonal group:

1. Designate the largest tree within the redwood clonal group as the retention tree, if operationally feasible; otherwise
2. Substitute another tree outside this redwood clonal group which is the same size class or next available size class as that designated largest tree.

NOTE

The purpose of this conservation measure is to replace any large tree which is harvested and to space out the large retention trees throughout the AMZ.

C§8.2.3.1.4-3 Substitute a tree for a large retention tree even though it does not meet the standards for large tree retention if (a) the HCP/NCCP or a report from a professional geologist dictates its retention to provide erosion control or mass wasting stability and (b) it meets the eligibility requirements in C§8.2.3.1.4-5.

NOTE

Apart from the prescriptions in C§8.2.3.1.4-2, MRC may only trade a large retention tree with another tree for operational purposes, such as cable line

restrictions (C§8.2.3.1.10-2) or felling and skidding limitations. The limitations on trade trees are (a) 10% of large trees within an AMZ per PTHP during the first 10 years of the HCP/NCCP and (b) 15% of large trees within an AMZ per PTHP from Years 11-20 of HCP/NCCP implementation. After Year 20, MRC may trade up to 20% of large trees per PTHP within an AMZ. Harvesting of a trade tree within an AMZ can only occur if the

1. AMZ meets its requirements for canopy and basal area.
2. Tree is not one of the largest retention trees or within 10 ft of the bankfull channel.
3. AMZ streams, in locations where harvests are occurring, meet their LWD targets.
4. Cumulative number of trade trees during the term of the HCP/NCCP account for no more than 40% of the large trees within an AMZ stand.

C§8.2.3.1.4-4 Mark a smaller tree that becomes a retention tree as part of a trade to ensure it will be retained and is no longer eligible as a trade tree during subsequent harvest entries.

Qualifying as a Trade Tree

C§8.2.3.1.4-5 Follow the rule that a tree is eligible for trade with a retention tree

- If it is the next largest individual tree in sequence after the full complement of trees has been retained.
- If it leans out toward the active channel, is likely to recruit in the near future, and is in the top 50 percentile of tree size for that AMZ band.

Silviculture - Class I and Large Class II AMZ

Inner Band

C§8.2.3.1.5-1 Apply silvicultural treatments to develop or maintain late seral forest conditions, such as thinning from below or individual tree selection.

C§8.2.3.1.5-2 Use high retention selection that meets basal area and canopy requirements.

C§8.2.3.1.5-3 Maintain or increase conifer dominance—if necessary, by controlling hardwoods.

C§8.2.3.1.5-4 Ensure that redwood clonal groups or “clumps” have no more than 50% of their stems greater than 8 in. dbh removed per entry.

C§8.2.3.1.5-5 Do not harvest trees from the inner band if shelterwood or seed tree removal occurs in the outer band for that rotation.

C§8.2.3.1.5-6 Do not sanitize or salvage LWD that is within the bankfull channel; retain all downed LWD in the AMZ unless the AMZ meets its LWD targets.

C§8.2.3.1.5-7 Harvest snags in the AMZ only with the approval of the wildlife agencies.

C§8.2.3.1.5-8 Leave, as a first priority, LWD previously designated as a large retention tree or wildlife tree.

C§8.2.3.1.5-9 Do not initiate prescribed burning in Small Class II AMZ.

C§8.2.3.1.5-10 Permit fire control lines for controlled burning in Small Class II AMZs only with concurrence of the wildlife agencies.

C§8.2.3.1.5-11 Allow salvage harvest in an AMZ only with concurrence of the wildlife agencies.

C§8.2.3.1.5-12	Allow harvest of a minimum merchantable length log from any LWD that obstructs a road.
C§8.2.3.1.5-13	Avoid damage or destruction to non-commercial vegetation beyond the minimum disturbance required for covered activities.
C§8.2.3.1.5-14	Retain all old-growth trees. **NOTE** If the RPF determines that the inner zone is over-stocked with trees <16 in. dbh and that this is limiting future growth, MRC may request the wildlife agencies to advise the RPF which trees to harvest in order to more quickly reach the objectives of the HCP/NCCP.
Middle Band	
C§8.2.3.1.5-15	Apply silvicultural treatments to develop or maintain late seral forest conditions, such as thinning from below or individual tree selection.
C§8.2.3.1.5-16	Use high retention selection that meets basal area and canopy requirements.
C§8.2.3.1.5-17	Maintain or increase conifer dominance—if necessary, by controlling hardwoods.
C§8.2.3.1.5-18	Do not harvest trees from the middle band if shelterwood or seed tree removal occurs in the outer band for that rotation, unless this is an AMZ restoration harvest.
C§8.2.3.1.5-19	Do not sanitize or salvage LWD that is within the bankfull channel; retain all downed LWD in the AMZ unless the AMZ meets its LWD targets.
C§8.2.3.1.5-20	Leave, as a first priority, LWD previously designated as a large retention tree or wildlife tree.
C§8.2.3.1.5-21	Allow salvage harvest in an AMZ only with concurrence of the wildlife agencies.
C§8.2.3.1.5-22	Allow harvest of a minimum merchantable length log from any LWD that obstructs a road.
C§8.2.3.1.5-23	Avoid damage or destruction to non-commercial vegetation beyond the minimum disturbance required for covered activities.
C§8.2.3.1.5-24	Retain all old-growth trees.
Outer Band	
C§8.2.3.1.5-25	Maintain or increase conifer dominance—if necessary, by controlling hardwoods.
C§8.2.3.1.5-26	Maintain, on average, 50% canopy within 330 ft (100 m) sections.
C§8.2.3.1.5-27	Limit harvest openings to ¼ ac in size.
C§8.2.3.1.5-28	Do not sanitize or salvage LWD that is within the bankfull channel; retain all downed LWD in the AMZ unless the AMZ meets its LWD targets.
C§8.2.3.1.5-29	Leave, as a first priority, LWD previously designated as a large retention tree or wildlife tree.

C§8.2.3.1.5-30 Allow salvage harvest in an AMZ where an adjacent upslope stand is "no harvest" only with concurrence of CDFG.

C§8.2.3.1.5-31 Allow harvest of a minimum merchantable length log from any LWD that obstructs a road.

C§8.2.3.1.5-32 Retain all old-growth trees.

Flood-prone Zones - Class I AMZ

C§8.2.3.1.6-1 Retain 300 ft^2/ac of the conifer basal area or retain 75% of the pre-harvest basal area, whichever is greater.

C§8.2.3.1.6-2 Avoid damage or destruction to non-commercial vegetation in the flood-prone or channel migration zone beyond the minimum disturbance required for covered activities.

C§8.2.3.1.6-3 Extend the width of the middle band out to the base of a hillslope, if it does not already extend to or beyond that point.

C§8.2.3.1.6-4 Exclude all equipment, unless on existing roads or for use in road decommissioning.

Streambank Stability - Class I and Large Class II AMZ

C§8.2.3.1.7-1 Retain all trees whose trunks (a) are within 10 ft of the bankfull channel or within 10 ft of a watercourse or lake transition zone where there is no delineated bankfull channel; or (b) have roots visible in the bank; or (c) provide anchor to an over-hanging bank, unless it is necessary to remove trees to create a cable corridor.

NOTE
Thinning of a redwood clonal group within 10 ft of a bankfull channel or within 10 ft of a watercourse or lake transition zone may also occur as long as MRC adheres to the guidelines for large tree retention.

C§8.2.3.1.7-2 Start the 10-ft retention zone at the landward edge of an undercut bank, using visual determination.

EXAMPLE
A bank is undercut by 5 ft. The retention zone will measure 10 ft from the depth of the undercut, i.e., 15 ft from the edge of the bank.

C§8.2.3.1.7-3 Ensure that redwood clonal groups or "clumps" have no more than 50% of their stems greater than 8 in. dbh removed per entry.

C§8.2.3.1.7-4 Follow 1 of these practices when trees, within the first 10 ft of the watercourse channel, are removed for cable corridors:

- Leave the trees in the AMZ for LWD.
- Place trees in the active channel as per the instream LWD enhancement guidelines, if feasible.

Equipment Exclusion - Class I and Large Class II AMZ

C§8.2.3.1.8-1 Exclude all equipment in Class I and Large Class II AMZs unless there is an allowable use.

ALLOWABLE USE

- *Erosion control or restoration*
  MRC may use a skid trail or landing one-time-only to control erosion or conduct restoration. Upon completing operations, we will decommission the skid trail or landing.

- *Existing skid trails, landings, or skid trail crossings*
  MRC may use—only rarely (perhaps 4 times a year)—an existing skid trail, landing, or designated skid trail crossing that does not require any reconstruction, if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - Perched material is pulled back from landings and the landings shaped to prevent rill erosion by draining them into a rocked face outlet.
  - Surface areas >25 ft^2 are mulched, rocked, or covered in slash compacted by a tractor.

- *New skid trails, landings, or skid trail crossings*
  MRC may construct —only rarely (perhaps once every 3 years, lessening over time) and after obtaining approval of the wildlife agencies—a new skid trail, landing, or designated skid trail crossing if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - All mitigations, approved by the wildlife agencies, are fully implemented.
  - All trees felled for construction of these new facilities in an AMZ within the inner and middle bands have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or near watercourse sections deficient in LWD.

- *Existing Roads*
  MRC may use and maintain existing roads in AMZs.

- *New Roads*
  MRC may construct— only rarely (perhaps once every 3 years, lessening over time)—new roads to watercourse approaches within an AMZ if
  - The road does not parallel a watercourse.
  - Each approach on either side of a watercourse does not exceed 200 ft.
  - All trees felled for construction of these new facilities in an AMZ within the inner and middle bands have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or near watercourse sections deficient in LWD.

  MRC may construct— only rarely (perhaps once every 3 years, lessening over time) and after obtaining approval of the wildlife agencies —a road segment not associated with a crossing or an approach to a crossing if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - All mitigations, approved by the wildlife agencies, are fully implemented.
  - All trees felled in an AMZ for construction of these new facilities have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or near watercourse sections deficient in LWD.

- *Watercourse crossing construction*
  MRC may use equipment to construct watercourse crossings.

Bare Soil - Class I and Large Class II AMZ

C§8.2.3.1.9-1 Treat, for erosion control, areas of exposed mineral soil which are (a) at least 100 ft^2 in size and (b) not on a running surface, with mulch, grass seed, slash, or other appropriate material; for running surfaces, see Appendix E, *Roads, Landings, and Skid Trails*.

C§8.2.3.1.9-2 Do not initiate prescribed or broadcast burning in the AMZ.

Cable Corridors - Class I and Large Class II AMZ

C§8.2.3.1.10-1 Allow felled trees to remain in the AMZ for LWD or place the trees in the active channel as per instream LWD enhancement guidelines.

C§8.2.3.1.10-2 Harvest trees in a cable corridor only if the

- AMZ meets requirements for canopy and basal area.
- Tree is not one of the largest retention trees or within 10 ft of the bankfull channel.
- Streams meet LWD targets.

Small Class II AMZ Widths

C§8.2.3.2.1-1 Establish AMZ widths.

- 0-30% slope = 50 ft
- 30-50% slope = 75 ft
- > 50% slope = 100 ft

  NOTE
  For slopes > 50%, MRC may subtract 25 ft from the AMZ width for cable and helicopter yarding.

Canopy - Small Class II AMZ

C§8.2.3.2.2-1 Maintain, on average, 50% canopy over the width of the AMZ within 330 ft (100 m) segments.

Silviculture - Small Class II AMZ

C§8.2.3.2.3-1 Maintain or enhance uneven-aged conditions.

C§8.2.3.2.3-2 Harvest so that trees are dispersed in a relatively uniform manner.

C§8.2.3.2.3-3 Maintain or increase conifer dominance—if necessary, by controlling hardwoods.

C§8.2.3.2.3-4 Do not sanitize or salvage LWD that is within the bankfull channel; retain all downed LWD in the AMZ unless the AMZ meets its LWD targets.

C§8.2.3.2.3-5 Leave, as a first priority, LWD previously designated as a large retention tree or wildlife tree.

C§8.2.3.2.3-6 Do not initiate prescribed burning in Small Class II AMZ.

C§8.2.3.2.3-7 Permit fire control lines in Small Class II AMZs only with concurrence of the wildlife agencies.

C§8.2.3.2.3-8 Allow salvage harvest in an AMZ only with concurrence of the wildlife agencies.

C§8.2.3.2.3-9 Allow harvest of a minimum merchantable length log from any LWD that obstructs a road.

C§8.2.3.2.3-10 Avoid damage or destruction to non-commercial vegetation beyond the minimum disturbance required for covered activities.

C§8.2.3.2.3-11 Retain all old-growth trees.

Streambank Stability - Small Class II AMZ

C§8.2.3.2.4-1 Retain all trees whose trunks (a) are within 10 ft of the bankfull channel or within 10 ft of a watercourse or lake transition zone where there is no delineated bankfull channel; or (b) have roots visible in the bank; or (c) provide anchor to an over-hanging bank, unless it is necessary to remove trees to create a cable corridor.

NOTE
MRC may also thin a redwood clonal group within 10 ft of the bankfull channel or within 10 ft of a watercourse or lake transition zone if they follow the large tree retention guidelines.

C§8.2.3.2.4-2 Start the 10-ft retention zone at the landward edge of an undercut bank, using visual determination.

EXAMPLE
A bank is undercut by 5 ft. The retention zone will measure 10 ft from the depth of the undercut, i.e., 15 ft from the edge of the bank.

C§8.2.3.2.4-3 Ensure that redwood clonal groups or "clumps" have no more than 50% of their stems greater than 8 in. dbh removed per entry.

C§8.2.3.2.4-4 Follow 1 of these practices when trees, within the first 10 ft of the watercourse channel, are removed for cable corridors:

- Leave the trees in the AMZ for LWD.
- Place trees in the active channel as per the instream LWD enhancement guidelines, if feasible.

Equipment Exclusion - Small Class II AMZ

C§8.2.3.2.5-1 Exclude all equipment unless there is an allowable use.

ALLOWABLE USE

- *Erosion control or restoration*
  MRC may use a skid trail or landing one-time-only to control erosion or conduct restoration. Upon completing operations, we will decommission the skid trail or landing.

- *Existing skid trails, landings, or skid trail crossings*
  MRC may use—only rarely (perhaps 4 times a year)—an existing skid trail, landing, or designated skid trail crossing that does not require any reconstruction, if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - Perched material is pulled back from landings and the landings shaped to prevent rill erosion by draining them into a rocked face outlet.
  - Surface areas >25 ft^2 are mulched, rocked, or covered in slash compacted by a tractor.

- *New skid trails, landings, or skid trail crossings*
  MRC may construct —only rarely (perhaps once every 3 years, lessening over time) and after obtaining approval of the wildlife

agencies—a new skid trail, landing, or designated skid trail crossing if

- Alternatives would create a greater risk and magnitude of sediment delivery.
- All mitigations, approved by the wildlife agencies, are fully implemented.
- All trees felled for construction of these new facilities within the inner and middle bands of an AMZ have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or near watercourse sections deficient in LWD.

- *Existing Roads*
  MRC may use and maintain existing roads in AMZs.

- *New Roads*
  MRC may construct new roads to watercourse approaches within an AMZ if
  - The road does not parallel a watercourse.
  - Each approach on either side of a watercourse does not exceed 200 ft.
  - All trees felled for construction of these new facilities in an AMZ within the inner and middle bands have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or near watercourse sections deficient in LWD.

  MRC may construct— only rarely (perhaps once every 3 years, lessening over time) and after obtaining approval of the wildlife agencies—a road segment not associated with a crossing or an approach to a crossing if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - All mitigations, approved by the wildlife agencies, are fully implemented.
  - All trees felled in an AMZ for construction of these new facilities have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or near watercourse sections deficient in LWD.

- *Construction of watercourse crossings*
  MRC may use equipment to construct watercourse crossings.

Soil Pipes - Small Class II AMZ

C§8.2.3.2.6-1 Exclude equipment from the area between a Class II watercourse and a swale when there is evidence of exposed soil pipes or soil pipes transitioning into stream channels, e.g., when areas of soil over a pipe collapse or when "holes" in the floor of the swale reveal flowing sub-surface water.

NOTE
The protection should extend up the swale until there is no more evidence of soil pipe collapse.

C§8.2.3.2.6-2 Use only existing skid trails or roads.

C§8.2.3.2.6-3 Disconnect roads or skid trails hydrologically from the swale, where topographical features allow.

C§8.2.3.2.6-4 Disperse drainage from roads or skid trails throughout the swale, if disconnecting roads or skids trails is not feasible.

Bare Soil - Small Class II AMZ

C§8.2.3.2.7-1 Treat, for erosion control, areas of exposed mineral soil which are (a) at least 100 ft^2 in size and (b) not on a running surface, with mulch, grass seed, slash, or other appropriate material; for running surfaces, see Appendix E, *Roads, Landings, and Skid Trails*.

C§8.2.3.2.7-2 Do not initiate prescribed or broadcast burning in the AMZ.

Band Widths - Class III AMZ

C§8.2.3.3.1-1 Establish AMZ widths.

- 0-30% slope = 25 ft
- > 30% slope = 50 ft

Canopy - Class III AMZ

C§8.2.3.3.2-1 Maintain, on average, 50% canopy over the width of the AMZ in 330 ft (100 m) sections.

Silviculture - Class III AMZ

C§8.2.3.3.3-1 Maintain or enhance uneven-aged conditions.

C§8.2.3.3.3-2 Harvest so that trees are dispersed in a relatively uniform manner.

C§8.2.3.3.3-3 Maintain or increase conifer dominance—if necessary, by controlling hardwoods.

C§8.2.3.3.3-4 Do not sanitize or salvage LWD that is within the bankfull channel; retain all downed LWD in the AMZ unless the AMZ meets its LWD targets.

C§8.2.3.3.3-5 Leave, as a first priority, LWD previously designated as a large retention tree or wildlife tree.

C§8.2.3.3.3-6 Do not initiate prescribed burning in Class III AMZ.

C§8.2.3.3.3-7 Permit fire control lines in Class III AMZs only with concurrence of the wildlife agencies.

C§8.2.3.3.3-8 Allow salvage harvest in an AMZ only with concurrence of the wildlife agencies.

C§8.2.3.3.3-9 Allow harvest of a minimum merchantable length log from any LWD that obstructs a road.

C§8.2.3.3.3-10 Avoid damage or destruction to non-commercial vegetation beyond the minimum disturbance required for covered activities.

C§8.2.3.3.3-11 Retain all old-growth trees.

Streambank Stability - Class III AMZ

C§8.2.3.3.4-1 Retain all trees whose trunks (a) are within 10 ft of the bankfull channel, or (b) have roots visible in the bank, or (c) provide anchor to an over-hanging bank, unless it is necessary to remove trees to create a cable corridor or thin a redwood clonal group.

C§8.2.3.3.4-2 Start the 10-ft retention zone at the landward edge of an undercut bank.

EXAMPLE

A bank is undercut by 5 ft. The retention zone will measure 10 ft from the depth of the undercut—15 ft from the edge of the bank.

C§8.2.3.3.4-3 Ensure that redwood clonal groups or "clumps" have no more than 50% of their stems > 8 in. dbh removed per entry.

Equipment Limitation - Class III AMZ

C§8.2.3.3.5-1 Adhere to the standards in Appendix E, *Roads, Landings, and Skid Trails*, and Appendix T, *Master Agreement for Timber Operations*.

C§8.2.3.3.5-2 Limit all heavy equipment unless there is an allowable use.

ALLOWABLE USE

- *Existing skid trails and landings*
  MRC may use stable, existing skid trails and landings. We will mulch or slash skid trails and landings upon completion of operations or before the winter period, whichever comes first.

- *Existing roads*
  MRC may use and maintain existing roads.

- *New roads*
  MRC may construct new roads that do not parallel an AMZ.

- *New landings*
  MRC may construct—only rarely (perhaps once a year)—a new landing within an AMZ if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - All mitigations, approved by the wildlife agencies, are fully implemented.
  - All trees felled in an AMZ for construction of these new facilities have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or in the nearest Class I or Class II watercourse deficient in LWD.

- *New truck road crossings and skid trail crossings*
  MRC may construct new truck road and skid trail crossings if
  - Alternatives would create a greater risk and magnitude of sediment delivery.
  - All trees felled in an AMZ for construction of these new facilities have the "key piece size" logs set aside for LWD placement, either in the vicinity of the new facilities or in the nearest Class I or Class II watercourse deficient in LWD.

Bare Soil - Class III AMZ

C§8.2.3.3.6-1 Treat, for erosion control, areas of exposed mineral soil which are (a) at least 100 ft^2 in size and (b) not on a running surface, with mulch, grass seed, slash, or other appropriate material; for running surfaces, see Appendix E, *Roads, Landings, and Skid Trails*.

C§8.2.3.3.6-2 Do not initiate prescribed or broadcast burning in the AMZ.

C§8.2.3.3.6-3 Treat the running surfaces of a truck road per Appendix E, *Roads, Landings, and Skid Trails*, section E.2.5.

Soil Pipes - Class III AMZ

C§8.2.3.3.7-1 Apply conservation measures C§8.2.3.3.7-1 through C§8.2.3.3.7-8 only when there is evidence of exposed soil pipes or soil pipes transitioning into stream channels, e.g., when areas of soil over a pipe collapse or when "holes" in the floor of the swale reveal flowing sub-surface water.

NOTE
The protection should extend up the swale until there is no more evidence of soil pipe collapse.

C§8.2.3.3.7-2 Fell trees so that they do not collapse a soil pipe, thereby prohibiting ground yarding across the collapsed soil pipe.

C§8.2.3.3.7-3 Use only existing skid trails or roads.

C§8.2.3.3.7-4 Avoid soil pipes when operating heavy equipment.

C§8.2.3.3.7-5 Cross soil pipes only at existing crossings when operating equipment.

C§8.2.3.3.7-6 Disconnect roads or skid trails hydrologically from the swale, where topographical features allow.

C§8.2.3.3.7-7 Disperse drainage from roads or skid trails throughout the swale, if disconnecting roads or skids trails is not feasible.

C§8.2.3.3.7-8 Remove all transported fill upon completion of the operation.

C§8.2.3.3.7-9 Avoid equipment use in the floor of the swale, with the exception of crossing locations, even if there is no evidence of soil pipes.

AC Restoration Treatments - Class I, Large Class II, Small Class II, and Class III AMZ

AMZ Restoration

AC§8.2.3.4-1 Ensure that conservation measures for bank stability applicable within 10 ft of a bankfull channel remain in effect during a restoration treatment.

AC§8.2.3.4-2 Allow restoration treatments in coho salmon streams where temperatures are at or above the threshold and water flows July through September, with concurrence of the wildlife agencies.

AC§8.2.3.4-3 Do not use restoration treatment on inner gorge topography or within 25 ft of an inner gorge break in slope.

AC§8.2.3.4-4 Do not use restoration treatment on historically active mass wasting hazards unless operations are approved by a California Registered Geologist and meet canopy standards of 70%.

AC§8.2.3.4-5 Retain at least 50% canopy in a restoration treatment on steep streamside slopes or steep dissected topography (i.e., within TSU1, TSU2, or TSU3), unless operations are approved by a California Registered Geologist.

AC§8.2.3.4-6 Apply equipment exclusion zone (EEZ) provisions during restoration treatments except for brush crushing operations.

AC§8.2.3.4-7	Retain at least 70% canopy within the inner bands of Class I and Large Class II AMZs.
AC§8.2.3.4-8	Retain all conifers > 12 in. dbh.
AC§8.2.3.4-9	Limit the percentage of stream length that can be restored (per rolling 10-year period and per CalWater planning watershed) by the range of stream temperature thresholds for the cold-water species present in the stream length proposed for restoration or downstream of the restoration for up to ¼ mile (see Table 8-12 and Table 8-13).
AC§8.2.3.4-10	Determine stream temperature values within ¼ mile downstream of the proposed treatment site.
AC§8.2.3.4-11	Limit AMZ restoration harvests through monitoring and adaptive management. **EXAMPLE** If stream temperatures rise above the current range for target species (see Table 8-12 and M§13.5.1.1-5), MRC will adjust the amount of AMZ restoration harvest.
AC§8.2.3.4-12	Phase in AMZ restoration harvests slowly with more intense monitoring in the first 5-10 years of the HCP/NCCP. **NOTE** During this initial period of intense monitoring, MRC will not conduct AMZ restoration harvests within watersheds on the 303(d) list, i.e., Navarro River, Big River, Garcia River, and South Fork Eel River.
Brush Crushing	
AC§8.2.3.4-13	Perform brush crushing only on slopes < 30%.
AC§8.2.3.4-14	Raise tractor blades when brush crushing.
AC§8.2.3.4-15	Retain at least 95% of ground cover (downed brush, mulch, tree lopping, etc.).
AC§8.2.3.4-16	Do not conduct brush crushing operations within 25 ft of the bankfull channel of a Class I or Class II watercourse or within 10 ft of the bankfull channel of a Class III watercourse.
AC§8.2.3.4-17	Plant brush-crushed areas with redwood and Douglas fir, interspersed no more than 12 ft apart.
AC§8.2.3.4-18	Do not remove any overstory tree within an inner zone of the AMZ, including hardwoods, during brush-crushing operation.
AC§8.2.3.4-19	Retain conifer trees ≥ 6 in. dbh in order to create a spacing of 20 ft between trees.
AC§8.2.3.4-20	Retain conifer trees < 6 in. order to create a spacing of 15-20 ft between trees, unless their removal is required for covered activities.
AC§8.2.3.4-21	Limit brush-crushing operations to 5% of stream length per decade per CalWater planning watershed (see Table 8-13).
AC§8.2.3.4-22	Allow brush-crushing operations only within the first 40 years of the HCP/NCCP.

Wetlands, Wet Areas, and Wet Meadows

C§8.2.3.5.1-1 Maintain a 25-ft EEZ (excluding existing roads) around wetlands, wet meadows, and wet areas whose surface area is > 10 ft^2 and < 50 ft^2.

C§8.2.3.5.1-2 Maintain a 50-ft EEZ (excluding existing roads) around wetlands, wet meadows, and wet areas that are more than 50 ft^2 in surface area.

> **NOTE**
> MRC must obtain approval of our aquatic biologist before equipment can enter the EEZ of a wet area, wetland, or a wet meadow, making them a potential equipment limitation zone (ELZ). C§10.2.2.3-2, C§10.2.2.3-3, C§10.2.2.3-8, C§10.2.3.3-1, and C§10.2.3.3-2 describe the survey methods and criteria for entering the EEZ.

C§8.2.3.5.1-3 Avoid artificial wetlands, wet areas, and wet meadows created by forest management, except for the use of existing roads or where alternate routes would result in more habitat degradation.

C§8.2.3.5.1-4 Retain within the EEZ at least 75 ft^2 of basal area or at least 50% of the pre-harvest basal area, whichever is greater.

C§8.2.3.5.1-5 Fell trees away from the area, unless this creates a safety hazard.

C§8.2.3.5.1-6 Leave trees in place that were felled to remediate safety concerns.

C§8.2.3.5.1-7 Retain old growth trees.

C§8.2.3.5.1-8 Do not sanitize or salvage harvest.

C§8.2.3.5.1-9 Retain LWD.

C§8.2.3.5.1-10 Survey a water drafting site for covered species prior to its development and apply the conservation measures for the covered species present.

C§8.2.3.5.1-11 Follow water drafting guidelines specified in C§10.2.2.3-4 and Appendix E (section E.7, *Standards for Water Drafting)*.

C§8.2.3.5.1-12 Protect covered wetland plants (see Chapter 11, *Conservation Measures for Rare Plants)*.

Seeps and Springs

C§8.2.3.5.2-1 Protect seeps or springs within Class I or Class II watercourses of AMZs.

C§8.2.3.5.2-2 Extend the AMZ boundary 50 ft beyond a seep or spring, if the seep or spring is on, near, or draining into the AMZ boundary.

C§8.2.3.5.2-3 Apply a 50-ft EEZ (excluding existing roads) and a 50% canopy retention requirement to seeps or springs that do not drain into a defined watercourse and are unable to deliver sediment to higher order streams.

> **NOTE**
> MRC will require a biological consultation with an MRC biologist before equipment can enter the EEZ of a seep or spring, making them a potential ELZ. C§10.2.2.3-2, C§10.2.2.3-3, C§10.2.2.3-8, C§10.2.3.3-1, and C§10.2.3.3-2 describe the survey methods and criteria for entering the EEZ.

C§8.2.3.5.2-4 Avoid artificial wetlands, wet areas, and wet meadows created by forest management, except for the use of existing roads or where alternate routes would result in more habitat degradation.

C§8.2.3.5.2-5 Fell trees away from seeps or springs, unless this creates a safety hazard.

C§8.2.3.5.2-6 Leave felled trees in place that were cut to remediate safety concerns.

C§8.2.3.5.2-7 Retain within the EEZ at least 75 ft^2 of basal area or at least 50% of the pre-harvest basal area, whichever is greater.

C§8.2.3.5.2-8 Retain all old-growth trees.

C§8.2.3.5.2-9 Do not sanitize or salvage harvest.

C§8.2.3.5.2-10 Retain LWD.

C§8.2.3.5.2-11 Survey a new or un-surveyed water drafting site for covered species prior to use and apply the conservation measures relevant to the covered species present.

C§8.2.3.5.2-12 Follow water drafting guidelines specified in C§10.2.2.3-4 and Appendix E (section E.7, *Standards for Water Drafting)*.

LWD Placement

C§8.2.3.6-1 Do not blade a trail to a tree.

C§8.2.3.6-2 Use existing roads or skid trails rather than building roads or skid trails.

C§8.2.3.6-3 Ensure that there is minimal soil disturbance in placing LWD, including the stump, into a watercourse.

C§8.2.3.6-4 Push standing trees into a watercourse with heavy equipment, as long as rootwads remain attached to LWD.

C§8.2.3.6-5 Ensure that the diameter of any wood placed as LWD in a watercourse is at least 80% of the key piece diameter, if a rootwad is attached, or meets key piece size requirements for diameter and length, if a rootwad is not attached.

C§8.2.3.6-6 Ensure that LWD, with rootwad attached, is at least as long as the bankfull channel width or 1.5 times the bankfull channel width, if there is no rootwad.

C§8.2.3.6-7 Place a rootwad within a stream channel provided a rootwad exceeds the volume standard for *key pieces*.

C§8.2.3.6-8 Do not exceed minimum numbers for “key pieces” by more than 300% when placing LWD “artificially” in order to moderate the amount of LWD in stream channels (see Appendix G, G.3.3.1, *General methods for LWD recruitment*).

Bankfull Width (ft)	Minimum Number of Key LWD Pieces		
	Per 328 ft	Per 1000 ft	Per Mile
<15	6.6	20	106
15-35	4.9	15	79
35-45	3.9	12	63
>45	3.3	10	53

C§8.2.3.6-9 Do not use downed wood from the AMZ unless the AMZ exceeds its target for LWD.

C§8.2.3.6-10 Permit the placement as LWD of 1 tree designated for large tree retention within a 330 ft segment of an AMZ, if the watercourse does not meet the target for key piece loading.

C§8.2.3.6-11 Fell trees into a stream channel provided the length of the tree segment that will interact with the stream channel is at least 1.5 times the width of the bankfull channel.

NOTE
This primarily refers to trees cut for a cable corridor.

C§8.2.3.6-12 Retain foliage from trees felled into a stream channel.

C§8.2.3.6-13 Do not place LWD pieces in one spot (i.e., within 100 ft of each other) without a site-specific plan developed by an MRC fisheries biologist or hydrologist; notify the wildlife agencies in an annual report of the LWD placement.

C§8.2.3.6-14 Situate LWD to maximize habitat benefit and minimize adverse effects.

C§8.2.3.6-15 Follow the guidelines in the CDFG *Salmonid Restoration Manual* when designing specific structures; otherwise ensure stability of LWD placement by following size requirements for key pieces (see Appendix G, G.3.3.1, *General methods for LWD recruitment*) and wedging LWD between riparian trees when possible.

C§8.2.3.6-16 Add LWD only during the course of PTHP activities, unless there is a site-specific plan.

C§8.2.3.6-17 Tag and mark LWD added to stream channels to allow MRC and the wildlife agencies to track it over time through instream monitoring programs.

C§8.2.3.6-18 Develop within the first 5 years of the HCP/NCCP and implement within the first 20 years of the HCP/NCCP an LWD placement plan for coho "core" watersheds.

NOTE
These planning watersheds, and in certain cases, sub-watersheds are: East Branch North Fork Big River; Russell Brook; Ramone Creek; a section of South Daugherty Creek, from the confluence of Gates Creek and Daugherty Creek downstream to the MRC property line; Middle Albion River; South Fork Albion River; John Smith Creek; Little North Fork Navarro River; Cook Creek; Lower South Branch Navarro River; Lower Navarro Drainages (Marsh, Flume, and Murray Gulches); Cottaneva Creek; Hayworth Creek; and the South Fork Garcia River.

Appendix Z (section Z.1 *"Selecting Coho Core Watersheds for Road Restoration*" and Table Z-1 MRC Coho Core Areas), describes the coho "core" watersheds in more detail. Section 8.3.3.2.2 outlines MRC plans for controllable erosion in these areas. The elevated LWD implementation schedule will, at a minimum, ensure that the watersheds contained within Table S-11 (*Future LWD Targets within the Plan Area by Planning Watershed*) will meet half of their target for "% of Segments with Low or Moderate Demand for LWD" by Year 10 of the HCP/NCCP and meet their full target by Year 20. Since the target date is actually Year 80, the coho "core' watersheds will cut their timeline by 75%.

C§8.2.3.6-19 Conduct LWD placement in coho "core" watersheds without equipment access during the first entry into the area under the HCP/NCCP.

C§8.2.3.6-20 Reduce, if necessary, the basal area harvest retention standards by the amount of basal area felled for LWD placement while still maintaining minimum shade requirements.

TSU 1 and TSU 2 - Inner Gorge

Roads

C§8.3.3.1.2-1 Do not construct or reconstruct roads or landings.

C§8.3.3.1.2-2 Do not construct watercourse crossings.

C§8.3.3.1.2-3 Decommission existing roads and landings when they are no longer needed.

NOTE
If relocation of a road poses a higher risk of sediment delivery than maintenance and use of an existing road, MRC will maintain the road to the design standards specified in Appendix E, *Roads, Landings, and Skid Trails*.

Tractor Trails

C§8.3.3.1.2-4 Do not construct tractor trails.

Tractor Yarding

C§8.3.3.1.2-5 Exclude equipment.

Timber Harvest

C§8.3.3.1.2-6 Do not harvest timber.

C§8.3.3.1.2-7 Maintain ≥ 50% canopy on slopes which contribute surface or subsurface flow to the inner gorge.

Site Preparation and Burning

C§8.3.3.1.2-8 Do not permit site preparation or burning.

LD TSU 1 and TSU 2 - Inner Gorge

C§8.3.3.1.2-9 Retain at least 70% canopy (averaged throughout the inner gorge) and at least 15 ft^2 of conifers ≥18 in. dbh per acre.

C§8.3.3.1.2-10 Ensure that trees are evenly dispersed across the slope after a timber harvest, unless an assessment reveals, from the presence of competent bedrock, that the inner gorge is in fact stable, in which case MRC will retain more trees on the least stable areas.

C§8.3.3.1.2-11 Allow construction and reconstruction of roads, skid trails, and landings within inner gorges only after notification to the wildlife agencies and review by a geologist.

TSU 1 and TSU 2 - Steep Streamside Slopes

Roads

C§8.3.3.1.2-12 Do not construct new roads or landings.

C§8.3.3.1.2-13 Do not construct watercourse crossings.

C§8.3.3.1.2-14 Adhere to the standards in Appendix E, *Roads, Landings, and Skid Trails*, for reconstructed roads.

C§8.3.3.1.2-15 Decommission existing roads and landings when they are no longer needed.

NOTE
If relocation of a road poses a higher risk of sediment delivery than maintenance and use of an existing road, MRC will maintain the road to the design standards specified in Appendix E, *Roads, Landings, and Skid Trails*.

Tractor Trails

C§8.3.3.1.2-16 Do not construct tractor trails.

Tractor Yarding

C§8.3.3.1.2-17 Permit equipment on existing stable trails where other yarding methods could pose a greater risk of sediment delivery to a watercourse or where one-time entry into the TSU is required to control erosion.

Timber Harvest

C§8.3.3.1.2-18 Retain at least 50% overstory canopy in those portions of the unit that extend above the AMZ.

C§8.3.3.1.2-19 Retain at least 15 ft^2 of conifers ≥18 in. dbh per acre, with trees evenly distributed across the slope in those portions of the unit that extend above the AMZ.

NOTE
The 20 ft reduction on the middle band of the AMZ for helicopter or cable yarding applies only when the AMZ extends beyond TSU1 and TSU2 and not when the AMZ is within these TSU units.

Expected regeneration harvest for even-aged stands on TSU1: 123 ac (Years 0-15); 82 ac (Years 15-30).

Expected regeneration harvest for even-aged stands on TSU2: 642 ac (Years 0-15); 254 ac (Years 15-30).

Site Preparation and Burning

C§8.3.3.1.2-20 Do not permit site preparation or burning.

LD TSU 1 and TSU 2 - Steep Streamside Slopes

C§8.3.3.1.2-21 Permit new construction of roads, skid trails, and landings only after a review and site specific design by a PG or CEG.

C§8.3.3.1.2-22 Permit reconstruction of roads, skid trails, and landings across unstable areas within TSU1 or TSU2 (i.e., steep streamside slopes) only after obtaining approval of the wildlife agencies as well as a review and site specific design by a PG or CEG.

C§8.3.3.1.2-23 Ensure that trees are evenly dispersed across the slope after a timber harvest in TSU1 and TSU2.

C§8.3.3.1.2-24 Permit a one-time use of shelterwood and seed-tree removal steps outside the inner and middle bands of an AMZ, as long as MRC retains 50% overstory canopy.

NOTE
1. Seed-tree removal will not be a deviation from default conservation measures if it retains 50% overstory canopy and at least 15 ft^2 of conifers ≥ 18 in. dbh per acre, with the trees evenly distributed across the slope.
2. Use of shelterwood or seed-tree removal steps does not preclude the requirement for wildlife trees in the AMZ. MRC will not retain, for this one time entry, 15 ft^2 of conifers ≥18 in. dbh per acre.

TSU 3 - Steep Dissected Topography

Roads

C§8.3.3.1.3-1 Do not construct or reconstruct a road to extend more than 50 ft across a headwall swale, excluding watercourse crossings.

C§8.3.3.1.3-2 Decommission existing roads and landings when they are no longer necessary.

NOTE
If relocation of a road poses a higher risk of sediment delivery than maintenance and use of an existing road, MRC will maintain the road to the design standards specified in Appendix E, *Roads, Landings, and Skid Trails*.

Tractor Trails

C§8.3.3.1.3-3 Do not construct or reconstruct tractor trails.

Tractor Yarding

C§8.3.3.1.3-4 Permit equipment on existing stable trails where other yarding methods could pose a greater risk of sediment delivery to a watercourse or where one-time entry into a TSU is required to control erosion.

Timber Harvest

C§8.3.3.1.3-5 Retain 50% overstory canopy and, per acre, 15 ft^2 of conifers ≥ 18 in. dbh, distributed evenly across the TSU.

C§8.3.3.1.3-6 Emphasize tree retention in the axis of headwall swales where pore water pressures are typically greatest.

Expected regeneration harvest for even-aged stands on TSU3: 3156 ac (Years 0-15); 1339 ac (Years 15-30).

Site Preparation and Burning

C§8.3.3.1.3-7 Do not permit site preparation or broadcast burning.

LD TSU 3 - Steep Dissected Topography

C§8.3.3.1.3-8 Permit a one-time use of shelterwood and seed-tree removal steps outside the inner and middle bands of an AMZ.

NOTE

1. Seed-tree removal will not be a deviation from default conservation measures if it retains 50% overstory canopy and at least 15 ft^2 of conifers ≥ 18 in. dbh per acre, with the trees evenly distributed across the slope.
2. Use of shelterwood or seed-tree removal steps does not preclude the requirement for wildlife trees in the AMZ. MRC will not retain, for this one time entry, 15 ft^2 of conifers ≥18 in. dbh per acre.

C§8.3.3.1.3-9 Retain 50% overstory canopy on headwall swales.

C§8.3.3.1.3-10 Permit new construction of roads, skid trails, and landings only after a review and site specific design by a PG or CEG.

C§8.3.3.1.3-11 Permit reconstruction of roads, skid trails, and landings across unstable areas within TSU1 or TSU2 (i.e., steep streamside slopes) only after obtaining approval of the wildlife agencies as well as a review and site specific design by a PG or CEG.

TSU 4 and TSU 5 - Non-dissected, Low Relief Topography

Roads

C§8.3.3.1.4-1	Construct and maintain roads and landings to the design standards set out in Appendix E, *Roads, Landings, and Skid Trails*.
Tractor Trails	
C§8.3.3.1.4-2	Construct and maintain tractor trails to the design standards set out in Appendix E, *Roads, Landings, and Skid Trails.*
Tractor Yarding	
C§8.3.3.1.4-3	Limit tractor yarding to the fewest number of trails necessary to conduct yarding operations.
TSU 6 - Earthflow Complexes	
Roads	
C§8.3.3.1.5-1	Do not construct new roads on an earthflow complex.
C§8.3.3.1.5-2	Maintain roads and landings so that water is not concentrated on slide materials.
C§8.3.3.1.5-3	Do not increase or create cuts into a slide body or place fill material on a slide body, except for normal road maintenance.
Tractor Yarding	
C§8.3.3.1.5-4	Minimize new tractor trails and avoid disruption from equipment to the natural drainage of the earthflow.
Timber Harvest	
C§8.3.3.1.5-5	Retain ≥50% canopy, distributed across the TSU.
	Expected regeneration harvest of even-aged stands on TSU6: 42 ac (Years 0-15); 63 ac (Years 15-30).
Site Preparation and Burning	
C§8.3.3.1.5-6	Do not disturb the existing overstory canopy or disrupt drainage with heavy equipment for site preparation.
TSU 7 - Accelerated Creep Terrain	
Roads	
C§8.3.3.1.6-1	Avoid water concentration on soils in order to prevent gully erosion.
Tractor Trails	
C§8.3.3.1.6-2	Maintain, construct, and reconstruct tractor trails so that they do not increase the risk of mass wasting.
Tractor Yarding	
C§8.3.3.1.6-3	Avoid water concentration on soils in order to prevent gully erosion.
Timber Harvest	
C§8.3.3.1.6-4	Retain, on average, 50% canopy that is evenly distributed across the forested portion of the TSU.
Site Preparation and Burning	
C§8.3.3.1.6-5	Do not disturb existing overstory or disrupt drainage with heavy equipment during site preparation.
TSU 8 - Ohlsen Ranch Formation	
Roads and Tractor Trails	
C§8.3.3.1.7-1	Manage all roads and skid trails with a risk of sediment delivery as “extreme” erosion hazards regardless of their slope gradient.

C§8.3.3.1.7-2	Reduce the spacing between waterbars and rolling dips to 50 ft in order to minimize the concentration of water on a traveled surface.
C§8.3.3.1.7-3	Slash pack or mulch outlets of waterbars and rolling dips to dissipate the energy of concentrated surface run-off and minimize the likelihood of gully development.
Historically Active Landslides	
Roads	
C§8.3.3.1.8-1	Do not construct or reconstruct roads or landings.
C§8.3.3.1.8-2	Maintain existing roads so that excessive water is not concentrated onto slide materials.
Tractor Trails	
C§8.3.3.1.8-3	Do not construct tractor trails.
C§8.3.3.1.8-4	Avoid concentration of excessive water drainage from skid trails on rockslide materials.
Tractor Yarding	
C§8.3.3.1.8-5	Limit equipment to existing stable trails or roads.
Timber Harvest	
C§8.3.3.1.8-6	Do not harvest timber.
Site Preparation and Burning	
C§8.3.3.1.8-7	Do not permit heavy equipment for site preparation.
C§8.3.3.1.8-8	Limit equipment on dormant landslides to existing stable trails or roads.
LD Historically Active Landslides	
C§8.3.3.1.8-9	Retain at least 50% canopy with trees evenly dispersed across the historically active landslide.

W.2 Summary of Conservation Measures for Terrestrial Habitat

Terrestrial Habitat	
Snags and Wildlife Trees within a THP	
C§9.2.3.1-1	Retain in Class I and Large Class II AMZ a minimum of • 1 hard snag or recruitment tree *on average per acre* that is ≥ 16 in. dbh and ≥ 30 ft tall. • 2 hard snags or recruitment trees o*n average per acre* that are ≥ 24 in. dbh and ≥ 40 ft tall. • 1 wildlife tree or recruitment tree *on average per acre* that is ≥ 16 in. dbh and ≥ 30 ft tall.
C§9.2.3.1-2	Retain in general forested areas a minimum of • 1 hard snag or recruitment tree *on average per acre* that is ≥ 16 in. dbh and ≥ 30 ft tall. • 1 hard snag or recruitment tree *on average per acre* that is ≥ 24 in. dbh and ≥ 40 ft tall. • 1 wildlife tree or recruitment tree *on average per acre* that is ≥ 16 in. dbh and ≥ 30 ft tall.

C§9.2.3.1-3 Retain, if present, 1 additional hard snag ≥ 16 in. dbh and ≥ 30 ft tall per acre during sanitation/salvage operations; do not retain additional recruitment trees if a hard snag is not present.

C§9.2.3.1-4 Fell snags only when they (a) present safety hazards to workers, (b) create excessive fuel loads, or (c) are part of a sanitation/salvage PTHP or exemption:

- **Safety hazards**
  - If MRC determines after a thorough review that we must cut a very large hard snag (i.e., >36 in. dbh and more than 20 ft tall), we will provide written notification to the wildlife agencies about (a) our intent to fell the tree, (b) our reasons, and (c) other alternatives considered. If we do not receive a response within 5 business days, we will fell the tree. MRC may fell other snags and wildlife trees for safety reasons without obtaining approval of the wildlife agencies; in those instances, we will include the number of felled trees in an annual report (see D.4.2.3).
  - If a snag which is > 16 in. dbh and > 30 ft tall presents a safety hazard, MRC will attempt to cut the tree at least 4 ft above the ground (always consistent with safe harvest operations) and leave the felled snag in place unless it is blocking a road right-of-way, an existing road, or skid trail. In that case, it will be necessary to move the felled snag but place it near the location where it originally was felled. MRC will notify the wildlife agencies of all such incidences in a yearly compliance report (see D.4.2.3).
- **Fuelwood**
  - If a snag which is < 16 in. dbh and < 30 ft tall presents a safety hazard along a road or landing, a Licensed Timber Operator (LTO) can cut it for fuelwood.

C§9.2.3.1-5 Do not leave trees harvested within LACMA (at the discretion of the wildlife agencies) to meet the retention goals for downed wood (see O§9.2.2-1 and O§9.2.2-2).

C§9.2.3.1.6 Prevent, as feasible, the loss of snags and wildlife trees during preparation and execution of prescribed burning.

C§9.2.3.1-7 Choose for recruitment those trees with the most characteristics valuable for wildlife (see 9.2.2.1.1).

NOTE
MRC will tally snags, wildlife trees, and recruitment trees within forested areas separately from Class I and Large Class II AMZs and from core areas for northern spotted owls. If MRC cannot meet the objective for snags or wildlife trees, we may choose recruitment trees that also meet the minimum size requirement for retained trees. MRC will paint a "W" on the tree trunk for a snag or wildlife tree, and an "R" for a recruitment tree.

C§9.2.3.1-8 Harvest, in subsequent entries, trees marked with an "R" only if there is a tree within the same acre more likely to recruit to a snag in a shorter time.

C§9.2.3.1-9 Assess snags within a silvicultural unit using only contiguous silvicultural units; exclude Class I and Large Class II AMZs and core areas for northern spotted owls.

NOTE
If a PTHP consists of 6 non-contiguous silvicultural units, MRC will assess each unit separately.

C§9.2.3.1-10 Ensure that no more than 50% of snag recruitment trees for each silvicultural unit are hardwoods.

C§9.2.3.1-11 Permit firewood cutting only in amounts that still allow MRC to meet snag or LWD objectives.

C§9.2.3.1-12 Provide to the wildlife agencies, in an annual report, maps and tables showing the number of old-growth trees, wildlife trees, and recruitment trees within each silvicultural unit (see Appendix D, section D.4.2.1).

C§9.2.3.1-13 Retain all wildlife trees.

NOTE

- MRC will permit the harvest of trees > 24 in. dbh with basal hollows that "heal over" as long as they do not otherwise fall into one of the protection categories.
- MRC will permit the harvest of stump sprouts growing over the basal hollows of previously harvested trees as long as this does not diminish the basal hollow characteristics of the original stump.
- MRC will permit the harvest of a former raptor-nest tree once the nest is no longer evident as long as the tree does not otherwise fall into one of the protection categories.
- MRC will retain trees that support nests with structural deformities (e.g., broken tops and forked tops) whether or not a raptor nest is present.
- MRC will obtain approval of the wildlife agencies on alternative conservation measures for protection of the characteristics most valuable to wildlife in a stand that is exceedingly dense with wildlife trees which, in many cases, appear limited in their actual wildlife value. These alternative conservation measures will not include harvesting old-growth trees. In any case, MRC will retain a minimum of 3 wildlife trees, snags, or recruitment trees per acre.

Downed Wood within a PTHP

C§9.2.3.2-1 Retain the requisite number and size of logs per acre, if harvesting hard downed wood in the stand:

- In Class I and Large Class II AMZs and in extended protection areas for northern spotted owls, 6 pieces of downed wood *on average* per acre, each ≥ 16 in. average diameter, ≥ 6 ft long, and derived from at least 3 trees.
- In general forested areas, 5 pieces of downed wood *on average* per acre, each ≥ 16 in. average diameter, ≥ 6 ft long, and derived from at least 3 trees.

C§9.2.3.2-2 Do not harvest downed wood embedded in the bed or bank of any watercourse.

C§9.2.3.2-3 Leave downed logs where they fall, if possible; otherwise place them so that they follow the contours of a hillslope, if possible.

C§9.2.3.2-4 Retain all hollow logs and hollow standing trees for future recruitment as downed wood.

C§9.2.3.2-5 Permit cutting of firewood only on roads and landings.

NOTE
This requirement does not apply to commercial harvest of firewood.

C§9.2.3.2-6 Leave non-commercial pieces of downed wood ≥16 in. average diameter and ≥ 6 ft long on the forest floor, if possible.

C§9.2.3.2-7 Return to the forest floor, before completing landing operations, any piece of wood that is > 24 in. average diameter.

Hardwood Retention - AMZs

C§9.3.3.1-1 Do not manage hardwoods in riparian stands (AMZs) unless this management enhances riparian or instream habitats; establishes cable corridors for harvesting operations; or creates safer working conditions.

C§9.3.3.1-2 Retain the boles of felled hardwoods to provide instream and terrestrial woody debris.

Hardwood Retention - General Areas

C§9.3.3.2-1 Retain, after harvest, 15 ft^2/ac of hardwoods > 6 in. dbh, if such hardwoods comprised at least 15 ft^2/ac of the total basal area of a silvicultural unit prior to harvest.

C§9.3.3.2-2 Prohibit treatment of hardwoods > 6 in. dbh if they comprise < 15 ft^2/ac basal area in a silvicultural unit prior to harvest.

C§9.3.3.2-3 Retain all hardwood trees ≥ 24 in. dbh when these hardwoods constitute ≤ 20% of the basal area of the harvest unit, unless it is necessary to remove them for safety, road right-of-way, or yarding corridors.

C§9.3.3.2-4 Retain clusters of mast-producing hardwoods.

C§9.3.3.2-5 Retain true oaks and madrones > 18 in. dbh unless it is necessary to remove them for safety, road right-of-way, or yarding corridors.

C§9.3.3.2-6 Leave true oaks and madrones > 18 in. dbh—felled for safety, road right-of-way, or yarding corridors—on the ground as downed wood, unless it is necessary to move them to clear a road or road right-a-way.

C§9.3.3.2-7 Retain trees, regardless of size, that show evidence of significant wildlife use (e.g., whitewash, acorn granaries of woodpeckers, nests of raptors or other birds) and that provide valuable structural complexity or decay elements (e.g., cavities, broken or dead tops, or loose bark).

C§9.3.3.2-8 Retain hardwoods, when possible, in clumps that include a variety of size classes and that surround large individual trees or those with significant wildlife value.

C§9.3.3.2-9 Place priority on retaining hardwood clumps where they enhance connectivity between wildlife habitats, such as in AMZs, atop ridgelines, and in low spots between two large drainages.

C§9.3.3.2-10 Retain aggregate hardwood patches in variable retention units for the life of the HCP/NCCP.

C§9.3.3.2-11 Harvest oak woodlands and true oak forests only to remove invasive conifers.

C§9.3.3.2-12 Exclude Class I hardwood stands (Appendix B, *HCP/NCCP Atlas*, MAPS 4A-C) from harvesting.

NOTE
MRC will not harvest native hardwood stands that we type as Class I (288 ac); we may harvest Class II hardwood stands (333 ac) if we re-classify them as Class III in future on-the-ground assessments.

Hardwood Representative Sample Areas

C§9.3.3.3-1 Maintain a mixed-age stand of hardwoods, representative of an early seral hardwood stand.

C§9.3.3.3-2 Maintain the relative proportion of conifers to hardwoods.

C§9.3.3.3-3 Meet the minimum stocking standards of the Timber Management Plan (TMP).

Type I Old Growth

C§9.4.3.1-1 Do not harvest in previously un-harvested stands of old growth.

C§9.4.3.1-2 Pursue conservation easements to permanently protect old-growth stands.

C§9.4.3.1-3 Protect a 150-ft buffer that retains at least 75% of the basal area of conifers in the Type I old-growth stand.

NOTE
A Type I stand with a basal area of 200 ft^2, for example, will have a 150-ft wide buffer with a minimum basal area of 150 ft^2.

C§9.4.3.1-4 Obtain the approval of the wildlife agencies before initiating any burning in old-growth stands.

C§9.4.3.1-5 Cooperate if the wildlife agencies, on their own initiative, decide to re-introduce ecological burns in old-growth stands.

Type II Old Growth

C§9.4.3.2-1 Harvest using single-tree selection to maintain and increase mean stand diameter.

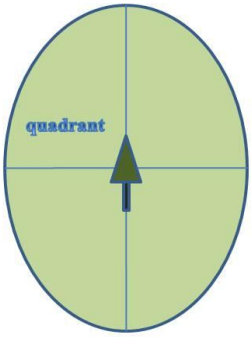
C§9.4.3.2-2 Maintain screen trees for old-growth trees and mark them with an “R” so that they are retained during harvest.

DEFINITION
A **screen tree** creates a barrier of protection, e.g., from wind, for an adjacent tree and for wildlife that might be occupying it. Its limbs must intermingle above or at the height of the canopy of the tree to be screened, while its tree top must be at least half the height of the tree to be screened.

C§9.4.3.2-3 Follow these procedures, if a tree to be screened does not have at least 4 screen trees, in order to assess and retain screen recruitment trees:

- Use 2 times the canopy spread as the distance within which to assess and retain potential screen trees.

- Ensure that a potential screen tree is the tallest tree in the assessment quadrant and at least ½ the height of the tree to be screened.



Tree To Be Screened

NOTE

If there are no trees which meet the criteria in C§9.4.3.2-3, do not retain additional trees.

C§9.4.3.2-4 Permit harvesting of a screen tree only if (a) there are at least 6 screen trees with intermingling limbs; (b) felling will not damage the tree to be screened; and (c) removing the harvested tree will not damage the tree to be screened.

C§9.4.3.2-5 Preserve all individual old-growth trees identified by size, characteristics, and dbh.

C§9.4.3.2-6 Obtain the approval of the wildlife agencies before initiating any burning in old-growth stands.

C§9.4.3.2-7 Cooperate if the wildlife agencies, on their own initiative, decide to re-introduce ecological burns in old-growth stands.

Residual Old-growth Trees

C§9.4.3.3-1 Protect and preserve individual old-growth trees, both conifers and hardwoods.

NOTE

If MRC determines that we must cut a very large hard snag (i.e., >36 in. dbh and more than 20 ft tall) or an old-growth tree, we will provide written notification to the wildlife agencies about (a) our intent to fell the tree, (b) our reasons based on a thorough review, and (c) alternatives considered. If we do not receive a response from the wildlife agencies within 5 business days, we will fell the tree. MRC may fell other snags and wildlife trees for safety reasons without obtaining the approval of the wildlife agencies; in those instances, we will leave the felled trees on the forest floor and include the number of felled trees in an annual report (see C§9.2.3.1-4).

C§9.4.3.3-2 Retain all screen trees around individual old-growth trees per the guidelines in C§9.4.3.2-2 and C§9.4.3.2-3.

Rocky Outcrops

C§9.5.3-1 Survey for peregrine falcon when timber operations occur within ½ mile of rocky outcrops or within 1 mile of any proposed helicopter yarding.

C§9.5.3-2 Survey newly discovered rocky outcrops for sensitive species if there are plans to convert them to quarries.

- If sensitive species are not present, MRC may convert the site to a quarry.
- If sensitive species are present, MRC will obtain approval of the wildlife agencies prior to any conversion of the site to a quarry.

C§9.5.3-3 Coordinate with adjacent landowners, as appropriate, to determine the status of adjacent peregrine falcon eyries.

C§9.5.3-4 Consult with the wildlife agencies for operations within ¼ mile of a peregrine falcon nest in order to determine site-specific conservation measures, including disturbance measures.

Common Natural Communities

C§9.6.1.3-1 Restore coastal redwoods and Douglas fir.

C§9.6.1.3-2 Restore a balance of conifers-to-hardwoods.

C§9.6.1.3-3 Maintain Class I hardwood stands (section 9.3.1.2).

C§9.6.1.3-4 Maintain existing stand dominance of native conifers other than redwood and Douglas fir where this occurs.

C§9.6.1.3-5 Follow all other conservation strategies related to common natural communities:

- *Riparian areas and wetlands*

  Protect distinct habitat features, such as watercourses, marshes, seeps, and springs.

- *Sediment and mass wasting*

  Limit the anthropogenic sources of mass wasting, thereby maintaining more ground in the forest and less sediment impairment of watercourses.

- *Wildlife trees, snags, and downed wood*

  Retain and recruit habitat elements necessary to maintain a diverse habitat structure.

- *Hardwoods*

  Maintain hardwood tree species within MRC conifer forests, as well as representative hardwood stands across the plan area.

- *Old- growth trees*

  Retain old-growth trees, a significant habitat element.

- *Northern spotted owl*

  Create and retain older and denser forest stands; this, in turn, increases the diversity of seral stages throughout the natural community.

- *Marbled murrelet*

  Retain large, uncommon trees with significant structural elements for nesting, such as platform branches or broken tops.

- *Point Arena mountain beaver*

  Retain existing burrow systems.
- *Rare plants*

  Protect and conserve covered rare plants.

Uncommon Natural Communities – Closed Cone Forest

C§9.6.2.3.1-1	Follow all conservation measures for rare plants detailed in Chapter 11.
C§9.6.2.3.1-2	Avoid conducting covered activities in closed-cone forest, if feasible.
C§9.6.2.3.1-3	Conduct covered activities in closed-cone forest to allow access to adjacent timber stands only if no other routes are feasible.
C§9.6.2.3.1-4	Conduct road maintenance and construction in accordance with the prescribed protections and take limitations on rare plants in Chapter 11.
C§9.6.2.3.1-5	Do not disturb, over the 80-year term of the plan, more than 5 ac of pygmy forest for construction of new facilities, such as roads, landings, and skid trails; obtain approval of the wildlife agencies if the proposed construction will impact additional acres.
C§9.6.2.3.1-6	Request technical assistance from USFWS, if necessary, to prevent take of the Lotis Blue Butterfly.
C§9.6.2.3.1-7	Apply surrogates for natural disturbance agents (e.g., fire) within natural communities, if the wildlife agencies concur.
C§9.6.2.3.1-8	Decommission, close, and re-vegetate historic roads (see Appendix E, *Roads, Landings, and Skid Trails*, section E.2.1)

Uncommon Natural Communities – Oak Woodlands and Natural Grasslands

C§9.6.2.3.2-1	Follow all conservation measures for rare plants detailed in Chapter 11.
C§9.6.2.3.2-2	Avoid conducting covered activities in oak woodlands and natural grasslands, if feasible.
C§9.6.2.3.2-3	Conduct covered activities in oak woodlands and natural grasslands to allow access to adjacent timber stands only if no other routes are feasible.
C§9.6.2.3.2-4	Conduct road maintenance and construction in accordance with the prescribed protections and take limitations on rare plants in Chapter 11.
C§9.6.2.3.2-5	Apply surrogates for natural disturbance agents (e.g., fire) within natural communities, if the wildlife agencies concur.
C§9.6.2.3.2-6	Decommission, close, and re-vegetate historic roads (see Appendix E, *Roads, Landings, and Skid Trails*, section E.2.1)
C§9.6.2.3.2-7	Harvest encroaching Douglas fir and avoid replanting the harvested area with conifers, if feasible and cost-efficient.

Salt Marsh

C§9.6.2.3.3-1	Map, within 5 years of HCP/NCCP commencement, the boundaries of any salt marsh in the plan area with ground surveys, extending out at least as far as the dominant species identified, including Zostera spp.
C§9.6.2.3.3-2	Prohibit water drafting within the boundaries of the salt marsh.
C§9.6.2.3.3-3	Maintain a 50-ft EEZ (excluding existing roads) around a salt marsh.
C§9.6.2.3.3-4	Provide AMZ Class I protections around watered areas of the marsh.

Invasive Species

C§9.7.3-1	Develop, within the first 5 years of HCP/NCCP implementation, an *Invasive Plant Control Program* and *Invasive Animal Control Program* for the plan area.
C§9.7.3-2	Incorporate applicable elements of the *Invasive Plant Control Program* and *Invasive Animal Control Program* into individual PTHPs and other site-specific projects.
C§9.7.3-3	Evaluate and revise the *Invasive Plant Control Program* and *Invasive Animal Control Program* as needed, with a formal evaluation and revision at least every 5 years.
C§9.7.3-4	Continue current control efforts on invasive plants and animals in the plan area during development of the *Invasive Plant Control Program* and *Invasive Animal Control Program*

W.3 Summary of Conservation Measures for Fish and Wildlife

Fish and Wildlife

Coho Salmon, Chinook Salmon, and Steelhead

C§10.2.1.3-1	See 8.2, *Riparian and Wetland Areas.*
C§10.2.1.3-2	See 8.3, *Sediment Inputs*.
C§10.2.1.3-3	See 8.4, *Hydrologic Change.*
C§10.2.1.3-4	See Appendix E, *Roads, Landings, and Skid Trails.*
C§10.2.1.3-5	See Appendix T, *Master Agreement for Timber Operations*

Red-legged Frogs

Disturbance Minimization

C§10.2.2.3-1	Follow these standards in maintaining documented red-legged frog breeding sites (both natural and man-made): ▪ Maintain and manage vegetation after July 1. ▪ Do not conduct vegetation management more than once every 3 years. ▪ Limit vegetation management to 50% of the breeding site's perimeter.
C§10.2.2.3-2	Maintain a 25 to 50 ft equipment limitation or exclusion zone (ELZ or EEZ) around wetlands, wet areas, wet meadows, seeps, and springs, excluding existing roads (see C§8.2.3.5.1-1, C§8.2.3.5.1-2, and C§8.2.3.5.2-3).

C§10.2.2.3-3 Maintain a 50 ft equipment exclusion or limitation zone (EEZ or ELZ) around all potential and documented red-legged frog breeding sites excluding existing roads.

NOTE
If MRC needs to enter an EEZ with equipment, we will conduct pre-project surveys as described in section 10.2.2.3.

C§10.2.2.3-4 Limit water drafting on documented red-legged frog breeding sites (both natural and man-made):

- Do not draft more than 50% of pond volume before July 1.
- Do not draft more than 80% of pond volume after July 1.
- Do not draft when egg masses are present.
- Use a screen with a mesh size less than 1/8 in. and an approach velocity of 0.33 ft/sec or less.

C§10.2.2.3-5 Ensure that all pump intakes are screened and, if feasible, are at least 6 in. off the bottom of the waterbody; follow the water-drafting prescriptions in Appendix E, *Roads, Landings, and Skid Trails*, E.7.

Bullfrog Control Plan

C§10.2.2.3-6 Construct new ponds with drain fixtures, where topographically possible.

NOTE
MRC will do this as the opportunity arises during covered activities with the concurrence of the wildlife agencies.

C§10.2.2.3-7 Control bullfrog populations if they are present in 1 or more documented red-legged frog breeding sites in a planning watershed, according to the following order of priority:

1. Remove bullfrog egg masses from the site.
2. Attempt to remove (e.g., gig, shoot, trap, and seine) metamorphic bullfrogs (i.e., frogs with legs) at least once a week until the CPUE (catch per unit effort of time) declines to < 1 bullfrog per hour—evidence that the bullfrog population has been reduced.
3. Drain a pond manually or mechanically during bullfrog invasion if there is no drain fixture.

NOTE
MRC will not drain ponds to control bullfrogs if there are larval forms of red-legged frogs in the pond. Moreover, it is not possible to drain some large ponds manually.

Take Minimization

C§10.2.2.3-8 Conduct pre-project surveys to determine the presence of covered aquatic species when proposing that heavy equipment enter into an EEZ or ELZ of any wet feature (wet areas, seeps, springs, wet meadows, and wetlands), including potential and documented red-legged frog breeding sites.

Habitat Conservation

C§10.2.2.3-9 Maintain at least 75% of both maximum depth and maximum total surface area of potential breeding sites as measured during baseline distribution surveys.

C§10.2.2.3-10 Construct new ponds with drain fixtures, where topographically possible.

NOTE
MRC will do this as the opportunity arises during covered activities with the concurrence of the wildlife agencies.

C§10.2.2.3-11	See 8.2, *Riparian and Wetland Areas*.
C§10.2.2.3-12	See 8.3, *Sediment Inputs*.
C§10.2.2.3-13	See 8.4, *Hydrologic Change.*
C§10.2.2.3-14	See Appendix E, *Roads, Landings, and Skid Trails.*
C§10.2.2.3-15	Prohibit herbicide use within 150 ft of habitat occupied by red-legged frogs or within an AMZ of a Class I or Class II stream unless the wildlife agencies concur.

Coastal Tailed Frogs

Disturbance Minimization	
C§10.2.3.3-1	Maintain a 25 to 50-ft equipment limitation or exclusion zone (ELZ or EEZ) around wetlands, wet areas, wet meadows, seeps, and springs, excluding existing roads.
Take Minimization	
C§10.2.3.3-2	Conduct pre-project surveys to determine the presence of covered aquatic species when proposing that heavy equipment enter into the EEZ or ELZ of any wet feature (wet areas, seeps, springs, wet meadows, and wetlands).
Habitat Conservation	
C§10.2.3.3-3	Designate and manage all basins or sub-basins with breeding coastal tailed frogs present as Large Class II regardless of their drainage area size (see Table 8-1). **NOTE** If MRC finds only an adult life stage of coastal tailed frog, we will conduct a second survey for larval forms to evaluate if the sub-basin supports breeding frogs. If we find larvae, we will manage the sub-basin as a Large Class II.
C§10.2.3.3-4	See 8.2, *Riparian and Wetland Areas*.
C§10.2.3.3-5	See 8.3, *Sediment Inputs*.
C§10.2.3.3-6	See 8.4, *Hydrologic Changes*.
C§10.2.3.3-7	See Appendix E, *Roads, Landings, and Skid Trails.*
C§10.2.3.3-8	See Appendix T, *Master Agreement for Timber Operations.*
C§10.2.3.3-9	Prohibit herbicide use within an AMZ of a Class I or Class II stream unless the wildlife agencies concur.

NSO Territories with High Protection

Habitat	
C§10.3.1.3.1-1	Provide, on covered lands, a core area of at least 80 contiguous ac (32 ha) which is 500 ft (153 m) from the initial activity center and off-limits to harvest.

C§10.3.1.3.1-2 Adhere to MRC guidelines for selecting a core area in the order of priority given below:

1. Create a circular buffer around the initial activity center with a 500-ft radius.
2. Select 80 ac of contiguous nesting/roosting habitat, if available.
3. Supplement any deficiencies in the desired 80 ac with the next-best contiguous habitat.
4. Locate the habitat on same side of a topographic divide, such as a ridge, if possible.

C§10.3.1.3.1-3 Protect core areas that are within both covered lands and state parks in proportion to the amount of core area acreage on covered lands.

EXAMPLE

A core area adjoins both the plan area and Navarro River Redwoods State Park, such that 60 ac are in the plan area and 20 ac on park land. MRC will protect the 60 ac of the core area that are in the plan area.

C§10.3.1.3.1-4 Retain suitable habitat (a) within 1000 ft of the initial activity center and (b) within the extended protection area (i.e., 267 ft beyond the periphery of the core area) and ensure that any harvests maintain or increase the pre-harvest mean stand diameter (MSD).

C§10.3.1.3.1-5 Maintain at least 500 ac of suitable habitat within 0.7 miles of the activity center or maintain the existing suitable habitat if, prior to harvest, it is already less than 500 ac.

NOTE

The forester will ensure that MRC meets the minimum habitat criteria post-harvest. Additionally, the forester will confirm via air photos or past harvest plans that the habitat typing is correct and current. If there is a disagreement about the habitat typing before, during, or after harvest, the forester will meet with the disputant at the stand in question to resolve the concern. If there is still disagreement, the disputing agency will work with MRC to agree upon a sampling intensity and protocol to determine canopy cover and habitat typing of the stand.

C§10.3.1.3.1-6 Permit fire control lines for prescribed burning within a core area only with approval of the wildlife agencies.

C§10.3.1.3.1-7 Mark and retain all known nest trees of northern spotted owls and protect them, if possible, with 4 screen trees.

DEFINITION

A screen tree creates a barrier of protection (e.g., from wind) for an adjacent tree and for wildlife that might be occupying it. It must have intermingling limbs above or equal to the height of the canopy of the tree to be screened. Its tree tops must be at least half the height of the tree to be screened.

NOTE

Conservation measures C§10.3.1.3.1-7 through C§10.3.1.3.1-9 still apply when a spotted owl has abandoned its core area and moved into another core area.

C§10.3.1.3.1-8 Follow this procedure if a tree to be screened does not have at least 4 screen trees:

- Use 2 times the canopy spread as the distance within which to assess and retain potential screen trees.
- Select, as the screen tree, the tallest tree in the assessment quadrant which is, at minimum, ½ the height of the tree to be screened.

  NOTE

  If no trees meet this criterion, do not retain additional trees.

- Select screen trees in open non-screened quadrants, if possible.

C§10.3.1.3.1-9 Permit harvesting of a screen tree only if (a) there are at least 6 screen trees; (b) felling will not damage the tree to be screened; and (c) removing the harvested tree will not damage the tree to be screened.

C§10.3.1.3.1-10 Restrict construction of new roads to locations outside of the core area.

Breeding Season

C§10.3.1.3.1-11 Conduct only the following operations within 1000 ft (305 m) of a current spotted owl activity center:

- Use of mainline haul roads and maintenance of mainline haul roads as designated in the *HCP/NCCP Atlas* (MAPS 14A-C).

  NOTE

  Maintenance includes actions necessary to use the roads, e.g., knocking down water bars, grading, and watering. Maintenance does not include actions that would be considered reconstruction of roads under the California Forest Practice Rules (CDF 2006, p. 14), such as changing the prism of the road. MRC will retain any trees felled for maintenance in forest adjacent to roads within the core area.
- Use of public roads.
- Use and maintenance of existing MRC roads which are at least the same distance from the current AC as a public road or mainline haul road.
- Use of pickups and ATVs on existing roads.

C§10.3.1.3.1-12 Permit helicopter operations, including service landings, only 2640 ft (805 m) or more from a spotted owl activity center, measured and marked according to map distance.

C§10.3.1.3.1-13 Allow a logging vehicle to stop only for safety reasons when within 1000 ft (305 m) of a nest site known to be currently active, unless the vehicle is on a mainline road.

C§10.3.1.3.1-14 Permit prescribed burning within ¼ mile of an occupied activity center only with the approval of the wildlife agencies.

C§10.3.1.3.1-15 Survey for spotted owls when operations could result in disturbance or reduction of suitable habitat (see Appendix K, *Northern Spotted Owl Data and Protocol*, section K.5.1.8).

Non-breeding Season

C§10.3.1.3.1-16 Prohibit harvest or forest management within the core area.

C§10.3.1.3.1-17 Conduct only the following operations within the core area:

- Use and maintenance of existing roads.
- Reconstruction of any truck road only if MRC has exhausted all other alternative measures that might result in less impact.
- Use of cable corridors and tailholds:
  - Fell only trees that may hang up cable lines.
  - Leave all trees felled for the cable corridor on the forest floor for woody debris.
  - Yard logs only outside the core area.
  - Exclude nest or screen trees from felling.
  - Fell trees for cable corridors away from nest or roost trees so that no damage can occur to nest trees, screen trees, or roost trees.

C§10.3.1.3.1-18 Permit helicopter operations—including service landings—that are at least 1000 ft (305 m) from an activity center, measured and marked according to map distance.

C§10.3.1.3.1-19 Survey for spotted owls when operations could result in reduction of suitable habitat (see Appendix K, *Northern Spotted Owl Data and Protocol*, section K.5.1.8).

NSO Territories with Moderate Protection

Habitat

C§10.3.1.3.1-20 Adhere to MRC guidelines for selecting a core area:

- Select nesting/roosting habitat over foraging habitat.
- Select contiguous habitat over isolated habitat.
- Select habitat located proximal to the activity center relative to a topographic divide, such as a ridge.

C§10.3.1.3.1-21 Provide a core area of at least 18 contiguous ac (7 ha) that are *no-harvest* with a minimum distance of 500 ft (152 m) to the initial activity center.

C§10.3.1.3.1-22 Retain suitable habitat that is within the extended protection area (i.e., 500 ft beyond the periphery of the core area) prior to harvest and ensure that harvested areas maintain or increase pre-harvest mean stand diameter.

C§10.3.1.3.1-23 Mark and retain all known nest trees of northern spotted owls and protect them with screen trees (see C§10.3.1.3.1-7).

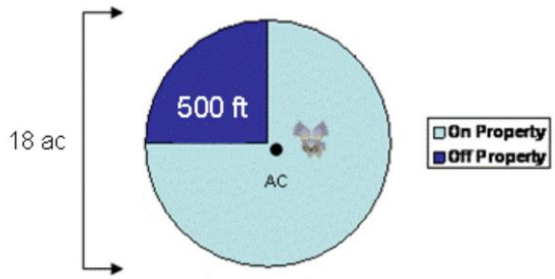
C§10.3.1.3.1-24 Permit fire control lines for prescribed burning within a core area only with the approval of the wildlife agencies.

C§10.3.1.3.1-25 Maintain at least 500 ac of suitable habitat within 0.7 miles of the activity center or maintain the existing suitable habitat if, prior to harvest, it is already less than 500 ac.

C§10.3.1.3.1-26 Protect core areas that are both on and off MRC property in proportion to the amount of acreage that is actually on MRC property.

EXAMPLE

A core area consists of a circle with a 500 ft radius. Within this 18-ac circle, 75% of the land is on covered lands. The rest of the core area is on other property. MRC will protect 0.75 * 18 or 14 ac.



MRC maintains a minimum of 14 ac (75%) of the core area

Breeding Season

C§10.3.1.3.1-27 Conduct only the following operations within 1000 ft (305 m) of the current activity center:

- Use of mainline haul roads and maintenance of mainline haul roads as designated in the *HCP/NCCP Atlas* (MAPS 14A-C).

  NOTE

  Maintenance does not include actions that would be considered reconstruction of roads under the California Forest Practice Rules (CDF 2006, 14), such as substantial change in the prism of the road.
- Use of public roads.
- Use and maintenance of existing MRC roads that (1) are located at least the same distance from the current spotted owl activity center as a public road or mainline haul road; or (2) are existing seasonal roads ≥500 ft (152 m) from the current activity center and in use during the time the spotted owl territory has been active.

  NOTE

  Maintenance does not include actions that would be considered reconstruction of roads under the California Forest Practice Rules (CDF 2006, 14), such as substantial change in the prism of the road.
- Use of pickups and ATVs on existing roads.
- Use of a road if an owl pair is upgraded from limited to moderate protection and has successfully reproduced while the AC was within 500 ft (152 m) of the road.

  NOTE

  The assumption is that the road disturbance has not disrupted the owls since they have already reproduced.

C§10.3.1.3.1-28 Permit helicopter operations—including service landings—that are at least 2640 ft (805 m) from an activity center, measured and marked according to map distance.

C§10.3.1.3.1-29 Permit prescribed burning within ¼ mile of an occupied activity center only with the approval of the wildlife agencies.

C§10.3.1.3.1-30 Allow a logging vehicle to stop only for safety reasons when within 1000 ft (305 m) of a nest site known to be currently active, unless the vehicle is on a mainline road.

C§10.3.1.3.1-31 Retain any trees, felled for allowable maintenance, in the forest adjacent to roads within the core area.

C§10.3.1.3.1-32 Survey for spotted owls when operations could result in disturbance or reduction of suitable habitat (see Appendix K, *Northern Spotted Owl Data and Protocol*, section K.5.1.8).

Non-breeding Season

C§10.3.1.3.1-33 Prohibit harvest or forest management within the core area.

C§10.3.1.3.1-34 Conduct only the following operations within the core area:

- Use of cable corridors and tailholds:
  - Fell only trees that may hang up cable lines.
  - Yard logs only outside the core area.
  - Exclude nest or screen trees from felling.
  - Leave all trees felled for the cable corridor on the forest floor for woody debris.
  - Fell trees for cable corridors away from nest or roost trees to limit damage to these trees
- Use and maintenance of existing roads.

C§10.3.1.3.1-35 Permit helicopter operations—including service landings—that are at least 1000 ft (305 m) from an activity center.

C§10.3.1.3.1-36 Survey for spotted owls when operations could result in reduction of suitable habitat (see Appendix K, *Northern Spotted Owl Data and Protocol*, section K.5.1.8).

C§10.3.1.3.1-37 Permit construction of new roads inside the core area only if MRC maintains habitat thresholds.

NSO Territories with Limited Protection

Habitat

C§10.3.1.3.1-38 Mark and retain all known nest trees of northern spotted owls and protect them with screen trees (see C§10.3.1.3.1-7).

Breeding Season

C§10.3.1.3.1-39 Protect a 500-ft (152-m) no-harvest buffer during the breeding season.

C§10.3.1.3.1-40 Permit helicopter operations—including service landings—that are at least 1320 ft (402 m) from an activity center.

C§10.3.1.3.1-41 Survey for spotted owls when operations could result in disturbance (see Appendix K, *Northern Spotted Owl Data and Protocol*, sections K.5.1.3 and K.5.1.9.2).

NSO Territories Off Property

Non-breeding Season

C§10.3.1.3.1-42 Mark and retain all known nest trees of northern spotted owls and protect them with screen trees.

Habitat

C§10.3.1.3.1-43 **Level 4A**
Apply C§10.3.1.3.1-20 through C§10.3.1.3.1-37.

C§10.3.1.3.1-44 **Level 4B**
Apply C§10.3.1.3.1-38 through C§10.3.1.3.1-41

Breeding and Non-breeding Seasons

C§10.3.1.3.1-45 **Level 4A**
Apply C§10.3.1.3.1-20 through C§10.3.1.3.1-37.

C§10.3.1.3.1-46 **Level 4 B**
Apply C§10.3.1.3.1-38 through C§10.3.1.3.1-41

NSO Territories On/Off Property

Habitat

C§10.3.1.3.1-47 Apply C§10.3.1.3.1-20 through C§10.3.1.3.1-37.

Breeding Season

C§10.3.1.3.1-48 Apply C§10.3.1.3.1-20 through C§10.3.1.3.1-37.

Non-breeding Season

C§10.3.1.3.1-49 Apply C§10.3.1.3.1-20 through C§10.3.1.3.1-37.

Mobile Activity Centers

Territories with High or Moderate Protection

C§10.3.1.3.2-1 Ensure that breeding season protections are always given to the most current activity center.

C§10.3.1.3.2-2 Maintain a **nest-site** core area through at least 3 breeding seasons (Figure 10-7).

EXAMPLE

Year 0: Spotted owl is in nest, and initial activity center and core area is established.
Year 1: Spotted owl is not in the core area, but the core area remains.
Year 2: Spotted owl is not in the core area, but the core area remains.
Year 3: Spotted owl is not in the core area, so core area is abandoned.

C§10.3.1.3.2-3 Maintain a **roost-site** core area through at least 2 breeding seasons unless in Year 0 a spotted owl is detected 1 time only in the roost site.

EXAMPLE

Year 0: Spotted owl is in roost site; initial activity center and core area is established.
Year 1: Spotted owl is not in the core area, but the core area remains.
Year 2: Spotted owl in not in core area, so core area is abandoned.

Territories with Limited Protection

C§10.3.1.3.2-4 Surround a spotted owl's most recent activity center with a 500 ft buffer during the breeding season.

Lower Alder Creek Core Area (LACCA)

General

C§10.3.2.3.1-1 Prohibit forest management operations, including timber harvest and road-building.

C§10.3.2.3.1-2 Prohibit public entry into a core area, e.g., for firewood cutting or recreation.

Lower Alder Creek Habitat Area (LACHA)

General	
C§10.3.2.3.1-3	Conduct timber management only to create and enhance habitat for marbled murrelets.
C§10.3.2.3.1-4	Obtain approval of the wildlife agencies before submitting a PTHP for any proposed forest management in LACMA.
C§10.3.2.3.1-5	Obtain approval of the wildlife agencies before altering vegetation or maintaining roads.
C§10.3.2.3.1-6	Provide the wildlife agencies with a map of the entire project area before initiating any activity.
C§10.3.2.3.1-7	Permit fire control lines for prescribed burning within LACHA only with approval of the wildlife agencies.
C§10.3.2.3.1-8	Treat logging debris—between September 15th and March 24th in the 1st year following any harvest conducted in LACHA—with means approved by the wildlife agencies, such as: ▫ Lopping slash so that a minimal amount remains as ladder fuels. ▫ Removing felled trees < 24 in. dbh to a landing. ▫ Cutting the top 50 ft off any felled tree > 24 in. dbh and removing this 50-ft segment to a landing. ▫ Bucking and limbing, in the forest, any segments of tree stems remaining on the ground. ▫ Lopping any residual slash, after the above operations have been completed, that is more than 30 in. high.
Breeding Season	
C§10.3.2.3.1-9	Conduct timber operations only if (a) an MRC survey shows that murrelets are not occupying any area within a ¼ mile of a proposed project; (b) the operations are at least a ¼ mile beyond a core area periphery; (c) the operations are at least 100 ft (23 m) away from potential habitat trees; and (d) the operations occur within the time period of 2 hours after sunrise to 2 hours before sunset.
C§10.3.2.3.1-10	Permit vehicular traffic within ¼ mile of a core area periphery or within 100 ft of potential murrelet habitat trees for (a) maintenance and hauling on mainline routes; (b) vehicles on existing seasonal or permanent roads which are 1 ton or less; or (c) all terrain vehicles (ATVs) on existing roads.
C§10.3.2.3.1-11	Permit prescribed burning within ¼ mile of LACHA only with approval of the wildlife agencies.
C§10.3.2.3.1-12	Permit helicopter operations if they are at least ½ mile from a core area periphery and an MRC survey shows that murrelets are not occupying any area within a ½ mile of the helicopter operations.
C§10.3.2.3.1-13	Conduct blasting only if (a) it is at least 1 mi (1.6 km) from a core area periphery; (b) it is within the time period of 2 hours after sunrise to 2 hours before sunset; and (c) an MRC survey shows that murrelets are not occupying any area within 1 mile of the blasting.
C§10.3.2.3.1-14	Conduct all road maintenance as well as rock and log hauling from 2 hours after sunrise to 2 hours before sunset.

C§10.3.2.3.1-15	Prohibit public entry, e.g., for firewood cutting or recreation.
Non-Breeding Season	
C§10.3.2.3.1-16	Permit vehicular traffic within 300 ft (91 m) of a core area periphery or within 100 ft (23 m) of potential murrelet habitat trees for (a) maintenance and hauling on mainline routes; (b) vehicles on existing seasonal or permanent roads which are 1 ton or less; or (c) all terrain vehicles (ATVs) on existing roads.
C§10.3.2.3.1-17	Conduct timber operations only if (a) an MRC survey shows that murrelets are not occupying any area within 300 ft (91 m) of a proposed project; (b) the project is at least 300 ft beyond a core area periphery; (c) the operations are 100 ft (23 m) away from potential habitat trees; and (d) the operations are within the time period of 2 hours after sunrise to 2 hours before sunset.
C§10.3.2.3.1-18	Create a required cable corridor only if (a) an MRC survey shows that murrelets are not occupying any area within 300 ft (91 m) of the cable corridor; (b) trees are felled away from potential habitat; and (c) operations are within the time period of 2 hours after sunrise to 2 hours before sunset.
C§10.3.2.3.1-19	Permit helicopter operations if they are at least 500 ft from a core area periphery and an MRC survey shows that murrelets are not occupying any area within 500 ft of the operations.
C§10.3.2.3.1-20	Conduct all maintenance and hauling (a) at least 300 ft (92 m) from a core area periphery and (b) within the time period of 2 hours after sunrise to 2 hours before sunset.
C§10.3.2.3.1-21	Maintain a consistent "viewshed" for radar monitoring sites.
Lower Alder Creek Buffer Area (LACBA)	
General	
C§10.3.2.3.1-22	Conduct timber management only to provide buffering and protection for LACCA and LACHA.
C§10.3.2.3.1-23	Obtain approval of the wildlife agencies before submitting a PTHP for any proposed forest management in LACMA.
C§10.3.2.3.1-24	Permit fire control lines for prescribed burning within LACBA only with approval of the wildlife agencies.
C§10.3.2.3.1-25	Obtain approval of the wildlife agencies before altering vegetation or maintaining, constructing, or reconstructing roads.
C§10.3.2.3.1-26	Provide the wildlife agencies with a map of the entire project area before initiating any activity.

C§10.3.2.3.1-27 Treat logging debris—between September 15th and March 24th in the 1st year following any harvest conducted in LACHA—with means approved by the wildlife agencies, such as:

- Removing felled trees < 24 in. dbh to a landing.
- Cutting the top 50 ft off any felled tree > 24 in. dbh and removing this 50-ft segment to a landing.
- Bucking and limbing, in the forest, any segments of tree stems remaining on the ground.
- Lopping any residual slash, after the above operations have been completed, that is more than 30 in. high.

C§10.3.2.3.1-28 Prohibit public entry, e.g., for firewood or recreation.

Breeding Season

C§10.3.2.3.1-29 Conduct timber operations only if an MRC survey shows that murrelets are not occupying any area within a ¼ mile of a proposed project and the operations are (a) at least a ¼ mile beyond a core area periphery; (b) at least 100 ft (23 m) away from potential habitat trees; and (c) within the time period of 2 hours after sunrise to 2 hours before sunset.

C§10.3.2.3.1-30 Permit vehicular traffic within ¼ mile of a core area periphery or within 100 ft of potential murrelet habitat trees for (a) maintenance and hauling on mainline routes; (b) vehicles on existing seasonal or permanent roads which are 1 ton or less; or (c) all terrain vehicles (ATVs) on existing roads.

C§10.3.2.3.1-31 Permit helicopter operations if they are at least ½ mile from a core area periphery and an MRC survey shows that murrelets are not occupying any area within a ½ mile of the helicopter operations.

C§10.3.2.3.1-32 Conduct blasting only if (a) it is at least 1 mi (1.6 km) from a core area periphery; (b) it is within the time period of 2 hours after sunrise to 2 hours before sunset; and (c) an MRC survey shows that murrelets are not occupying any area within 1 mile of the blasting.

C§10.3.2.3.1-33 Permit prescribed burning within ¼ mile of LACBA only with approval of the wildlife agencies.

C§10.3.2.3.1-34 Conduct all maintenance and hauling from 2 hours after sunrise to 2 hours before sunset.

Non-breeding Season

C§10.3.2.3.1-35 Harvest to create a required cable corridor only if (a) an MRC survey shows that murrelets are not occupying any area within 300 ft of the cable corridor; (b) trees are felled away from potential habitat; and (c) operations are within the time period of 2 hours after sunrise to 2 hours before sunset.

C§10.3.2.3.1-36 Conduct timber operations only if (a) an MRC survey shows that murrelets are not occupying any area within 300 ft of a proposed project; (b) the project operations are at least 300 ft beyond a core area periphery; (c) the operations are at least 100 ft (23 m) away from potential habitat trees; and (d) the operations are within the time period of 2 hours after sunrise to 2 hours before sunset, unless harvest is required for a cable corridor and (i) trees are felled away from potential habitat, and (ii) operations are within the time period of 2 hours after sunrise to 2 hours before sunset.

C§10.3.2.3.1-37 Permit vehicular traffic within 300 ft (91 m) of a core area periphery or within 100 ft (23 m) of potential murrelet habitat trees for (a) maintenance and hauling on mainline routes; (b) vehicles on existing seasonal or permanent roads which are 1 ton or less; or (c) all terrain vehicles (ATVs) on existing roads.

C§10.3.2.3.1-38 Permit helicopter operations if they are at least 500 ft from a core area periphery and an MRC survey shows that murrelets are not occupying any area within 500 ft of the helicopter operations.

C§10.3.2.5.1-39 Conduct all maintenance and hauling only within the period from 2 hours after sunrise to 2 hours before sunset.

Murrelet Habitat Recruitment Stands (MHRS)

C§10.3.2.3.2-1 Identify and prioritize MHRS with the wildlife agencies within 2 years of HCP/NCCP approval.

C§10.3.2.3.2-2 Provide at least 2-years notice to the wildlife agencies prior to submitting a PTHP containing or adjacent to an MHRS in order to allow the wildlife agencies to analyze the MHRS and possibly purchase it at a mutually agreed upon price prior to approval of the PTHP.

> **NOTE**
> MRC may at any time identify potential murrelet habitat as a conservation easement and provide the wildlife agencies the opportunity to purchase it. If the wildlife agencies decide to purchase any potential or designated habitat, they may apply silviculture based on stand conditions and on habitat enhancement for murrelets.

C§10.3.2.3.2-3 Prohibit harvest in MHRS during the first 20 years of HCP/NCCP implementation.

Occupied Murrelet Habitat in the Murrelet Habitat Zones (MHZ)

Breeding Season

C§10.3.2.3.10-1 Limit approaches to at least a distance of 0.25 mi (0.4 km) from identified habitat tree(s) unless it involves (a) maintenance or hauling on mainline haul routes, (b) the use of non-mainline roads if they are farther away from an identified habitat tree than the mainline road, (c) use of a vehicle ≤ 1 ton on existing seasonal or permanent roads; or (d) all terrain vehicles (ATVs) on existing trails.

C§10.3.2.3.10-2 Permit prescribed burning within ¼ mile of occupied murrelet stands only with approval of the wildlife agencies.

C§10.3.2.3.10-3 Permit fire control lines for prescribed burning within occupied murrelet stands only with approval of the wildlife agencies.

C§10.3.2.3.10-4 Permit helicopters at least 0.50 mile (0.8 km) from identified habitat trees.

C§10.3.2.3.10-5 Conduct blasting at least 1 mile (1.6 km) from identified habitat trees.

C§10.3.2.3.10-6 Conduct all maintenance and hauling within 0.25 miles of identified habitat trees only from 2 hours after sunrise to 2 hours before sunset.

Non-breeding Season

C§10.3.2.3.10-7 Conduct harvest operations and construction of new roads at least 300 ft (92 m) away from identified habitat trees.

C§10.3.2.3.10-8 Permit helicopters at least 500 ft (152 m) away from identified habitat trees.

C§10.3.2.5.10-9 Conduct all maintenance and hauling within 300 ft (92 m) of identified habitat trees only from 2 hours after sunrise to 2 hours before sunset.

Murrelet Habitat in the Murrelet Habitat Zones (MHZ) - High Protection Areas

Breeding Season

C§10.3.2.3.11-1 Conduct operations defined in Table 10-18 at their prescribed distance from habitat trees.

NOTE
This constraint does not apply to (a) use or maintenance of mainline roads for log hauling or (b) use of non-mainline roads that are farther from the potential habitat trees than a mainline or public road.

C§10.3.2.3.11-2 Conduct operations not defined in Table 10-18 at least 800 ft (244 m) from habitat trees

NOTE
This constraint does not apply to (a) use or maintenance of mainline roads for log hauling or (b) use of non-mainline roads that are farther from the potential habitat trees than a mainline or public road.

C§10.3.2.3.11-3 Permit helicopters at least 0.25 mile (0.40 km) away from potential habitat trees.

C§10.3.2.3.11-4 Conduct blasting at least 1 mile (1.6 km) away from potential habitat trees.

Non-breeding Season

C§10.3.2.3.11-5 Conduct harvests at least 100 ft (30 m) away from potential habitat trees.

NOTE
This constraint does not apply to operations where tree felling is necessary for a cable corridor.

C§10.3.2.3.11-6 Conduct harvests between 100-200 ft (61 m) from habitat trees in accordance with the following silvicultural prescriptions or obtain approval of the wildlife agencies for alternative prescriptions more suitable for a specific stand.

Buffer	Buffer Silvicultural Prescription
100-200 ft (30-60 m)	• $\geq$ 175 ft^2 post-management • 70% post-management canopy closure • No harvesting of existing old-growth or potential murrelet trees

C§10.3.2.3.11-7 Permit helicopters that are at least 300 ft (92 m) away from habitat trees or known Type I or Type II old-growth stands unless they have been surveyed according to currently accepted protocols without murrelet detections.

C§10.3.2.3.11-8 Retain all primary murrelet trees and screen trees.

C§10.3.2.3.11-9 Permit harvest of secondary murrelet trees if a ground survey determines that it is unlikely murrelets are occupying the surrounding area.

NOTE
MRC will not harvest old-growth trees under this provision.

Murrelet Habitat in the Murrelet Habitat Zones (MHZ) - Moderate Protection Areas

Breeding Season

C§10.3.2.3.12-1 Conduct operations defined in Table 10-18 at their prescribed distance from habitat trees.

NOTE
This constraint does not apply to (a) use or maintenance of mainline roads for log hauling or (b) use of non-mainline roads that are farther from the potential habitat trees than a mainline or public road.

C§10.3.2.3.12-2 Conduct operations not defined in Table 10-18 at least 400 ft (153 m) from habitat trees.

NOTE
This constraint does not apply to (a) use or maintenance of mainline roads for log hauling or (b) use of non-mainline roads that are farther from the potential habitat trees than a mainline or public road.

C§10.3.2.3.12-3 Permit helicopters at least 0.25 mile (0.40 km) away from potential habitat trees.

C§10.3.2.3.12-4 Conduct blasting at least 1 mile (1.6 km) away from habitat trees by line of sight and at least 0.5 miles (0.80 km) away by map distance.

Non-breeding Season

C§10.3.2.3.12-5 Conduct harvests at least 75 ft (23 m) away from habitat trees unless tree felling is necessary for a cable corridor

NOTE
This constraint does not apply to operations where tree felling is necessary for a cable corridor. In these cases, MRC will leave all felled trees on the ground and will fell trees away from potential habitat trees. Additionally, MRC will make every reasonable effort to avoid felling trees within 50 ft (15 m) of potential habitat trees.

C§10.3.2.3.12-6 Conduct harvests between 75-200 ft (22-60 m) from habitat trees in accordance with the following silvicultural prescriptions or obtain approval of the wildlife agencies for alternative prescriptions more suitable for a specific stand.

Buffer	Buffer Silvicultural Prescriptions
200 ft (61 m)	• $\geq$ 175 ft^2 post-management basal area • 60% post-management canopy closure • No harvesting of existing old growth or potential murrelet trees

C§10.3.2.3.12-7 Permit helicopters at least 200 ft (61 m) away from habitat trees or known Type I or Type II old growth stands unless they have been surveyed according to currently accepted protocols without murrelet detections.

C§10.3.2.3.12-8 Retain all potential murrelet trees and screen trees.

C§10.3.2.3.12-9 Permit harvest of secondary murrelet trees if a ground survey determines that it is unlikely murrelets are occupying the surrounding area.

NOTE
MRC will not harvest old growth trees under this provision.

Murrelet Habitat in Murrelet Habitat Zones (MHZ) - Limited Protection Areas

Breeding and Non-breeding Seasons

C§10.3.2.3.13-1 Retain all primary murrelet habitat trees.

C§10.3.2.3.13-2 Permit harvest of secondary murrelet trees if a ground survey determines that it is unlikely murrelets are occupying the surrounding area.

Point Arena Mountain Beavers

General

C§10.3.3.3-1 Prohibit timber operations (including felling, yarding, and construction of firelines) in any contiguous habitat area that is within 200 ft of active PAMB burrows or un-surveyed suitable PAMB habitat.

NOTE
Patches of habitat are contiguous only if they are less than 50 ft apart.

C§10.3.3.3-2 Prohibit road construction in any contiguous habitat area that is within 400 ft of active PAMB burrows or un-surveyed suitable PAMB habitat.

C§10.3.3.3-3 Prohibit salvage operations within 100 ft of known existing PAMB burrow systems.

C§10.3.3.3-4 Prohibit foot traffic that might cause burrow collapse within 25 ft of active PAMB burrow systems or un-surveyed potential PAMB habitat.

ALLOWABLE USE
MRC staff may enter the bounds of an active burrow system or un-surveyed potential habitat when surveying for burrows or conducting HCP/NCCP monitoring.

C§10.3.3.3-5 Fell trees away from un-surveyed potential PAMB habitat or active PAMB burrow systems, unless the wildlife agencies approve an alternative treatment within adaptive management.

C§10.3.3.3-6 Construct or reconstruct roads to maintain or enhance hydrologic conditions in the vicinity of PAMB burrow systems.

NOTE
MRC will only modify local hydrology with the approval of the wildlife agencies.

C§10.3.3.3-7 Prohibit construction of permanent barriers, including fences and permanent openings greater than 50 ft (15 m), which might disrupt dispersal or movement between occupied PAMB colonies.

C§10.3.3.3-8 Conduct rodent control, including trapping, at least 500 ft (152.5 m) away from active PAMB burrows or un-surveyed potential PAMB habitat.

C§10.3.3.3-9 Conduct outdoor rodent control within PAMB assessment areas only with individuals approved as PAMB surveyors.

C§10.3.3.3-10 Restrain domestic dogs on a 6-ft leash in areas containing PAMB burrow systems or un-surveyed potential PAMB habitat.

C§10.3.3.3-11 Conduct blasting at least 500 ft (152.5 m) away from an active PAMB burrow or un-surveyed potential PAMB habitat.

C§10.3.3.3-12 Conduct prescribed burning at least 100 ft away from an active PAMB burrow or un-surveyed potential PAMB habitat.

Breeding Season

C§10.3.3.3-13 Conduct the following operations (resulting in severe ground disturbance) at least 500 ft (152.5 m) away from an active PAMB burrow or un-surveyed potential PAMB habitat:

- Use of heavy equipment off roads.
- Tractor yarding.
- Operation of log landings.
- Loading log trucks.
- Use of rock pits.

C§10.3.3.3-14 Conduct the following operations (resulting in above-ground noise and ground vibration) at least 100 ft (30.5 m) from an active PAMB burrow system or un-surveyed potential PAMB habitat:

- Use and maintenance of existing roads for log hauling.
- Chainsaw brushing or thinning of non-commercial trees.
- Felling commercial trees.
- Cable yarding.
- Helicopter yarding.
- Use of motorized vehicles.
- Limbing and bucking.
- Maintenance and re-fueling of heavy equipment.
- Construction or re-construction of roads.

ALLOWABLE USE

MRC may yard logs in un-surveyed potential PAMB habitat and occupied PAMB habitat as long as the logs are fully suspended above the habitat. Yarding must occur between 1 hour after sunrise and 1 hour prior to sunset.

C§10.3.3.3-15 Permit the following operations at all times no matter what the distance from active PAMB burrow systems or un-surveyed potential PAMB habitat:

- Use of mainline roads for log hauling and maintenance of mainline roads as designated by various maps in the HCP/NCCP Atlas.

  NOTE

  Maintenance includes actions necessary to use the roads, e.g., knocking down waterbars, grading, and watering. Maintenance does not include actions considered reconstruction of roads under the California Forest Practice Rules (CDF 2006, 14), such as changing the prism of the road. MRC must retain any trees felled for maintenance in forest adjacent to burrow systems or un-surveyed potential habitat.
- Use of public roads.
- Use and maintenance of MRC roads which are at least the same distance from a current active PAMB burrow as a public road or mainline haul road.
- Use of pickups and ATVs on roads.

Non-breeding Season

C§10.3.3.3-16 Conduct the following operations (resulting in severe ground disturbance) at least 100 ft (30.5 m) away from an active PAMB burrow or un-surveyed potential PAMB habitat:

- Use of heavy equipment off roads.
- Tractor yarding.
- Operation of log landings.
- Loading log trucks.
- Use of rock pits.

ALLOWABLE USE

MRC may schedule these operations within 100 ft (30.5 m) of a known burrow system with prior approval of the wildlife agencies (M§13.9.3.2-2).

C§10.3.3.3-17 Conduct the following operations (resulting in above-ground noise and ground vibration) at least 50 ft from an active PAMB burrow system or un-surveyed potential PAMB habitat:

- Chainsaw brushing or thinning of non-commercial trees.
- Felling commercial trees.
- Cable yarding.
- Helicopter yarding.
- Use of motorized vehicles.
- Limbing and bucking.
- Maintenance and re-fueling of heavy equipment.
- Construction or re-construction of roads.

ALLOWABLE USE

MRC may yard logs in un-surveyed potential PAMB habitat and occupied PAMB habitat as long as the logs are fully suspended above the habitat. Yarding must occur between 1 hour after sunrise and 1 hour prior to sunset.

C§10.3.3.3-18 Permit the following operations at all times no matter what the distance from active PAMB burrow systems or un-surveyed potential PAMB habitat:

- Use of mainline roads for log hauling and maintenance of mainline roads as designated by various maps in the HCP/NCCP Atlas.

  NOTE

  Maintenance includes actions necessary to use the roads, e.g., knocking down waterbars, grading, and watering. Maintenance does not include actions considered reconstruction of roads under the California Forest Practice Rules (CDF 2006, 14), such as changing the prism of the road. MRC must retain any trees felled for maintenance in forest adjacent to burrow systems or un-surveyed potential habitat.
- Use of public roads.
- Use and maintenance of MRC roads which are at least the same distance from a current active PAMB burrow as a public road or mainline haul road.
- Use of pickups and ATVs on roads.

W.4 Summary of Conservation Measures for Rare Plants

Covered Rare Plants	
Management Category 1	
Communications	
C§11.7.1-1	Instruct all field personnel working in the vicinity of covered species occurrences, particularly operators of heavy equipment and those who apply pesticides, to comply with conservation measures, especially in locations with activity restrictions for core occurrence areas and buffers.
Core Occurrence Area	
C§11.7.1-2	Install a marking system that will persist throughout the term of the HCP/NCCP to designate environmentally sensitive areas along roads, such as core occurrences areas.
C§11.7.1-3	Mark the boundaries of a core occurrence area at regular intervals with painted t-posts, with stakes and colored flags, with clearly visible marks on retained trees, or with other means, so that the occurrence boundary maintains its integrity and is easily identifiable during activity and monitoring periods.
C§11.7.1-4	Mark the outer limits of the core occurrence area at least 5 ft beyond any visible parts (e.g., branches, surface roots) of a covered rare plant; use GPS data, as required, to define the core occurrence and ensure relocation if markers are damaged or removed.
C§11.7.1-5	Mark groups of plants within a core occurrence area, using methods described above, to facilitate avoidance and monitoring.
C§11.7.1-6	Restrict operations to use of existing truck roads, landings, and rock pits, as well as any activities intended to conserve rare plants, such as weed control.
C§11.7.1-7	Avoid all activities, including those outside the core occurrence and buffer areas, which result in significant alterations in surface water hydrologic conditions within the core occurrence area and adversely affect covered rare plants.
C§11.7.1-8	Fell trees, only for safety purposes, into a core occurrence area but do not harvest them. **NOTE** If this need arises, MRC will notify the wildlife agencies before felling occurs. The wildlife agencies have 15 working days to respond before MRC can proceed with the planned felling operations.
C§11.7.1-9	Avoid using site preparation within designated core areas unless the wildlife agencies concur.
C§11.7.1-10	Avoid piling slash within designated core areas.
Buffer Width	
C§11.7.1-11	Ensure that the buffer width is 150 ft for forested sites (subject to timber harvest and other covered activities) and 50 ft for all other sites. **NOTE** MRC can reduce the buffer width—while still providing adequate protection—because of factors such as topographic characteristics (e.g., north slope situation); silvicultural practices (e.g., single tree selection); or adjacent stand conditions (e.g., uneven-aged management). Such reduction requires MRC to obtain the approval of the wildlife agencies.

C§11.7.1-12	Mark the outer edge of the buffer area with colored flagging or its equivalent, before covered activities begin; flagging must be clearly visible throughout the period when covered activities are taking place.
Buffer Management during Timber Operations	
C§11.7.1-13	Use only non-ground-disturbing types of site preparation (e.g., chainsaw brush cutting).
C§11.7.1-14	Use silviculture that results in cover approximately equivalent to that found in the core occurrence area with the harvest at least meeting the basal area and canopy requirements (derived from Class I and Large Class II AMZ, inner and middle bands). **NOTE** MRC will obtain the approval of the wildlife agencies on exceptions for early successional species and others that prefer open conditions.
C§11.7.1-15	Retain the approximate spatial and species mix and size distribution of tree species (conifers and hardwoods) found in the local area.
C§11.7.1-16	Fell trees away from a core occurrence area, whenever possible.
C§11.7.1-17	Treat the buffer area as an ELZ, allowing for use of existing roads, landings, and rock pits.
C§11.7.1-18	Avoid significantly altering surface water hydrologic conditions in ways that could adversely affect covered rare plants.
Invasive Pest Plant Management	
C§11.7.1-19	Control invasive pest plants within 50 ft of all covered rare plant individuals, using methods that are feasible and effective, and that minimize impacts to non-target species, during both the 1st and 2nd years following covered activities.
Take Provisions	
C§11.7.1-20	Avoid or minimize take to the maximum degree feasible.
C§11.7.1-21	Permit take only if required for normal operations.
C§11.7.1-22	Permit take only for occurrences > 250 individuals, except for roads, landings, and rock pits (see below).
C§11.7.1-23	Describe in project documents (e.g., PTHPs) the amount of take anticipated from covered activities.
C§11.7.1-24	Restrict activities causing take to the period between seed set and the breaking of dormancy, if feasible.
C§11.7.1-25	Consult with the wildlife agencies, if normal operations require higher take limits than those specified in C§11.7.1-26 and C§11.7.1-29.
Take for Roads, Landings, and Rock Pits	

C§11.7.1-26 Permit take of covered rare plant individuals growing in previously established roads, landings, and rock pits, if avoidance is infeasible, and adhere to the following limits:

- For occurrences < 250 individuals, take of up to 2% of the individuals within a single occurrence, per each single- or multiple-year project.
- For occurrences of 251-500 individuals, take of up to 5% of the individuals within a single occurrence, per each single- or multiple-year project.
- For occurrences > 500 individuals, take of up to 10% of the individuals within a single occurrence, per each single- or multiple-year project.

NOTE
Feasible minimization includes: (1) minimizing grading of roadbed and roadsides; (2) running logging trucks and other equipment in tire tracks only; (3) enforcing seasonal restrictions; and (4) applying other restrictions.

C§11.7.1-27 Spread soil from road berms (which need to be removed for proper road drainage and on which rare plants are growing) in roadside areas that MRC will manage as EEZs for a minimum of 2 years.

NOTE
If these sites are not colonized by rare plants within 2 years, MRC will remove EEZ restrictions. If these sites are colonized by rare plants within 2 years, MRC will continue to manage them as EEZs as long as the rare plants persist in those locations.

C§11.7.1-28 Donate, for scientific purposes and whenever possible, any rare plant that is incidentally taken and not used in translocation; this includes collecting and preserving voucher specimens, as well as salvaging live plants and seeds for researchers, seed banks, or botanic gardens.

NOTE
If MRC gets no willing takers for a specific species, we will advise the wildlife agencies and no longer make donations of that species unless the wildlife agencies identify a recipient.

Take for All Other Covered Activities

C§11.7.1-29 Permit take, in the case of occurrences > 250 individuals, as follows:

- Take of up to 2% of the individuals within a single occurrence, per stand entry, for PTHPs.
- Take of up to 2% of the individuals within a single occurrence, per year, for other activities, without approval of the wildlife agencies.

Variances

C§11.7.1-30 Seek approval in writing from the wildlife agencies if requesting changes to core area management, buffer management, or buffer width; include the variances in a PTHP subject to public comment.

C§11.7.1-31 Ensure that requested variances are consistent with the objectives of the conservation strategy.

Translocation

Non-compensatory

C§11.7.1-32 Notify the wildlife agencies when MRC will perform a non-compensatory translocation.

C§11.7.1-33 Mark and map the location of the translocation in the field.

C§11.7.1-34 Describe in writing the result of the translocation for the wildlife agencies.

Covered Rare Plants	
Compensatory translocation	
C§11.7.1-35	Obtain approval from the wildlife agencies before implementing.
C§11.7.1-36	Mark and map the location of the translocation in the field.
C§11.7.1-37	Provide thorough written documentation of methods, results, and conclusions for the wildlife agencies.
Management Category 2	
Communications	
C§11.7.2-1	Instruct all field personnel working in the vicinity of covered species occurrences, particularly operators of heavy equipment and those who apply pesticides, about complying with conservation measures, especially in locations with activity restrictions for core occurrence areas and buffers.
Core Occurrence Area	
C§11.7.2-2	Install a marking system along roads to designate environmentally sensitive areas, such as core occurrences areas; ensure the system persists throughout the period when the HCP/NCCP is in effect.
C§11.7.2-3	Mark the boundaries of a core occurrence area at regular intervals with painted t-posts, with stakes and colored flags, with clearly visible marks on retained trees, or with other means, so that the occurrence boundary maintains its integrity and is easily identifiable during activity and monitoring periods.
C§11.7.2-4	Mark the outer limits of the core occurrence area at least 5 ft beyond any visible parts (e.g., branches, surface roots) of a covered rare plant; use GPS data, as required, to define the core occurrence and ensure relocation if markers are damaged or removed.
C§11.7.2-5	Mark groups of plants within a core occurrence area, using methods described in C§11.7.2-4, to facilitate avoidance and monitoring.
C§11.7.2-6	Avoid using site preparation within designated core areas unless the wildlife agencies concur.
C§11.7.2-7	Avoid piling slash within designated core areas.
Buffer Width	
C§11.7.2-8	Ensure that the buffer width is 50 ft. **NOTE** MRC can reduce the buffer width—if still providing adequate protection—because of factors such as topographic characteristics (e.g., north slope situation); silvicultural practices (e.g., single tree selection); or adjacent stand conditions (e.g., uneven-aged management). Such reduction requires approval of the wildlife agencies.
C§11.7.2-9	Mark the outer edge of the buffer area with colored flagging or its equivalent before covered activities begin; flagging must be clearly visible throughout the period when covered activities are taking place.
Core Area Management during Timber Operations	
C§11.7.2-10	Ensure that post-harvest stands meet the basal area and canopy requirements of the inner and middle bands of Class I and Large Class II AMZs. **NOTE** MRC will obtain approval of the wildlife agencies on early successional species and others that prefer open conditions.

C§11.7.2-11	Retain the approximate distribution of conifers and hardwoods found in the core occurrence area.
C§11.7.2-12	Fell trees away from the core occurrence area, whenever possible.
C§11.7.2-13	Treat a core occurrence area as an ELZ, allowing for use of existing roads, landings, and rock pits.
C§11.7.2-14	Avoid significantly altering surface water hydrologic conditions in ways that could adversely affect covered rare plants.
Buffer Management during Timber Operations	
C§11.7.2-15	Ensure that post-harvest stands meet the basal area and canopy requirements of the inner and middle bands of Class I and Large Class II AMZs. **NOTE** MRC will obtain approval of the wildlife agencies on early successional species and others that prefer open conditions.
C§11.7.2-16	Retain the approximate distribution of trees (conifers and hardwoods) found in the local area.
C§11.7.2-17	Fell trees away from a core occurrence area, whenever possible.
C§11.7.2-18	Treat the buffer area as an ELZ, allowing for use of existing roads, landings, and rock pits.
C§11.7.2-19	Avoid significantly altering surface water hydrologic conditions in ways that could adversely affect covered rare plants.
C§11.7.2-20	Prepare sites without creating ground disturbances.
Invasive Pest Plant Management	
C§11.7.2-21	Control invasive pest plants within 50 ft of all covered rare plant individuals, using methods that are feasible and effective, and that minimize impacts to non-target species, during both the 1st and 2nd years following covered activities.
Take Provisions	
C§11.7.2-23	Permit take only if required for normal operations.
C§11.7.2-24	Permit take only for occurrences > 250 individuals, [14] except for roads, landings, and rock pits (see C§11.7.2-28).
C§11.7.2-25	Describe in project documents (e.g., PTHPs) the amount of take anticipated from covered activities.
C§11.7.2-26	Restrict activities causing take to the period between seed set and the breaking of dormancy, if feasible.
C§11.7.2-27	Consult with the wildlife agencies, if normal operations require higher take limits than those specified in C§11.7.2-28 and C§11.7.2-31.
Take for Roads, Landings, and Rock Pits	

C§11.7.2-28 Permit take of covered rare plant individuals growing in previously established roads, landings, and rock pits, if avoidance is infeasible, and adhere to the following limits:

- For occurrences < 250 individuals, take of up to 5% of the individuals within a single occurrence, per each single- or multiple-year project.
- For occurrences > 250 individuals, take of up to 10% of the individuals within a single occurrence, per each single- or multiple-year project.

NOTE
Feasible minimization includes: (1) minimizing grading of roadbed and roadsides; (2) running logging trucks and other equipment in tire tracks only; (3) enforcing seasonal restrictions; and (4) applying other restrictions

C§11.7.2-29 Spread soil from road berms (which need to be removed for proper road drainage and on which rare plants are growing) in roadside areas that MRC will manage as EEZs for a minimum of 2 years.

NOTE
If these sites are not colonized by rare plants within 2 years, MRC will remove EEZ restrictions. If these sites are colonized by rare plants within 2 years, MRC will continue to manage them as EEZs as long as the rare plants persist in those locations

C§11.7.2-30 Donate, for scientific purposes and whenever possible, any rare plant that is incidentally taken and not used in translocation; this includes collecting and preserving voucher specimens, and salvaging live plants and seeds for researchers, seed banks, or botanic gardens.

NOTE
If MRC gets no willing takers for a specific species, we will advise the wildlife agencies and no longer make donations of that species unless the wildlife agencies identify a recipient.

Take for All Other Activities

C§11.7.2-31 Permit take, in the case of occurrences > 250 individuals, as follows:

- Take of up to 5% of the individuals within a single occurrence, per stand entry, for PTHPs.
- Take of up to 5% of the individuals within a single occurrence, per year, for other activities, without approval of the wildlife agencies.

Variances

C§11.7.2-32 Seek approval in writing from the wildlife agencies if requesting changes to core area management, buffer management, or buffer width; include the variances in a PTHP subject to public comment.

C§11.7.2-33 Ensure that requested variances are consistent with the objectives of the conservation strategy.

Translocation

Non-compensatory

C§11.7.2-34 Notify the wildlife agencies when MRC will perform a non-compensatory translocation.

C§11.7.2-35 Mark and map the location of the translocation in the field.

C§11.7.2-36 Describe in writing the result of the translocation for the wildlife agencies.

Compensatory translocation

C§11.7.2-37 Obtain approval from the wildlife agencies before implementing.

C§11.7.2-38	Mark and map the location of the translocation in the field.
C§11.7.2-39	Provide thorough written documentation of methods, results, and conclusions for the wildlife agencies.
Management Category 3	
Communications	
C§11.7.3-1	Instruct all field personnel working in the vicinity of covered species occurrences, particularly operators of heavy equipment and those who apply pesticides, about complying with conservation measures, especially in locations with activity restrictions for core occurrence areas and buffers.
Core Occurrence Area	
C§11.7.3-2	Mark the boundaries of a core occurrence area at regular intervals with painted t-posts, with stakes and colored flags, with clearly visible marks on retained trees, or with other means, so that the occurrence boundary maintains its integrity and is easily identifiable during activity and monitoring periods.
C§11.7.3-3	Mark the outer limits of the core occurrence area at least 5 ft beyond any visible parts (e.g., branches, surface roots) of a covered rare plant; use GPS data, as required, to define the core occurrence and ensure relocation if markers are damaged or removed.
C§11.7.3-4	Limit losses of individual covered rare plants as feasible.
C§11.7.3-5	Treat a core occurrence area as an ELZ, allowing for use of existing roads, landings, and rock pits.
C§11.7.3-6	Minimize significant alterations to surface water hydrologic conditions that could adversely affect covered rare plants.
C§11.7.3-7	Minimize disturbance from site preparation and slash piles.
Buffer Width	
C§11.7.3-8	Ensure that the buffer width is 50 ft. **NOTE** MRC can reduce the buffer width—if still providing adequate protection—because of factors such as topographic characteristics (e.g., north slope situation); silvicultural practices (e.g., single tree selection); or adjacent stand conditions (e.g., uneven-aged management). Such reduction requires approval of the wildlife agencies.
C§11.7.3-9	Mark the outer edge of the buffer area with colored flagging or its equivalent, before covered activities begin; flagging must be clearly visible throughout the period when covered activities are taking place.
Core Management during Timber Operations	
C§11.7.3-10	Fell trees away from the core occurrence area, whenever possible.
C§11.7.3-11	Minimize direct impacts, where feasible, by felling trees away from plants and by not skidding on plants.
Buffer Management during Timber Operations	
C§11.7.3-12	Fell trees away from a core occurrence area.
C§11.7.3-13	Treat the buffer area as an ELZ.
C§11.7.3-14	Minimize significant alterations to surface water hydrologic conditions that could adversely affect covered rare plants.
Invasive Pest Plant Management	
C§11.7.3-15	Control invasive pest plants within 25 ft of all covered rare plant individuals, using methods that are feasible and effective and that minimize impacts to non-target species, during the first year following covered activities.
Take Provisions	

C§11.7.3-16	Avoid or minimize take to the maximum degree feasible.
C§11.7.3-17	Permit take only if required for normal operations.
C§11.7.3-18	Permit take only for occurrences > 250 individuals, except for roads, landings, and rock pits (see C§11.7.3-22).
C§11.7.3-19	Describe in project documents (e.g., PTHPs) the amount of take anticipated from covered activities.
C§11.7.3-20	Restrict activities causing take to the period between seed set and the breaking of dormancy, if feasible.
C§11.7.3-21	Consult with the wildlife agencies, if normal operations require higher take limits than those specified in C§11.7.3-25.
Take for Roads, Landings, and Rock Pits	
C§11.7.3-22	Permit take of covered rare plant individuals growing in previously established roads, landings, and rock pits, if avoidance is infeasible. **NOTE** Feasible avoidance includes: (1) minimizing grading of roadbed and roadsides; (2) running logging trucks and other equipment in tire tracks only; and (3) other feasible restrictions.
C§11.7.3-23	Spread soil from road berms (which need to be removed for proper road drainage and on which rare plants are growing) in roadside areas that MRC will manage as EEZs for a minimum of 2 years. **NOTE** If these sites are not colonized by rare plants within 2 years, MRC will remove EEZ restrictions. If these sites are colonized by rare plants within 2 years, MRC will continue to manage them as EEZs as long as the rare plants persist in those locations.
C§11.7.3-24	Donate, for scientific purposes and whenever possible, any rare plant that is incidentally taken and not used in translocation; this includes collecting and preserving voucher specimens, and salvaging live plants and seeds for researchers, seed banks, or botanic gardens. **NOTE** If MRC gets no willing takers for a specific species, we will advise the wildlife agencies and no longer make donations of that species unless the wildlife agencies identify a recipient.
Take for All Other Covered Activities	
C§11.7.3-25	Permit take, in the case of occurrences > 250 individuals, as follows: ▪ Take of up to 10% of the individuals within a single occurrence, per stand entry, for PTHPs. ▪ Take of up to 10% of the individuals within a single occurrence, per year, for other activities, without approval of the wildlife agencies.
Variances	
C§11.7.3-26	Seek approval in writing from the wildlife agencies if requesting changes to core area management, buffer management, or buffer width; include the variances in a PTHP subject to public comment.
C§11.7.3-27	Ensure that requested variances are consistent with the objectives of the conservation strategy.
Translocation	
Non-compensatory	

C§11.7.3-28	Notify the wildlife agencies when MRC will perform a non-compensatory translocation.
C§11.7.3-29	Mark and map the location of the translocation in the field.
C§11.7.3-30	Describe in writing the result of the translocation for the wildlife agencies.
Compensatory translocation	
C§11.7.3-31	Obtain approval from the wildlife agencies before implementing.
C§11.7.3-32	Mark and map the location of the translocation in the field.
C§11.7.3-33	Provide thorough written documentation of methods, results, and conclusions for the wildlife agencies.
Standard Conservation Measures for Management Category 4	
Communications	
C§11.7.4-1	Instruct all field personnel working in the vicinity of covered species occurrences, particularly operators of heavy equipment and those who apply pesticides, to comply with conservation measures.
Core Occurrence Area	
C§11.7.4-2	Mark the boundaries of a core occurrence area at regular intervals with painted t-posts, with stakes and colored flags, with clearly visible marks on retained trees, or with other means, so that the occurrence boundary maintains its integrity and is easily identifiable during activity and monitoring periods.
C§11.7.4-3	Mark the outer limits of the core occurrence area at least 5 ft beyond any visible parts (e.g., branches, surface roots) of a covered rare plant; use GPS data, as required, to define the core occurrence and ensure relocation if markers are damaged or removed.
C§11.7.4-4	Avoid impacts to individual covered rare plants to the degree necessary to meet conservation objectives.
Limits of Take	
C§11.7.4-5	Ensure that the number of individuals lost through incidental take is low enough so that a covered rare plant species qualifies for its current S rank or a higher S rank.
Longbeard Lichen	
C§11.8.1-1	Train foresters and rare plant surveyors in the field to recognize pendant lichens that may be long-beard lichen.
C§11.8.1-2	Search for, identify, and document long-beard lichen source and sink trees during rare plant surveys in PTHP areas.
C§11.8.1-3	Protect up to 10 source trees in any PTHP area. **EXAMPLES** • If the PTHP area has 7 source trees, MRC will protect all 7. • If the PTHP area has 25 source trees, MRC will protect 10 of the 25.
C§11.8.1-4	Prevent the cutting or trimming of protected sources trees, except to ensure the safety of workers.
C§11.8.1-5	Maintain screen trees in the vicinity of source trees to buffer them from wind-throw and other threats and to provide an opportunity for the dispersal of long-beard lichen. **NOTE** If feasible, MRC will select screen trees that are within the dispersal range for long-beard lichen, i.e., < 16 ft (5 m) from a source tree, and whose retention will not cause source trees to be heavily shaded.

C§11.8.1-6	Protect old-growth trees and snags and limit harvest in AMZs to provide potential habitat for new occurrences of long-beard lichen.
C§11.8.1-7	Test lichen samples, whenever possible, to determine their identity, using tests recommended by lichenologists.
C§11.8.1-8	Monitor for the presence or absence of long-beard lichen throughout the term of the HCP/NCCP during preparatory fieldwork for PTHP submissions.
Humboldt Milk-vetch	
Communications	
C§11.8.2-1	Instruct all field personnel working in the vicinity of covered species occurrences, particularly operators of heavy equipment and those who apply pesticides, about complying with conservation measures, especially in locations with activity restrictions for core occurrence areas and buffers.
Core Occurrence Area	
C§11.8.2-2	Mark the boundaries of a core occurrence area at regular intervals with painted t-posts, with stakes and colored flags, with clearly visible marks on retained trees, or with other means, so that the occurrence boundary maintains its integrity and is easily identifiable during activity and monitoring periods.
C§11.8.2-3	Mark the outer limits of the core occurrence area at least 5 ft beyond any visible parts (e.g., branches, surface roots) of a covered rare plant; use GPS data, as required, to define the core occurrence and ensure relocation if markers are damaged or removed.
C§11.8.2-4	Mark groups of plants within a core occurrence area, using methods described above, to facilitate avoidance and monitoring.
C§11.8.2-5	Avoid using site preparation within designated core areas unless the wildlife agencies concur.
C§11.8.2-6	Avoid piling slash within designated core areas.
Core Management during Timber Operations	
C§11.8.2-7	Fell trees away from core occurrence areas, whenever possible, in order to create the least direct disturbance to individual plants.
C§11.8.2-8	Establish an ELZ within a 25 ft radius of a core occurrence area's periphery.
C§11.8.2-9	Allow the use of existing roads, skid trails, landings, and rock pits within the ELZ surrounding the core occurrence area.
C§11.8.2-10	Limit road maintenance within the ELZ to grading of running surfaces and creation of drainage structures as specified in Chapter 8, Appendix E, or the Forest Practice Rules.
C§11.8.2-11	Transport spoils from the ELZ no farther than 100 ft from the plant population unless safety or operational needs require otherwise.
C§11.8.2-12	Deposit spoils from the ELZ preferably on the outside edge of the road where impacts from traffic and grading are limited or, if necessary, across the road surface or on a turnout or landing.
C§11.8.2-13	Permit roadside brushing and road day-lighting within the ELZ.
C§11.8.2-14	Conduct road maintenance and other covered activities, if feasible, between seed-set in the fall and breaking of dormancy in the spring.
C§11.8.2-15	Do not allow direct ignition or pile burning within the ELZ unless the wildlife agencies concur.
C§11.8.2-16	Do not plant trees within a designated core area.

C§11.8.2-17	Avoid significantly altering surface water hydrologic conditions in ways that could adversely affect covered rare plants.
Invasive Pest Plant Management	
C§11.8.2-18	Control invasive pest plants within 100 ft of a designated core area, using methods that are feasible and effective and that minimize impacts to non-target species, during both the 1st and 2nd years following covered activities.
Take Provisions	
C§11.8.2-19	Avoid or minimize take to the maximum degree feasible.
C§11.8.2-20	Permit take only if required for normal operations.
C§11.8.2-21	Describe in project documents (e.g., PTHPs) the amount of take anticipated from covered activities.
C§11.8.2-22	Restrict activities causing take to the period between seed set and the breaking of dormancy, if feasible.
C§11.8.2-23	Consult with the wildlife agencies, if normal operations require higher take limits than those specified in C§11.8.2-24 and C§11.8.2-28.
Take for Roads, Landings, and Rock Pits	
C§11.8.2-24	Permit take of Humboldt milk-vetch individuals growing in previously established roads, landings, and rock pits, if avoidance is infeasible, and adhere to the following limits: ▪ For occurrences > 100 reproductive individuals, take of up to 15% of the individuals within a single occurrence, per each single- or multiple-year project. ▪ For occurrences < 100 reproductive individuals, take of up to 10% of the individuals within a single occurrence, per each single- or multiple-year project. **NOTE** Feasible avoidance includes: (1) minimizing grading of roadbed and roadsides; (2) running logging trucks and other equipment in tire tracks only; and (3) other feasible restrictions.
C§11.8.2-25	Seek approval of the wildlife agencies prior to commencement of operations if anticipated take exceeds permitted levels.
C§11.8.2-26	Spread soil from road berms (which need to be removed for proper road drainage and on which rare plants are growing) in roadside areas that MRC will manage as EEZs for a minimum of 2 years. **NOTE** If these sites are not colonized by rare plants within 2 years, MRC will remove EEZ restrictions. If these sites are colonized by rare plants within 2 years, MRC will continue to manage them as EEZs as long as the rare plants persist in those locations.
C§11.8.2-27	Donate, for scientific purposes and whenever possible, a sampling of Humboldt milk-vetch that is incidentally taken and not used in translocation; this includes collecting and preserving voucher specimens, and salvaging live plants and seeds for researchers, seed banks, or botanic gardens. **NOTE** If MRC gets no willing takers for a specific species, we will advise the wildlife agencies and no longer make donations of that species unless the wildlife agencies identify a recipient.
Take for All Other Covered Activities	

C§11.8.2-28	Permit take, in the case of occurrences > 100 reproductive individuals, as follows: ▪ Take of up to 5% of the individuals within a single occurrence, per stand entry, for PTHPs. ▪ Take of up to 5% of the individuals within a single occurrence, per year, for other activities, without approval of the wildlife agencies.
Variances	
C§11.8.2-29	Seek approval in writing from the wildlife agencies if requesting changes to core area management, buffer management, or buffer width; include the variances in a PTHP subject to public comment.
C§11.8.2-30	Ensure that requested variances are consistent with the objectives of the conservation strategy.
Translocation	
Non-compensatory	
C§11.8.2-31	Notify the wildlife agencies when MRC will perform a non-compensatory translocation.
C§11.8.2-32	Mark and map the location of the translocation in the field.
C§11.8.2-33	Describe in writing the result of the translocation for the wildlife agencies.
Compensatory translocation	
C§11.8.2-34	Obtain approval from the wildlife agencies before implementing.
C§11.8.2-35	Mark and map the location of the translocation in the field.
C§11.8.2-36	Provide thorough written documentation of methods, results, and conclusions for the wildlife agencies.

Appendix X

Pathogen Transfer

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X. PATHOGEN TRANSFER

MRC recognizes that there is potential for research and monitoring to increase the transmission of pathogens. We have considered strategies to reduce or decrease these risks. Below are some of these strategies—primarily formulated for aquatic pathogens, but potentially applicable to terrestrial pathogens as well.

X.1 General Practices

- MRC will develop a hierarchy of risk for specific sites using both the conservation status of species and the status of chytridiomycosis, ranaviral disease, whirling disease and other pathogens discovered at the sites.
- MRC will use this hierarchy of risk to
  - Minimize the possibility of spreading pathogens.
  - Minimize the impact severity of an introduced pathogen.
- MRC will (if feasible) sequence work to proceed
  - From sites in which there is low prevalence and density of pathogens to sites of higher prevalence and density (i.e., minimize potential for spread).
  - From sites with high conservation status to sites with lesser conservation status (i.e., minimize impact on amphibian and fish population).
  - From upstream transects to downstream transects, when working in river systems.
- MRC will not move amphibians and fish between sites.

X.2 Site Definition

A site is a location or place where the proximity of individual amphibians and fish is such that transmission of pathogens is likely. Site definition depends on the particular pathogen and physical characteristics of the location:

- Within river systems, separate watersheds constitute separate sites.[1]
- Within isolated water bodies, such as lakes, ponds and dams, separate water bodies constitute separate sites.

X.3 Site Procedures

MRC will strive to prevent researchers from introducing pathogens into any site, even if pathogens are already present at that site. When working at a site or between 2 or more sites, we will carry out disinfection procedures to kill all pathogens on personnel and their equipment.

X.3.1 Disinfection and disposal

MRC will instruct aquatic researchers in the following standard procedures:

1. Wash equipment in water to remove any visible organic debris.
2. Wear disposable latex gloves throughout the entire disinfection procedure.
3. Apply an effective disinfectant, such as 10% solution of household chlorine bleach, to all equipment for 10 minutes—by spray, immersion, or wipes.
4. Dry equipment, if possible, between sites; drying alone for 3 hours will kill *B. dendrobatidis*, but not ranaviruses or whirling disease.
5. Dispose of disinfection materials, including used wipes and latex gloves, in plastic bags.
6. Flush any immersion solution down a toilet.

[1] A watershed is a biologically-based scale.

7. Store unused disinfection solution in a sealed container for recycling.

Appendix Y

Termination Mitigation

Contents

Y. Termination Mitigation **1**

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Y. TERMINATION MITIGATION

The *Implementing Agreement* (Appendix A) details, in legalese, the mitigation that will take effect if MRC terminates the HCP/NCCP before its full 80-year term. In Appendix Y, we have provided a basic statement of these mitigation measures by category.

Y.1 AMZ Stands

If MRC terminates the HCP/NCCP before the end of its 80-year term, we may not harvest an AMZ stand previously harvested under the HCP/NCCP until it meets its harvest trigger specified in the conservation measures. Once such an AMZ stand does meet its harvest trigger, post termination mitigation for that specific stand is complete. This requirement does not apply to AMZ stands which were never harvested while our HCP/NCCP permit was in effect.

Example 1
An AMZ stand in the inner band of a Site Class I timberland has a basal area of 340 ft^2/ac. In 2015, an MRC harvest reduces the basal area to 280 ft^2/ac. MRC terminates the HCP/NCCP in 2020. On a 20-year rotation, MRC would normally not harvest this particular stand again until at least 2035. However, if in 2025 the basal area of the specified AMZ stand has rebounded to 300 ft^2/ac, which is the pre-harvest condition (C§8.2.3.1.3-1), MRC, under the terms of mitigation, can harvest the AMZ stand in 2025.

Example 2
An AMZ stand in the middle band of a Site Class II timberland has a basal area of 280 ft^2/ac. In 2015, an MRC harvest reduces the basal area to 225 ft^2/ac. MRC terminates the HCP/NCCP in 2020. On a 20-year rotation, MRC would normally plan to harvest this particular stand again in 2035. In 2035, however, the basal area of the AMZ stand is only 240 ft^2/ac. MRC still cannot harvest the stand, under the terms of mitigation, until it rebounds to 260 ft^2/ac (C§8.2.3.1.3-2).

	Conservation Measures for Basal Area Retention Inner and Middle Bands Class I and Large Class II AMZ
Pre-harvest condition: ≥ 300 ft^2/ac of conifer basal area	
C§8.2.3.1.3-1	Retain in Site Class I, **post harvest**, 240 ft^2/ac or 75% of the pre-harvest basal area, whichever is greater.
Pre-harvest condition: ≥ 260 ft^2/ac of conifer basal area	
C§8.2.3.1.3-2	Retain in Site Class II or III, **post harvest**, 200 ft^2/ac or 75% of the pre-harvest basal area, whichever is greater.

Y.2 5% Alternative

The limits of the 5% alternative as stated in section 8.3.4 will remain in effect no more than 10 years after termination of the MRC permit.

Y.3 Roads

If MRC terminates their permit during the first 30 years of the HCP/NCCP, they will remain responsible for treating all controllable erosion sites designated high priority only if the sites are

(1) on roads used by MRC for harvest operations while the permit was in force and (2) identified in the initial MRC road inventory. MRC will treat such sites within 10 years of permit termination. Once this treatment is complete, post-termination mitigation ceases. Post-termination mitigation does not apply to Masonite Road, which is subject to a different time-frame for upgrades; this is covered in an agreement between MRC and the North Coast Regional Water Quality Control Board (NCRWQCB).

Y.4 Snags, Wildlife Trees, and Recruitment Trees

After termination of our permit, MRC will retain snags, wildlife trees, and recruitment trees in a stand for a period of 20 years since the last harvest of that stand.

Y.5 Northern Spotted Owls

Y.5.1 Post termination mitigation measures

Relative to the take-avoidance standards in 2008[1], there are 3 scenarios in which take of northern spotted owls could occur during the term of the HCP/NCCP:

1. Operations within 0.7 miles of an activity center with limited protection result in a reduction of suitable habitat below 500 ac.
2. Harvest within 1000 ft of an activity center with limited protection takes place during the breeding season.
3. Harvest within 500 ft of an activity center with limited protection takes place outside the breeding season.

In each of these cases, MRC biologists will monitor the occupancy, pair status, and reproductive outcomes of the spotted owl territories for at least 5 years following take. If for at least 3 of those 5 years a northern spotted owl occupies any area within 0.5 miles of the activity center where take occurred, the wildlife agencies will not require post-termination mitigation for that territory.

Y.5.2 Post-termination mitigation based on time periods

TERMINATION DURING 2011-2030

1. For operations within 0.7 miles of an activity center with limited protection that either reduce suitable habitat below 500 ac or commence with suitable habitat below 500 ac:
    a. MRC will include in the annual report on northern spotted owls our data on the amount of pre- and post-harvest acres within 0.7 miles of the activity center.
    b. MRC will assess all areas for current habitat acreage:
        - If there are more than 500 ac of suitable habitat, MRC will retain at least 500 ac of habitat for 5 years following termination.
        - If there are less than 500 ac of suitable habitat prior to harvest, MRC will
            - Map all stands within 0.7 miles of the activity center that were suitable habitat prior to harvest.
            - Restrict harvest in those stands until they grow suitable habitat.
            - Continue harvest restrictions for 5 additional years once suitable habitat has been established.
2. For operations that harvest within 1000 ft of an activity center with limited protection during breeding season or within 500 ft of such an activity center during any other time:

[1] A letter sent by USFWS to Bill Snyder of CAL FIRE on February 1, 2008 describes take-avoidance requirements for northern spotted owls in timber harvest plans (THPs).

a. MRC will include in the annual report on northern spotted owls our data on the amount of nesting/roosting and foraging habitat within 500 ft or 1000 ft of the activity center both pre- and post-harvest.
b. MRC will map any stands that were reduced to foraging or unsuitable habitat as a result of harvest:
    - If the stands have grown habitat equivalent to the habitat that existed prior to the operations, MRC will maintain that habitat for 5 years following termination.
    - If the stands have not grown habitat equivalent to the habitat that existed prior to the operations, MRC will wait until they do so and then maintain that habitat for an additional 5 years.

TERMINATION DURING 2031-2070

- If MRC is meeting both the population and distribution objective for this time period and the habitat objective, no mitigation is required.
- If MRC is not meeting either the population and distribution objective or the habitat objective for this time period, we will follow the mitigation terms detailed for Years 2011-2030.

TERMINATION DURING 2071-2091

- If MRC is meeting both the population and distribution objective for this time period as well as the habitat objective, no mitigation is required.
- If MRC is not meeting (a) either the population or distribution objective or (b) the habitat objective for this time period, we will follow the mitigation terms detailed for Years 2011-2030.

Y.6 LACMA

MRC will maintain LACMA core areas plus connective acreage (i.e., approximately 200-300 ac) for at least 60 years from the issuance of our permit. Currently 6 areas of approximately 228 ac are potential murrelet conservation areas. If any additional acres become occupied by murrelets prior to termination of the plan, MRC will retain a maximum of 200 of these acres for at least 60 years from the issuance of our permit.

Appendix Z

Coho Recovery Strategies

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Z. COHO RECOVERY STRATEGIES

Z.1 Selecting Coho Core Watersheds for Road Restoration

According to estimates, only 1% of wild populations of native coho salmon remain in California streams. In February 2004, the California Fish and Game Commission voted to encompass coho salmon populations north of San Francisco under CESA. Coho populations south of San Francisco were listed under CESA in the mid 1990s. The federal ESA had listed all coho populations in California since the mid 1990s as well.

Accompanying the State listing was a coho recovery strategy. Informing the strategy were discussions of local landowners, tribes, fishing interests, environmental groups, and agency staff. Some of the plan recommendations directly address the adverse impacts on coho from logging practices. In 2002, NMFS began recovery planning for the coho ESUs of Southern Oregon, Northern California Coast, and Oregon Coast (SONCC). The NMFS plan is still in draft status.

In determining the pace and location for our road restoration and LWD placement, MRC used 3 sources:

1. CDFG Recovery Strategy for Coho Salmon in California (2004).[1]
2. Map of core areas from a draft of the NMFS Coho Salmon Recovery Plan.
3. MRC data on coho presence in the plan area.

The CDFG plan, while broad in scope, is not specific at the planning watershed level. Recovery units generally correspond to CALWATER 2.2a hydrologic units. These are 2 hierarchical levels above planning watersheds. Within their plan, CDFG ranks entire basins for recovery efforts. Most of the MRC plan area has a ranking of 5, meaning the land has a high potential for restoration and management. The NMFS recovery plan is more specific to planning watersheds.

Table Z-1 shows the planning watersheds in which MRC will accelerate road restoration and LWD placement to recover coho core areas. An asterisk (*) indicates the sub-watersheds. Table Z-2 is a list of planning watersheds in which MRC will treat road restoration on a routine schedule since CDFG, NOAA, and MRC did not collectively select these as coho areas for the HCP/NCCP. Both lists indicate the evaluation of CDFG, NMFS, and MRC on current coho presence and potential recovery. Tables Z-3 thru Z-8 show CDFG recommendations for South Fork Eel River and Mendocino Coast broken down by Hydrologic Unit (HU) and Hydrologic Sub Area (HSA), as well as the MRC anticipated actions to comply with the recommendations.

Z.1.1 Locations selected as coho core areas

Table Z-1 MRC Coho Core Areas

MRC Coho Core Areas			
River	**Planning Watershed or Sub-watershed (*)**	**Evaluator**	**Recommendations and Comments**
1. Big River	a. East Branch North Fork Big River	NMFS	This watershed has a consistent, moderate coho presence. According to the MRC harvest schedule, it will not have PTHP road work before 2020. Therefore, this watershed should be a

[1] Refer to http://www.dfg.ca.gov/fish/REsources/Coho/SAL_CohoRecoveryRpt.asp (accessed 08/14/2009)

MRC Coho Core Areas			
River	**Planning Watershed or Sub-watershed (*)**	**Evaluator**	**Recommendations and Comments**
			priority for repair.
	b. *Ramone Creek[2]	MRC	Ramone Creek is not a planning watershed. While most of the South Fork Big River has a low potential for coho presence, Ramone Creek seems to be a localized "hot spot" for coho presence on a consistent basis.
	c. *Russell Brook[3]	NMFS MRC	Although coho is not as consistently present in the Russell Brook sub-watershed as in the Ramone Creek sub-watershed, the MRC Aquatic Biology Group decided that even this moderate presence is reason to include Russell Brook as a coho core area.
	d. *South Daugherty Creek	NMFS	Although South Daugherty Creek is a planning watershed, MRC has designated it only for LWD placement in a very specific channel location. MRC will accelerate LWD placement from Gates Creek confluence of Daugherty Creek down to the property line, which is ¼ mile from the confluence with South Fork Big River.
2. Albion River	a. Middle Albion	CDFG NMFS	Coho are consistently present here.
	b. South Fork Albion	CDFG NMFS	Coho are consistently present here.
3. Navarro River	a. John Smith Creek	CDFG NMFS	This is the best coho stream on the Navarro. The area has poor road systems in need of repair.
	b. Little North Fork Navarro River	CDFG	This is a very good coho stream. There are numerous miles of roads near the stream which need decommissioning or repair.
	c. Lower South Branch Navarro River	NMFS	This drains into the North Fork (called the South Branch of the North Fork). The upper and middle planning watersheds have most of the road work completed. As of 2011, the lower watershed has had the least work done, so it is a good candidate for restoration work.
	d. *Lower Navarro	MRC	This is not a planning watershed, but includes the actual drainage areas of the Marsh, Flume, and

[2] This refers to the actual drainage area of Ramone Creek.
[3] This refers to the actual drainage area of Russell Brook.

MRC Coho Core Areas			
River	**Planning Watershed or Sub-watershed (*)**	**Evaluator**	**Recommendations and Comments**
	Drainages		Murray Gulch streams. All three of these sub-watersheds have coho presence annually.
	e. *North Fork Navarro River	NMFS	This core area is only designated for road repair in one location within the planning watershed. As of 2011, more than 60% of the roads in the North Fork Navarro watershed meet HCP/NCCP standards. MRC will repair specific road segments within this watershed during the first 20 years of HCP/NCCP implementation. MRC will address all road segments from the south side of the North Fork Navarro Planning Watershed, starting from the Scale Ramp bridge crossing, proceeding west to Dimmick Camp Ground, and then up to the divide between the main Navarro and the North Fork Navarro. The roads in this geographic location have had sporadic work since 1998; many road segments are in need of repair. There are restrictions on LWD placement in the Navarro River because, at that location, a state park is on one side of Highway 128 and a Save the Redwoods Conservation Easement on the other side.
	f. *Cook Creek	NMFS	As a sub-watershed of the Dutch Henry Creek Planning Watershed, this is a core watershed only designated for LWD placement. All road work is nearly completed. MRC decommissioned the main road alongside Cook Creek, along with many spur roads near streams, in THPs 1-01-354 and 1-01-355. NMFS reviewed THP 1-01-354 during the PHI and provided recommendations.
4. Cottaneva Creek	Cottaneva Creek	NMFS	Although MRC has completed a substantial amount of road work in this planning watershed since 1998, there are many miles of roads near streams which need upgrading to the standards in Appendix E. Since coho are consistently present in its streams, this planning watershed is a good candidate for restoration.
5. Garcia River	South Fork Garcia	CDFG NMFS	Coho are consistently present in the Garcia River. MRC has restored many roads in this planning watershed to the standards in Appendix E. However, some of its roads still need upgrading.

MRC Coho Core Areas			
River	**Planning Watershed or Sub-watershed (*)**	**Evaluator**	**Recommendations and Comments**
6. Noyo River	Hayworth	NMFS	MRC biologists have observed coho presence within the streams of this watershed almost every year. While road work on the western portion of the planning watershed is nearly complete, MRC has not recently assessed the roads in the remaining two-thirds of the watershed for sediment control. The California Conservation Corps (CCC) has placed LWD in approximately 2500 ft of Hayworth Creek; they will continue LWD placement in 2011.

Z.1.2 Locations excluded as coho core areas

Table Z-2 Excluded as Coho Core Areas

Excluded as Coho Core Areas			
River	**Planning Watershed**	**Evaluator**	**Recommendations and Comments**
1. Big River	a. Dark Gulch	NMFS	MRC does not influence much of this planning watershed since it owns 533 of the 7151 ac or 7% of the watershed.
	b. Two Log Creek	NMFS	MRC does not influence much of this planning watershed since it owns 624 of the 11424 ac or 5% of the watershed.
	c. South Daugherty Creek	NMFS	Portions of this planning watershed, not yet treated, have been designated for road repair. Coho presence is very low and sporadic within this watershed. MRC last found coho here in 2002. LP detected coho in 1996. Between 1997 and 2001, there were no observations of coho salmon in this planning watershed. Since 1998, MRC decommissioned approximately 4.75 miles of roads and landings near streams. As of 2011, another 2 miles of road are scheduled for decommissioning within an approved THP. For another 1.9 miles of road near streams, we excavated eroded crossings and properly drained the road from surface water. MRC conducted these operations after the Horse Fire, which was a part of the 2008 Mendocino Lightning Complex. We effectively abandoned these roads and will decommission 4 remaining miles of roads near streams. The 8.65 miles of road already abandoned or approved for abandonment represent 55% of all the roads near streams within

Excluded as Coho Core Areas			
River	**Planning Watershed**	**Evaluator**	**Recommendations and Comments**
			the Daugherty Creek watershed.
2. Navarro River	a. Mill Creek	NMFS	MRC does not influence much of this watershed since it owns approximately 600 of the 7731 ac or 8% of the watershed. MRC brought approximately 95% of the roads up to HCP/NCCP standards in 2008, leaving less than .35 miles of road to repair.
	b. Dutch Henry Creek	CDFG	Within this planning watershed, MRC has brought most of the Cook Creek and Deer Creek sub-watersheds up to HCP/NCCP standards. MRC has abandoned all of the roads near streams in these 2 sub-watersheds (4.9 miles within Cook Creek and 1.9 miles in Deer Creek). The remaining MRC roads near streams in the Dutch Henry Creek watershed are within an approved THP in Little Jack Creek or an approved CDFG grant. MRC decommissioned the 1 mile long Little Jack Creek road in 2011. Although MRC owns the 2.6 mile long Dutch Henry Creek Road, we do not own the lands surrounding it. This road is an old railroad grade that Masonite Corporation purchased and used to haul logs.
	c. Flynn Creek	CDFG	This watershed had very few roads near streams. The Tank 4 Gulch Road is presently up to HCP/NCCP standards. There are 2.5 miles of railroad grade, near a stream, which was never converted for log truck hauling. Although there are some sediment problems along this railroad grade, MRC would have difficulty getting equipment into the site; this would require a substantial amount of excavation and placement of crossings. In 2004, MRC staff walked the railroad grade to locate the sediment problems. They noted only 1 site, of 40-100 yds^3, for high priority treatment. The site was at the terminus of the railroad grade. Due to the condition of the historic railroad grade, there was virtually no way to get equipment into the area without destroying it and converting the grade to a road. The remaining roads within this watershed are small spur segments off of ridge roads. Any unknown, isolated road problems on these ridge roads would be minor and located well upslope.
	d. North Fork Navarro	NMFS	See Table Z-1, #3e for an exception to the selection process for coho core areas; this specific area is designated for road repair. For the remaining areas in this watershed, MRC has decommissioned most of the roads near streams

Excluded as Coho Core Areas			
River	**Planning Watershed**	**Evaluator**	**Recommendations and Comments**
			and along tributary streams, such as those within Coon Creek and Deadhorse Creek. In 2007, MRC decommissioned 2 miles of road along Deadhorse Creek. In 2008, we decommissioned 1/3 of a mile of road in Coon Creek, and made major repairs to the crossings along Coon Creek. LP abandoned 1 mile of the road along Coon Creek in the 1990s. Under MRC harvest schedules, more than 80% of the roads in this planning watershed will be up to HCP/NCCP standards by Year 10 of HCP/NCCP implementation. Currently, 50% of the roads are up to standard. Small tributaries within this watershed that feed into the mainstem of the North Fork Navarro have only minimal areas, near the flood plain, with fish-passable streams.
	e. Ray Gulch	NMFS	• Mustard Gulch sub-watershed is a Class I watercourse for only ¼ mile. MRC has completed sediment control work on all roads that drain here. • Barton Gulch sub-watershed shows no presence of coho. MRC has completed sediment control work on 90% of our roads in this sub-watershed. • Ray Gulch sub-watershed shows no presence of coho above the 20-acre pond that is close to its mouth. MRC still has roads to repair in this sub-drainage. Although there are roads near streams, our surveys indicate very few sediment sites and those that exist are minor. MRC repaired the one main road that crossed many headwater streams within the 1-02-058 THP. Although we will continue to address roads near streams, this sub-watershed does not fit into the coho recovery plans because of the lack of coho.
3. Elk Creek	a. Lower and Upper Elk Creek	CDFG	Overall, there is very little coho presence in this watershed, with only sporadic observations from 1996. Due to the MRC efforts in fire suppression during the 2008 Mendocino Lightning Complex and to our past THP work, more than 70% of the roads are currently at HCP/NCCP standards.
4. Albion River	a. Lower Albion River	CDFG NMFS	MRC has brought more than 75% of the roads in this planning watershed up to HCP/NCCP standards. Most of this watershed drains into estuarine habitat in the lower portions of the Albion.
	b. Upper Albion	CDFG	MRC does not influence much of this watershed

Excluded as Coho Core Areas			
River	**Planning Watershed**	**Evaluator**	**Recommendations and Comments**
	River		since it owns approximately 1420 of the 8733 ac or 16% of the watershed.
5. Garcia River	a. Rolling Brook	CDFG	There is no coho presence in this watershed. CDFG lists this watershed only for cold water refugia to the Garcia. Road repair does not have as much of an influence on water temperatures as streamside shade and LWD.
	b. Inman Creek	NMFS	MRC does not influence much of this watershed since it owns approximately 110 of the 5481 ac or 2% of the watershed.
6. Noyo River	a. Redwood Creek	NMFS	Redwood Creek watershed shows, on an annual basis, the best coho presence within the Noyo River. MRC does not influence much of this watershed since it owns approximately 1100 of the 3361 ac or 33% of the watershed. Our acreage is at the lower end of Redwood Creek. Up-stream sources create most of the influence within this planning watershed.
	b. *Marble Gulch	NMFS	Marble Gulch sub-watershed shows coho presence that is both limited and sporadic. MRC owns most of the sub-watershed.
	c. McMullen Creek	NMFS	McMullen Creek watershed has only shown coho presence once since 1994. Roads which MRC owns roads high in the watershed could affect coho downstream in the Noyo River. However, MRC has repaired half of our roads in this watershed for sediment control. Our road surveys only show low and moderate sediment sites in the remaining roads.
	d. Middle Fork Noyo River	NMFS	Middle Fork watershed has had reported sightings of coho presence a number of times since 1994. MRC has recently repaired most of the sediment sites related to our roads through both grants and THPs. The CCC has been placing LWD in the Middle Fork Noyo River and will continue to do so.

Z.2 Watershed Recommendations for South Fork Eel River

The South Fork Eel HU is part of the SONCC ESU. Within the South Fork Eel HU, there is only 1 HSA in the MRC plan area—the Laytonville HSA. The highlighted text in Table Z-3 is verbatim from the CDFG *Recovery Strategy for California Coho Salmon.* Each excerpt is succeeded by the anticipated MRC action to comply with the CDFG recommendations.

Table Z-3 Laytonville HSA

ER-LA-03	Encourage the county to coordinate with landowners on the removal of barriers on private property.
MRC Action	MRC will share data with both the county and private landowners to identify barriers outside of the MRC plan area.
ER-LA-04	Support efforts by the county sheriff to enforce laws against dumping and the Department of Health to clean up dumped materials.
MRC Action	MRC security officers will patrol our property and assist in removing trash.
ER-LA-07	To minimize and reduce the effects of water diversions, take actions to improve SWRCB coordination with other agencies to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and other anadromous salmonids and natural hydrograph, and avoidance of adverse impacts caused by water diversion.
MRC Action	MRC will reduce and minimize the impacts of water drafting by adhering to the standards in section E.7 as well as through conservation measures designed to reduce and minimize hydrologic change (section 8.4).

Z.3 Watershed Recommendations for the Mendocino Coast

The Mendocino Coast HU is part of the CCC ESU. Within the Mendocino Coast HU, there are 5 HSAs in the plan area; however, MRC is only addressing Albion River, Big River, Garcia River, and Navarro River in our HCP/NCCP. The 4 recommendations for the Noyo HSA are for projects that do not require MRC direct action; for example, CDFG recommends investigating the role of Pudding Creek Dam in coho migration and the barriers to coho passage on the right-of-way of the California Western Railroad. The highlighted text in Tables Z-4 through Z-8 is verbatim from the CDFG *Recovery Strategy for California Coho Salmon.* Each excerpt is succeeded by the anticipated MRC action to comply with the CDFG recommendations.

Table Z-4 Mendocino Coast HU

MC-HU-06	Increase stream complexity by actions to: a. Retain current limited supply of LWD, boulders, and other structure-providing features; b. Install new LWD, boulders, and other features immediately; and c. Restore riparian vegetation to provide for future recruitment of LWD.
MRC Action	MRC will retain all in-stream LWD, boulders, and other features that provide structure. Following the conservation measures presented in section 8.2.3.6, we will meet or exceed objectives set for LWD. Our conservation measures for largest tree retention (section 8.2.3.6) will also promote recruitment of LWD to the stream channel.
MC-HU-07	Support the assessment, prioritization, and treatment of sediment sources at an HSA level.
MRC Action	MRC has assessed and prioritized the sediment sources. We will treat controllable erosion per the prescriptions in 8.3.3.2.1.
MC-HU-08	Determine site-specific recommendations, including incentives, to remedy high temperatures. Depending on the terrain and aspect, examples could include riparian planting to increase shade to reduce high ambient temperature and raise humidity along streams.
MRC Action	MRC will create a 10-ft no harvest zone along with AMZ buffers of various widths to provide shade to watercourses (section 8.2.3).

MC-HU-09	Map unstable soils and use that information to guide land-use decisions, road design, PTHPs, and other activities that can promote erosion.
MRC Action	MRC has identified and mapped potentially unstable areas—Terrain Stability Units (TSUs)—and proposed conservations measures for each unit (section 8.3.2).
MC-HU-11	Improve pool frequency and depth by actions to: a. Continue to treat existing upslope sediment sources; and b. Avoid or minimize land ownership fragmentation/conversion to more intensive uses.
MRC Action	MRC will address upslope sediment sources through TSUs (section 8.3.3). In addition, we will reduce sediment by upgrading all roads and skid trails to the standards presented in Appendix E. Through the 80-year commitment of this HCP/NCC, MRC will avoid fragmentation of our landscape.
MC-HU-12	Discourage poaching of coho salmon by measures to: a. Cooperate with and provide incentives to landowners to maintain road and trail closures to be effective against trespass; b. Encourage monitoring of road closures and timely repair of defective or damaged road closure systems; c. Promote CalTIP, especially how it might apply to spawning coho salmon; d. Report un-permitted road use to local, State, and Federal enforcement personnel during periods when coho salmon are running.
MRC Action	The MRC road system is closed to the public; gates restrict vehicle access to our property. Security officers are on duty, patrolling the property for trespassers.
MC-HU-14	Supplement ongoing efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through: a. Management to promote conifer recruitment; and b. Incentives to landowners, such as technical support.
MRC Action	MRC will improve LWD and shade throughout the plan area by adhering to the conservation measures for LWD placement (section 8.2.3.6) as well as the conservation measures for AMZs (section 8.2.3). By streamlining the permit process, the wildlife agencies can assist us in our restoration activities.
MC-HU-15	Maintain or improve instream flows by actions to: a. Avoid or minimize increases in water use; and b. Provide incentives to remove or convert direct diversions to off-stream storage and restrict the season of diversion to December through March.
MRC Action	MRC will address instream flows through the water drafting plan (section E.7) and through conservation measures designed to reduce and minimize hydrologic change (section 8.4).
MC-HU-16	The Department, the SWRCB, the RWQCB, the CDF, Caltrans, and counties, in cooperation with NOAA Fisheries, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon. These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality.

MRC Action	MRC will minimize water drafting impacts to all covered species, including coho salmon (section E.7).
MC-HU-17	Maintain or re-establish geographic distribution of coho salmon by continuing to allocate substantial improvement efforts towards identified biological refugia spawning coho salmon populations, and/or otherwise suitable habitat conditions accessible to coho salmon.
MRC Action	MRC will maintain the geographic distribution of coho salmon in all of the major basins within the plan area as well as their distribution in specific watercourses. We will not on our own accord transport coho salmon among sites but will cooperate with the wildlife agencies if they determine repatriation efforts are necessary. However, since we cannot control conditions in the marine environment, changes there may still result in changes in fish distribution.
MC-HU-18	Coordinate with the NCRWQCB to implement water quality monitoring and streamline permitting of coho salmon habitat restoration projects (RWQCB 401, USACE 404, NOAA Fisheries, and USFWS permitting).
MRC Action	MRC has coordinated with NCRWQCB to implement water quality monitoring (section 13.4.4).
MC-HU-20	Decrease coarse sediment delivery by implementing actions to work with: a. Landowners, other resource professionals, and agencies to identify areas of increased risk of mass wasting to enable avoidance or mitigation of triggering activities; and b. Transportation system (State, county, and private road and rail) construction and maintenance personnel to identify risks and mitigation measures for mass wasting such as replacing culverts with bridges, minimizing fill volumes on culverts, and constructing critical dips at culverts.
MRC Action	MRC will address upslope sediment sources through TSUs (section 8.3.2). In addition, we will reduce sediment by upgrading all roads and skid trails to the standards presented in Appendix E.
MC-HU-21	Decrease fine sediment loads by actions to: a. Abandon riparian road systems and/or upgrade roads and skid trails that deliver sediment to adjacent water courses; b. Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses; c. Minimize the density of road and trail crossings of water courses; d. Encourage out-sloping roads with rolling dips as the standard, wherever feasible, for all roads, and especially unsurfaced roads; and e. Work with landowners to identify and modify practices such as road maintenance that generate fine sediment.
MRC Action	MRC standards for roads, landings, and skid trails (Appendix E) address road use, seasonal road use, and limited road access during the wet season.
MC-HU-22	Develop erosion control projects similar to the North Fork Ten Mile River erosion control plan.

MRC Action	MRC has assessed and prioritized our sediment sources. We will treat controllable erosion per the prescriptions in 8.3.3.2.1.

Table Z-5 Albion River HSA

MC-AR-01	Place instream structures to improve gravel retention and habitat complexity.
MRC Action	MRC will improve LWD and habitat complexity by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as by cooperating with other interested parties, such as the California Conservation Corp (CCC), with similar restoration objectives.
MC-AR-03	Conduct collaborative evaluations of priorities for treatment of barriers such as Fish Passage Forum.
MRC Action	MRC has identified and treated the majority of fish barriers within the plan area and will continue to do so throughout the 80-year term of the HCP/NCCP.
MC-AR-04	Supplement ongoing efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through: a. LWD placement; b. Management to promote conifer recruitment; c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and d. Incentives to landowners, such as technical support.
MRC Action	MRC will improve LWD and shade throughout the plan area by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as the conservation measures for AMZs (section 8.2.3). By streamlining the permit process, the wildlife agencies can assist us in our restoration activities.
MC-AR-10	Encourage coordination of large wood placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort.
MRC Action	MRC will improve LWD and habitat complexity by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as by cooperating with other interested parties, such as the California Conservation Corp (CCC), with similar restoration objectives.
MC-AR-11	Encourage, when necessary and appropriate, restricted access to unpaved roads in winter to reduce road degradation and sediment release. Where restricted access is not feasible, encourage measures such as rocking to prevent sediment from reaching streams with coho salmon.
MRC Action	MRC standards for roads, landings, and skid trails (Appendix E) address road use, seasonal road use, and limited road access during the wet season.
MC-AR-12	Conduct comprehensive sub-basin erosion control “storm proofing” combined with installation of LWD into streams.
MRC Action	MRC has assessed and prioritized our sediment sources. We will treat controllable erosion per the prescriptions in 8.3.3.2.1. To improve LWD and habitat complexity, we will adhere to the conservation measures for LWD placement (section 8.2.3.6) and cooperate with other interested parties, such as the California Conservation Corp (CCC), following similar restoration objectives.

MC-AR-13	Modify stream barriers to allow coho salmon passage while maintaining LWD.
MRC Action	MRC will maintain LWD by treating significant stream barriers as encountered.

Table Z-6 Big River HSA

MC-BR-01	To minimize and reduce the effects of water diversions, take actions to improve SWRCB coordination with other agencies to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and other anadromous salmonids and natural hydrograph, and avoidance of adverse impacts caused by water diversion.
MRC Action	MRC will reduce and minimize the impacts of water drafting by adhering to the standards in section E.7 as well as through conservation measures designed to reduce and minimize hydrologic change (section 8.4).
MC-BR-02	Target Big River for enhancement of instream habitat by installation of LWD.
MRC Action	MRC will improve LWD and habitat complexity by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as by cooperating with other interested parties, such as the California Conservation Corp (CCC), with similar restoration objectives.

Table Z-7 Garcia River HSA

MC-GA-06	Utilize as a model for erosion reduction and LWD placement the comprehensive approach practiced in the South Fork of the Garcia River.
MRC Action	The model described above was actually developed and implemented in the plan area at South Fork Garcia.
MC-GA-07	Investigate stream nutrient enrichment and cycling needs for coho salmon.
MRC Action	MRC will participate in and support any scientific efforts to improve the stream nutrients and cycling needs of coho salmon.
MC-GA-09	Encourage coordination of LWD in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort.
MRC Action	MRC will improve LWD and habitat complexity by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as by cooperating with other interested parties, such as the California Conservation Corp (CCC), with similar restoration objectives.
MC-GA-11	Maintain the following tributaries to provide coldwater input to the Garcia River mainstem: Hathaway, North Fork, Rolling Brook, Mill Creek (lower Garcia River), South Fork, Signal, Mill Creek (upper Garcia River).
MRC Action	MRC will improve shade throughout the plan area by adhering to the conservation measures for AMZs (section 8.2.3). Our monitoring data on stream temperatures in the South Fork and Rolling Brook tributaries confirms that these watercourses currently provide cold water inputs and should continue to do so.
MC-GA-13	Encourage, when necessary and appropriate, restricted access to unpaved roads in winter to reduce road degradation and sediment release. Where restricted access is not feasible, encourage measures such as rocking to prevent sediment from reaching streams with coho salmon.
MRC Action	MRC standards for roads, landings, and skid trails (Appendix E) address road use, seasonal road use, and limited road access during the wet season. All our road networks

	are behind locked gates and road use is restricted during the wet season to administrative requirements. To ensure that trespassers do not degrade these road networks, our security officers patrol MRC roads on a regular basis.
MC-GA-18	Consider projects to open logjam migration barriers while maintaining LWD in the North Fork, South Fork, and Fleming Creek.
MRC Action	MRC will identify and address migration barriers, where present in the plan area.
MC-GA-19	Complete the remaining 25% of erosion control sites, identified in the South Fork Garcia River by the Trout Unlimited North Coast Coho Project.
MRC Action	In conjunction with Trout Unlimited and Pacific Watershed Associates, MRC has identified and treated 100% of the erosion control sites in the South Fork Garcia (Pacific Watershed Associates 2010).
MC-GA-21	Place large woody debris in Inman Creek, South Fork Garcia River, Signal Creek, and North Fork Garcia River, where necessary and with willing landowners
MRC Action	MRC will improve LWD and habitat complexity by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as by cooperating with other interested parties, such as the California Conservation Corp (CCC), with similar restoration objectives.

Table Z-8 Navarro River HSA

MC-NA-03	Investigate stream nutrient enrichment and cycling needs for coho salmon.
MRC Action	MRC will participate in and support any scientific efforts to improve the stream nutrients and cycling needs of coho salmon.
MC-NA-04	Supplement ongoing efforts to provide short-term and long-term benefits to coho salmon by restoring LWD and shade through: a. LWD placement; b. Management to promote conifer recruitment; c. Improvement of existing riparian zones through plantings, release of conifers, and control of alders, blackberries, and other competitors; and d. Incentives to landowners, such as technical support.
MRC Action	MRC will improve LWD and shade throughout the plan area by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as the conservation measures for AMZs (section 8.2.3). By streamlining the permit process, the wildlife agencies can assist us in our restoration activities.
MC-NA-07	Comprehensive, sub-basin wide, erosion control and LWD installation is being implemented by Mendocino Redwood Company in partnership with the Department through the North Coast Coho Project in the Little North Fork. This approach of "storm proofing" key subbasins needs to be fully implemented in the key sub-basins of Flynn, Dutch Henry, John Smith, Minnie, Horse Camp and German creeks. These tributaries have been identified as high priority in the Navarro River Restoration Plan.
MRC Action	MRC standards for roads, skid trails, and landings (Appendix E) dictate road upgrades, as necessary. Our conservation measures for LWD placement (8.2.3.6) will add LWD in these sub-basins. We will treat controllable erosion per the prescriptions in 8.3.3.2.1. In the sub-basins listed in MC-NA-07, we plan to implement erosion control and LWD

	placement.
MC-NA-09	Encourage coordination of large wood placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort.
MRC Action	MRC will improve LWD and habitat complexity by adhering to the conservation measures for LWD placement (section 8.2.3.6), as well as by cooperating with other interested parties, such as the California Conservation Corp (CCC), with similar restoration objectives.
MC-NA-11	Encourage, when necessary and appropriate, restricted access to unpaved roads in winter to reduce road degradation and sediment release. Where restricted access is not feasible, encourage measures such as rocking to prevent sediment from reaching streams with coho salmon.
MRC Action	MRC standards for roads, landings, and skid trails (Appendix E) address road use, seasonal road use, and limited road access during the wet season. All our road networks are behind locked gates and road use is restricted during the wet season to administrative requirements. To ensure that trespassers do not degrade these road networks, our security officers patrol MRC roads on a regular basis.