Mattole Forest Futures Project

Combined Final and Draft ("Complete")
Program Timberland
Environmental Impact Report
(PTEIR)
for private timberlands in the Mattole River watershed

California Department of Forestry and Fire Protection
(CAL FIRE)

Lead Agency under the
California Environmental Quality Act

May 17, 2011

prepared by BBW Associates, Arcata, California

under the direction of the
Mattole Restoration Council, Petrolia, California

for more information contact:
Allen S. Robertson
Deputy Chief, Environmental Protection
P.O. Box 944246, Sacramento, CA 94244-2460
916-657-0300

Table of contents

Chapter 1: Introduction 1-1
1.0 Program (Project) Description 1-1
1.1 Program Location 1-2
1.2 Program Background 1-5
1.3 Program Purpose and Program Objectives 1-8
1.4 Purpose of PTEIR 1-9
1.5 Decision Subject to California Environmental Quality Act (CEQA) 1-9
1.6 How Will the Proposal Program be Accomplished 1-8
1.7 State Agency Oversight of Program and PTHP's 1-11
1.8 PTEIR and Program Duration 1-12
1.9 Role of Local Government in PTEIR Process 1-12
1.10 Chapter 1 Bibliography 1-13

Chapter 2: Environmental Settings, Program Description and Alternatives 2-1
2.0 Environmental Setting 2-1
2.1 Proposed Program: Mattole Forest Futures Program 2-24
2.2 Methodology for Projecting Acreage Harvested for Program and Alternatives 2-40
2.3 Elements Common to All Alternatives and Alternative Development 2-46
2.4 Alternative 1: No Program-Continue Status Quo 2-51
2.5 Alternative 2:Broader Buffers While Allowing Even-Aged Management 2-54
2.6 Alternative 3:Fire and Fuels Alternative 2-47
2.7 Comparison of Treatments 2-56
2.8 Environmentally Superior Alternative 2-58
2.9 Environmental Superior Alternative 2-62
2.10 Chapter 2 Bibliography 2-64

Chapter 3: Environmental Impacts and Mitigation Measures 3-1
3.0 Introduction and Overview of Chapter 3-1
3.1 Comparison of Program and Alternative Practices and Landscapes 3-1
3.2 Potentially Significant Impacts Generated During Scoping 3-5
3.3 Impacts of Program/Alternative Implementation on Air Quality 3-6
3.4 Impacts of Program/Alternative Implementation Aquatics Resources, Including Fish and Amphibians 3-22
3.5 Impacts of Program/Alternative Implementation on Cultural, Archeological and Historic Resources 3-44
3.6 Impacts of Program/Alternatives Implementation on Greenhouse Gases 3-64
3.7 Impacts of Program/Alternative Implementation on Geology and Soils. 3-78
3.8 Impacts of Program/Alternative Implementation on Noise 3-113

3.9 Impact of Program/Alternative Implementation on Population and Housing.....3-121
3.10 Impacts of Program/Alternative Implementation on Recreation.....3-127
3.11 Effects of Program/Alternative Implementation Associated With Hazards and Hazardous Materials.....3-133
3.12 Impacts of Program/Alternative Implementation on Transportation/Traffic.....3-144
3.13 Impacts of Program/Alternative Implementation on Utilities and Energy.....3-150
3.14 Impacts of Program/Alternative Implementation on Vegetation Including Invasives.....3-154
3.15 Impacts of Program/Alternative Implementation on Visual/ Aesthetic Resources.....3-177
3.16 Impacts of Program/Alternative Implementation on Water Quality.....3-186
3.17 Impacts of Program/Alternative Implementation on Wildfire.....3-218
3.18 Impacts of Program/Alternative Implementation on Wildlife/Terrestrial Species..3-237
3.19 Impacts of Program Implementation on Timber Resources (Maximum Sustained Productivity Analysis).....3-286
3.20 Significant Impacts that Cannot be Avoided.....3-303
3.21 Significant Irreversible Environmental Changes.....3-303
3.22 Growth Inducing Impacts.....3-303

Chapter 4: Cumulative Impacts Analysis.....4-1
4.0 Introduction and Overview of Chapter.....4-1
4.1 Methodology.....4-1
4.2 Description of Assessment Area.....4-2
4.3 General Description of Program Area.....4-3
4.4 Past Activities.....4-4
4.5 Present Activities.....4-13
4.6 Probable Future Projects.....4-13
4.7 Watershed Cumulative Impacts.....4-23
4.8 Soil Productivity and Geologic Cumulative Impacts.....4-32
4.9 Biological Cumulative Impacts.....4-36
4.10 Recreation Cumulative Impacts.....4-55
4.11 Visual and Aesthetic Cumulative Impacts.....4-55
4.12 Cumulative Impacts to Traffic and Transportation.....4-64
4.13 Air Quality Cumulative Impacts.....4-65
4.14 Greenhouse Gas Cumulative Impacts.....4-68
4.15 Wildfire Cumulative Impacts.....4-70
4.16 Population and Housing Cumulative Impacts.....4-73
4.17 Cultural, Archaeological and Historic Resources Cumulative Impacts.....4-74
4.18 Cumulative Impact Summary.....4-78

Appendices

A: Methods and Procedures Used to Establish the Footprint of the Mattole Forest Futures Program and Alternatives A-1
B: Geologic Review Flow Charts B-1
C: Stand Delineation and Within-Stand Differentiation C-1
D: Methods Used to Predict Sediment Yield D-1
E: Mattole Planning Documents E-1
F: Contents of a Sediment Prevention Plan (SPP) and Erosion Control Plan (ECP) F-1
G: EIR Preparers G-1
H: PTHP Checklist H-1

List of Figures

Chapter 1: Introduction

Figure 1-1: Mattole Basin Cal Wat HUC's and PTEIR Sub Basin 1-4
Figure 1-2: Vicinity Map of Mattole River Watershed 1-7

Chapter 2: Environmental Settings, Program Description and Alternatives

Figure 2-1: Ownership Classes in the Mattole Watershed 2-6
Figure 2-2: Vegetation Types in Mattole 2-13
Figure 2-3: Proposed Program Footprint 2-43
Figure 2-4: Harvest History in the Mattole Watershed, 1983-2007 2-47
Figure 2-5: Alternative 1 Footprint 2-50
Figure 2-6: Alternative 2 Footprint 2-53
Figure 2-7: Alternative 3 Footprint 2-55

Chapter 3: Environmental Impacts and Mitigation Measures

Figure 3-1: Historic Range of Coho 3-23
Figure 3-2: Historic Range of Chinook 3-24
Figure 3-3: Historic Range of Steelhead 3-25
Figure 3-4: NCWAP Map of Salmonid Refugia 3-28
Figure 3-5: Location of Amphibian Surveys in Mattole 3-31
Figure 3-6: Mattole Basin Geologic Terrain Types 3-79
Figure 3-7: Mattole Basin Landslide Potential 3-80
Figure 3-8: Landslide Potential, Rattlesnake Creek 3-81
Figure 3-9: Ownership Density 3-123
Figure 3-10: Mattole Basin Road System 3-145
Figure 3-11: [deleted]
Figure 3-12: Southern Humboldt Tanoak Mortality 2004-2009 3-160
Figure 3-13: Humboldt Risk Map 3-166
Figure 3-14: Program Trend in WHR Typ 3-169
Figure 3-15: Status Quo (Alt 1) Trend in WHR Type 3-169
Figure 3-16: Alt 3 (Fire & Fuel Mgmt) Trend in WHR Type 3-170
Figure 3-17: Status Quo (Alt 1) Trend in WHR Type South 1 Subbasin 3-172
Figure 3-18: Program Trend in WHR Type South 1 Subbasin 3-172
Figure 3-19: Maximum Weekly Average Temperature 3-187
Figure 3-20: Water Temperature on Mattole Tributaries 2002-2008 3-203
Figure 3-21: Water Temperature on Mattole Tributaries 2002-2008, part 2 3-204
Figure 3-22: Net Sediment Yield by Alternative and Subbasin 3-209
Figure 3-23: Fire Threat in Mattole and Surrounding Areas 3-220
Figure 3-24 Wildland Fires in or Near Program Area, 1950-2009 3-221

Figure 3-25: Predicted Flame Lengths in Program and Status Quo 3-231
Figure 3-26: Program Flame Lengths by Subbasin in Moderate Fire Weather 3-231
Figure 3-27: Flame Lengths in Status Quo in Severe Fire Weather Conditions 3-232
Figure 3-28: Percent Mortality in Residual Stand from Wildfire Burning in Two Weather Conditions 3-238
Figure 3-29: Comparing the Development of WHR Classes in the Program Area 3-254
Figure 3-30: South 1 Program Managed Landscape, WHR Type Proportions 3-257
Figure 3-31: Status Quo Managed Landscape, WHR Type Proportions 3-258
Figure 3-32: Total Projected Standing Timber Volume in the Program Footprint 3-300

Chapter 4: Cumulative Impacts Assessment

Figure 4-1: Mattole Harvest History by Silviculture Type, 1999-2010 4-11
Figure 4-2: BLM Silvicultural Treatment Areas 4-17
Figure 4-3: BLM Existing and Planned Shaded Fuel Break System 4-18
Figure 4-4: Cumulative Annual Sediment Yield by Subbasin 4-28
Figure 4-5: North_1, Sediment Yield by Category Over Time 4-29
Figure 4-6: West_2, Sediment Yield by Category Over Time 4-29
Figure 4-7: Mattole Watershed WHR Type Proportions Under the Program 4-44
Figure 4-8: Mattole Watershed WHR Type Proportions Under the Program 4-44

Appendices

[Unnumbered]: Stumpage value, Timber Value Area (TVA) 1 ..... A-7
[Unnumbered]: Projected Doug-fir Delivered Log Prices, TVA 1 ..... A-7
Figure A-1: Proposed Program Footprint A-12

Chapter 1: Introduction

1.0 Program (Project) Description

The Mattole Forest Futures Project (hereafter the Program) has been developed by the Mattole Restoration Council (MRC) to facilitate beneficial forest management in the Mattole River Basin by providing Mattole landowners with an alternative regulatory option whereby they may engage in "light touch" timber harvest that can be approved by simplified agency review. Light touch timber harvest is defined in detail in chapter 2 but can be summarized here as 1) generally using only selection silviculture, 2) growing larger trees and increasing the proportion of conifer to hardwood stocking, 3) retaining old-growth, 4) maintaining or enhancing late seral conditions, 5) tractor logging restrictions, 6) generous riparian buffers, and 7) road upgrade requirements. By reducing the cost of preparing and filing a Program Timber Harvesting Plan (PTHP), the Program aims to make it feasible for landowners to harvest timber at a lower intensity than if they needed to recover the higher planning costs they would incur under a conventional Timber Harvesting Plan (THP) or Nonindustrial Timber Management Plan (NTMP) – see ISF 2011, cited in the bibliography, for an analysis of Timber Harvest Planning Costs vis a vis the Mattole Forest Futures Program.

The environmental effects to the Mattole River watershed from Program implementation, as well as from three feasible alternatives to the Program, are analyzed in this Program Timberland Environmental Impact Report (PTEIR). The analysis assesses impacts to land, water, and biological resources of the Mattole basin as they might occur from implementation of the Program or alternatives to the Program, based on several factors, including:

1. Landowner interest in light touch timber harvest under a PTHP,
2. Availability of commercial-sized timber by parcel as projected over time,
3. Size, timber stocking, and terrain of private parcels in terms of harvest operability,
4. Areas requiring protection from harvest impacts (e.g., Watercourse and Lake Protection Zones [WLPZs], geologically unstable areas), and
5. Presence of cultural resources and/or species of concern requiring protection or mitigation.

A detailed description of the Program is found in Chapter 2. Activities resulting from the Program include timber harvesting and related activities, including skid trail and landing construction; road construction, reconstruction, and maintenance; construction and/or use of stream crossings; prescribed burning; and treatment of slash via mastication, piling and burning, chipping, and other treatments. The Program is designed to be consistent with the requirements of the Z'berg-Nejedly Forest Practice Act of 1973 (Forest Practice Act), utilizing the PTEIR/PTHP process detailed in California Code of Regulations (CCR) Sections 1092.01-1092.32 of the California Forest Practice Rules (CA FPR) and the California Environmental Quality Act (CEQA) and Guidelines.

1.1 Program Location

The Mattole River drainage is approximately 189,760 acres in extent (296 sq. mi.). It is located in the California Coast Range, in western Humboldt and northern Mendocino Counties, about 290 miles north of San Francisco and 26 miles southwest of Eureka, the largest nearby city and the county seat of Humboldt County. The watershed drains into the Pacific Ocean near the town of Petrolia.

The Program area consists of approximately 156,484 acres of private parcels that contain or have the potential to contain, forest and woodland vegetation types, within the Mattole River watershed. The bulk of the population in the watershed is concentrated around the five communities of Ettersburg, Thorn Junction, Whitethorn, Honeydew, and Petrolia. The total resident population of the Mattole basin in the 2000 census was estimated at about 1,200, or four people per square mile (NCWAP, 2002). Local residents pursue a variety of economic activities, including stock raising (cattle, sheep, and goats), nonindustrial timber management, logging, agriculture (including orchards, pasture, field crops, and viticulture), and heavy equipment operation. No state highways run through the watershed, but all the main access routes eventually lead eastward to U.S Route 101, a major north-south travel corridor.

The current vegetation is predominately forestland. Mixed conifer/hardwood forestland occupies 57% of the watershed while hardwood forests occupy 17% and more purely conifer forests occupy another 8%. Annual grasslands occupy 15% of the watershed. The current vegetation is the result of fire history in addition to timber harvesting and grazing.

Figure 1-1 shows the general location of the Program area by Cal Wat (California Interagency Watershed Map of 1999 normally referred to as CalWater Version 2.2.1) hydrological units (HUC) hereafter referred as the Cal Wat HUC's. In addition, for purposes of analysis, the Program area was divided into seven sub-basins, which are aggregations of 2 to 5 contiguous Cal Wat HUCs. The relationship of these sub-basins to the Cal Wat HUCs is shown in the following table and figure. The designation of these subbasins was influenced by the subbasins described in the California Resources Agency and California Environmental Protection Agency's North Coast Watershed Assessment Program Mattole Watershed Assessment Report (NCWAP, 2002). The three largest sub-basins in that planning effort (North, East, and West) were each broken in two for this analysis; the South sub-basin was used here in the same form in which it appears in the NCWAP analysis. Throughout the remainder of the document, the Program subbasins are used for analysis of environmental impacts, because the geographic scale is more appropriate than either the entire Mattole basin or the larger NCWAP sub-basins for the consideration of cumulative watershed effects. At the same time, a choice was made not to disaggregate the analysis to each of the twenty-five Cal Wat HUCs in the basin, except for qualitative discussion of each HUC provided in Chapter 4. This was done both to avoid redundancy, and because some of the baseline data on the effects of concern (erosion, sedimentation, and water quality) were available at the scale of the sub-basin only.

TABLE 1-1
CAL WAT HUC'S AND PROGRAM SUBBASINS

PTEIR Subbasin Name	CAL FIRE Name	CDFNUM22	Acres
East 1	Dry Creek	1112.300304	7,384
East 1	Westlund Creek	1112.300302	7,271
East 1	Sholes Creek	1112.300303	11,421
East 2	Mattole Canyon	1112.300301	10,573
East 2	Blue Slide Creek	1112.300305	6,482
East 2	Eubank Creek	1112.300102	8,044
North 1	Long Ridge	1112.300602	6,655
North 1	Joel Flat	1112.300603	4,904
North 1	Rainbow	1112.300604	7,247
North 1	Apple Tree	1112.300601	3,951
North 1	Petrolia	1112.300702	4,940
North 1	Cow Pasture Opening	1112.300704	6,661
North 2	Oil Creek	1112.300403	8,897
North 2	Rattlesnake Creek	1112.300401	8,720
North 2	McGinnis Creek	1112.300503	4,724
North 2	Camp Mattole	1112.300502	7,006
South 1	Bridge Creek	1112.300101	10,281
South 1	Thompson Creek	1112.300104	7,322
West 1	Shenanigan Ridge	1112.300701	9,833
West 1	Woods Creek	1112.300501	5,154
West 1	Squaw Creek	1112.300504	10,657
West 2	Honeydew Creek	1112.300402	12,101
West 2	North Fork Bear Creek	1112.300201	8,329
West 2	Big Finley Creek	1112.300103	5,970
West 2	South Fork Bear Creek	1112.300202	5,234
	Total acreage		**189,760**

Figure 1-1

Mattole Basin Cal Wat HUCs and PTEIR Sub Basins
1112.300602
1112.300603
North_1
1112.300601
1112.300604
1112.300702
1112.300704
1112.300503
1112.300403
North_2
1112.300701
1112.300401
1112.300502
West_1
1112.300501
1112.300504
1112.300304
East_1
1112.300302
1112.300402
1112.300301
1112.300303
East_2
1112.300306
West_2
1112.300201
1112.300103
1112.300102
1112.300202
1112.300101
South_1
1112.300104
1 inch equals 3.25 miles
Legend
PTEIR Sub basins
CalWat Sub basins
N

1.2 Program Background

The majority of timber stands currently occupying the private parcels in the Program area are "second growth" that reoccupied timberlands after broad-scale elimination of the ancient old growth conifer forest by logging, which largely occurred during the post-WWII Douglas-fir boom from 1945 to 1965. (Another factor that encouraged forest depletion was the ad valorem state tax, which levied taxes on standing timber.) Between 1945 and 1974, over 75% of the old growth Douglas-fir-dominated forests that had occupied much of the watershed for hundreds of years were either clearcut or high-graded. A comparison of aerial photos before and after logging shows a drastically changed landscape, in which relatively pristine forests were replaced by bare ground and a massive network of skid roads, which in many cases ran down watercourses, along which the logs were moved to landings (which also were often located in watercourses). Logging-related erosion on the cleared slopes, aggravated by disastrous floods in 1955 and 1964, caused many hillsides to unravel and sediment to fill in the stream channels. The once-abundant anadromous fisheries experienced a severe decline, which, despite many efforts to improve conditions, still persists.

During the Douglas-fir boom, few provisions were made by landowners or loggers to encourage regeneration by desired commercial species. Tanoak trees, in particular, which had experienced their own decimation by bark stripping for tannin in the early 1900s, had sprouted abundantly in the understory of the conifer stands, and after release, aggressively occupied many sites. Tanoak and other native hardwoods comprise an abundant and accessible resource, but efforts to develop a commercial market have not come to fruition. Many other logged acres did regenerate abundantly or partially with Douglas-fir (and other commercial conifers, including coast redwood and grand fir), and these stands are beginning to reach commercial size. Since 1976, all private timberland logging has been conducted under the California Forest Practice Rules (FPR). This management has generally been successful in regeneration of desirable species and is also poised to produce abundant commercial timber over time, as well as other ecosystem services. The climate and soils of the Mattole watershed are ideal for growing forests. This ability, combined with the steepness of the slopes and their unsuitability for most other uses, indicates that forest management is one obvious economic activity that could help sustain livelihoods in the basin.

Within the Mattole, a host of citizen groups have come together to seek solutions to environmental and economic challenges. In particular, streams in the basin have been the focus of extensive restoration efforts. Since impacts to streams are in many cases related to logging—particularly failed or poorly maintained logging roads and associated watercourse crossings—there is a recognition that, if any resurgence of timber harvest begins across non-industrial ownerships as timber stands mature, it must be held to very high standards of environmental protection.

The last few years have also seen drastic changes in the local timber industry, which continues to contract as mills close and markets for raw logs move further away. Globalization has made timber and lumber from other states and countries competitive with local sources. Logs originating in the Mattole watershed must travel scores of miles to the few operating mills. To make matters worse, prices for California conifers, particularly Douglas-fir, have slumped badly

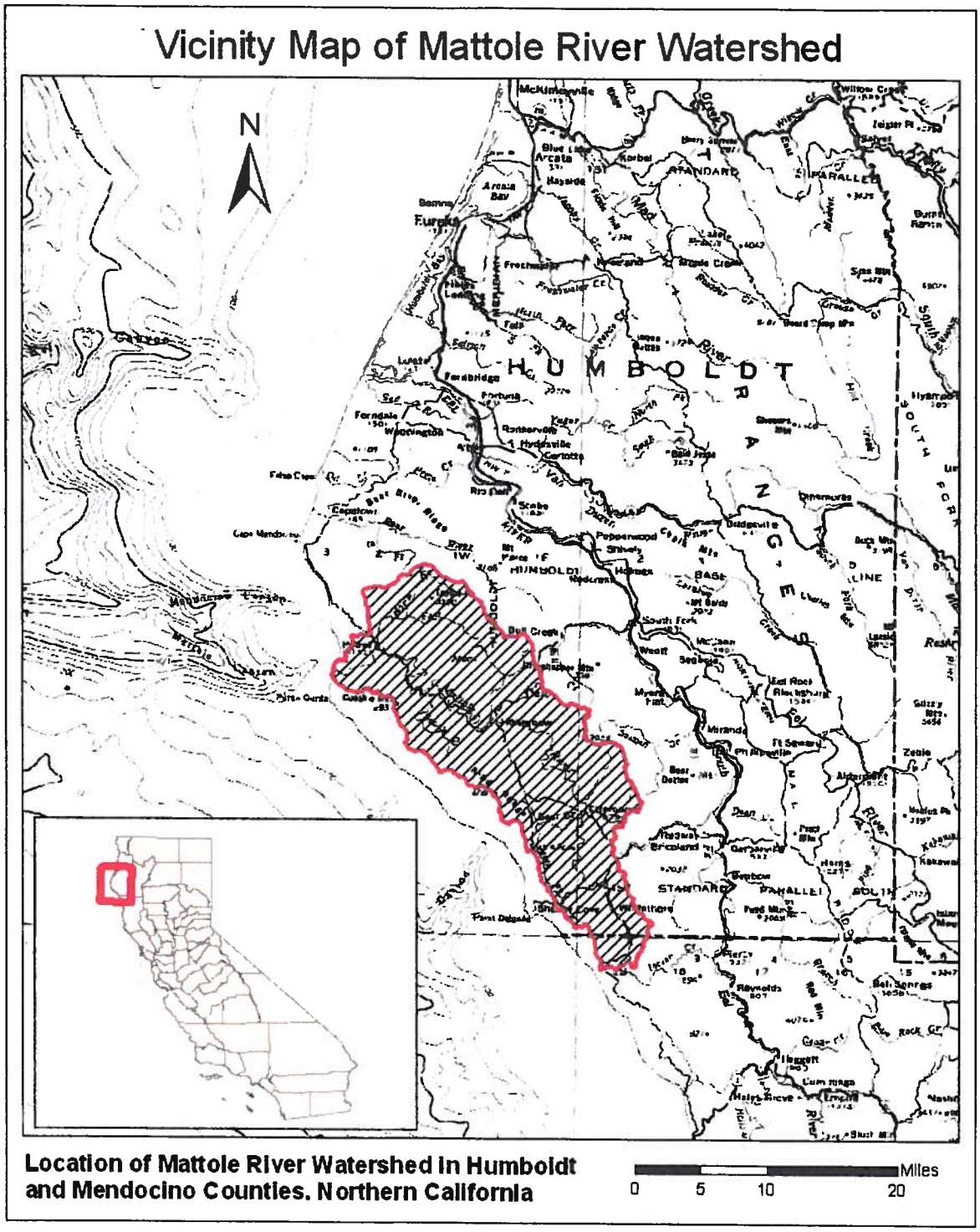
along with the decline in housing starts that also began in 2007.

Landowners with potentially commercial conifer stands face a difficult task in bringing their stands into sustainable management. By state law, protection of environmental values must be built into every timber harvest plan, the preparation and approval of which adds to the cost of timber management – and makes timber and wood products from neighboring states and foreign countries with less restrictive laws competitive with local timber. (Until its shutdown in 2007, Harwood Industries, located just south of the Program area in northern Mendocino County, operated largely with feedstock from Washington State and British Columbia.) The "light touch" logging described in the description of the Proposed Program in Chapter 2 adds further restrictions to the already extensive provisions of the FPR, in order to ensure that not only are resources being protected, but timber stands are also being managed to increase in size and age and develop into a variety of wildlife habitats over the next several decades. Current prices for preparation of a timber harvesting plan under the FPRs are well into five figures (Thompson and Dicus 2005), making even "normal" timber harvest barely feasible commercially, much less the more restrictive silvicultural treatments proposed under the Program.

In addition to the challenges posed by eroded and unstable slopes, shaky economics, and the necessity of focused environmental protection, the Mattole watershed is recognized as having a high propensity for stand-replacing wildfire (http://firesafecouncil.org/fireplanindex.html May 2002). The young, closed-canopy timber stands that have developed since the Douglas-fir boom are particularly flammable. Citizens of the area have worked to create fire-resistant forested areas around homes, communities, and along strategic firebreak locations such as roads and ridgelines. Nevertheless, the overall risk is still high. The prescriptions proposed by the Program incorporate components that could help reduce fire hazard across a potentially large portion of the watershed over time.

The MRC believes that analyzing the long-term timber management practices proposed by the Program under a blanket document such as this PTEIR will allow landowners to reduce their management planning costs. PTHPs, which are organized in a checklist format tiering to the analysis in the PTEIR, are expected to substantially lower costs for preparing timber harvest plans (THPs), while encouraging application of environmentally sensitive practices within managed stands that will benefit timberland owners and the environment over both the short and long term. Even though there are a host of obstacles to developing a sustainable timber-based economy in the Mattole basin over the next several decades, the ability of the land to produce trees, combined with the environmental consciousness of many residents of the basin, leads the MRC to believe that this effort has a good chance of succeeding.

Figure 1-2


Vicinity Map of Mattole River Watershed
N
HUMBOLDT
Location of Mattole River Watershed in Humboldt and Mendocino Counties, Northern California
Miles
0
5
10
20

1.3 Program Purpose and Program Objectives

The ultimate purpose of the Mattole Forest Futures Program is to facilitate improved forest management practices in the Mattole. Implementing the Program will provide an alternative regulatory pathway for timber harvest approval, containing extensive environmental protection measures which require less analysis (and thus cost less) than more intensive actions allowed under the California Forest Practice Rules (FPR). Landowners who agree to engage in "light touch" timber harvest may tier to this watershed-wide environmental review of the impacts of these specific practices, greatly simplifying the plan preparation process on most private parcels. The objectives of the Mattole Forest Futures Program include:

- Encourage the development of mature to late successional stands
- Maintain or improve wildlife habitat, particularly by developing late-seral habitat for listed species
- Increase the average size of trees so that timber stands become more commercially and ecologically valuable over time
- Improve water quality through reduction of controllable sediment sources
- Improve stocking of conifer species so that long-term sustainable timber management becomes more economically feasible
- Reduce the danger of catastrophic fire
- Manage existing stands, rather than "clearcut and start over"
- Retain legacy trees that are large and old, to provide stand structural diversity
- Maintain or improve the health and structure of riparian stands

1.4 Purpose of PTEIR

A PTEIR is prepared by a timberland owner, group of timberland owners, or other organization and submitted to the California Department of Forestry and Fire Protection (CAL FIRE) for a program or series of actions that can be characterized as one large project, which in this case is the ongoing management of timberlands, including timber operations and related land management practices, on multiple ownerships [see the Forest Practice Rules (14 CCR 1092.01) for information on PTEIR content and intent] in the Mattole Basin. This PTEIR analyzes the Program's proposed "light touch" practices in detail and once "certified" by CAL FIRE, landowners in the Program area may implement such practices by filing a PTHP with CAL FIRE. Program EIRs generally analyze broad environmental effects of the program, with the acknowledgment that site-specific environmental review may be required for particular aspects or portions of the program (see California Environmental Quality Act Guidelines, Section 15168).

This PTEIR, like other EIRs (and program EIRs), documents the environmental impacts of the Proposed Program and alternatives to the Proposed Program in order to:

- Inform decision makers and the public about a project's significant environmental effects and ways to enhance or reduce such effects

- Demonstrate to the public that the environment is being protected during Program implementation
- Adopt mitigation measures designed to minimize significant effects
- Ensure political accountability by disclosing to citizens the environmental values held by their elected and appointed public officials

1.5 Decisions Subject to California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) applies only to discretionary activities by public agencies that are defined as "projects". A "project" is defined as the whole of an action, which has the potential for resulting in either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment. (CEQA Guidelines sec. 15378(a); PRC 21065)

> A "project" under CEQA is considered to be an activity directly undertaken by a public agency, an activity that is supported, in whole or in part, through public agency contracts, grants, subsidies, loans, or other assistance from a public agency, or an activity involving the public agency issuance of a lease, permit, license, certificate, or other entitlement for use by a public agency. CEQA encourages the application of a programmatic approach where a group or series of projects are similar in activities and impacts and where potential impacts can be avoided or mitigated in a similar manner.

As required by regulation, CAL FIRE is the lead agency for this project. The Mattole Restoration Council (MRC) is preparing the PTEIR for CAL FIRE under letter agreement. The PTEIR process and CEQA require the preparation and circulation of a draft PTEIR. The certification of a final PTEIR by the CAL FIRE Director may occur once comments on the draft PTEIR have been addressed and specific findings are made with regard to the potentially significant effects of the project. At the time of Program approval the lead agency will adopt a Mitigation Monitoring and Reporting Plan (PRC 21081.6; MMRP). The monitoring plan is an important component of the PTEIR process. It ensures that the FPRs and mitigation measures contained in the PTEIR are in fact carried out in future PTHPs tiered to the PTEIR.

The Forest Practice Rules require PTHPs be accompanied by a checklist developed in the PTEIR to determine whether practices within individual PTHPs are within the scope of the analysis of the PTEIR. CAL FIRE will use this checklist as the agency evaluates these individual projects.

1.6 How Will the Proposed Program be Accomplished?

Critical steps necessary for accomplishment of the proposed Program include:

- Develop a set of Program goals that are realistic, practical, and achievable;
- Conduct public scoping and outreach to adequately inform the community about the project, and incorporate community values and knowledge into the array of practices that will be included in the Program;
- Design and base the Program on an array of forest management practices that are environmentally, economically, technically, scientifically, and socially sound;
- Prepare a PTEIR that can be certified by the CAL FIRE;

- Develop a Program specific checklist to accompany all PTHP filings that is cost-effective to submit and facilitates agency approval;
- Implement the Program land management practices across significant timbered acreage in the basin;
- Verify, through monitoring, that the goals of the Program are being met.

CAL FIRE regulates commercial timber harvesting on non-federal timberlands in California. Harvesting for commercial purposes is defined as: "(1) the cutting or removal of trees which are processed into logs, lumber, or other wood products and offered for sale, barter, exchange, or trade, or; (2) the cutting or removal of trees or other forest products during the conversion of timberlands to land uses other than the growing of timber which are subject to the provisions of Section 4621, including, but not limited to, residential or commercial developments, production of other agricultural crops, recreational developments, ski developments, water development projects, and transportation projects." (PRC 4527) The Mattole basin is within a state responsibility area and CAL FIRE has wildland fire suppression responsibility. CAL FIRE depends on the voluntary cooperation of private landowners to implement local fuel reduction measures. (For areas immediately around structures, state law PRC 4291 requires fuels management.)

Individual landowners who are interested in harvesting timber and in mitigating environmental impacts from such harvest by complying with the prescribed practices in the proposed Program are key to implementing the Mattole Forest Futures Project. In order to commercially harvest timber, California landowners must submit a Notice to or obtain approval from CAL FIRE through either:

- A THP (14 CCR 1032)
- An approved Modified THP (14 CCR 1051)
- A NTMP (14 CCR 1090)
- An Emergency Notice (14 CCR 1052)
- A Notice of Conversion Exemption Timber Operations (14 CCR 1104.1)
- A THP exemption (14 CCR 1038)
- An approved Program THP (PTHP) (14 CCR 1092)

PTHPs filed by individual landowners or groups of landowners are tiered to the PTEIR, which analyzes the consequences of the proposed action at the landscape scale. The Program contains an array of forest management practices developed to be applied and analyzed at the landscape level. Once the PTEIR is certified, individual landowners may, at their discretion, submit a PTHP to CAL FIRE in lieu of a standard THP, and it may be approved by CAL FIRE as long as it is within the scope of the PTEIR. In this case landowners are potentially afforded a significantly simplified approval process, including potentially reduced costs for preparation of the PTHP, compared to a THP that is not tiered to the PTEIR. Landowners would still have the option of filing any of the other CAL FIRE permits listed above.

1.7 State Agency Oversight of Program and PTHPs

There are three possible tiers of agency involvement in implementing the Program in addition to CAL FIRE. As noted above, CAL FIRE is the lead agency for the PTEIR and is responsible for overall decision-making at both the programmatic and project (PTHP) levels.

The California Department of Fish and Game (DFG) is both a trustee agency since it manages the state's wildlife and fisheries resources on behalf of the citizens of California and a responsible agency due to its role in permitting for stream crossings through Lake and Streambed Alteration Agreements (LSAAs). For the PTEIR, because DFG is a trustee agency, CAL FIRE will be required to consult on and coordinate all Program projects directly with DFG. The California Geological Survey (CGS) (Eureka office) ensures that geologic concerns for THPs submitted for Del Norte, Humboldt and Trinity counties are addressed and that landslide and mass wasting requirements are implemented. In addition to THP review, CGS provides technical advice in the development of site-specific prescriptions and provides ground verification of mapped landslides during the engineering geologic review of THPs.

Another tier of involvement by other State agencies in the Program includes responsible agencies that will use this EIR as the basis for making their own regulatory approvals such as the North Coast Regional Water Quality Control Board (NCRWQCB), which will be requested to issue a Waiver from Waste Discharge Requirements. Other responsible agencies that could be involved in project regulatory oversight and approval include the Coastal Commission or another agency with an approved Local Coastal Plan, and the North Coast Unified Air Quality Management Districts (NCUAQMD).

The third tier of State agency involvement includes commenting agencies (State Parks, Caltrans, etc.)

Another possible nexus for the involvement of responsible agencies in PTHP oversight is related to the use of prescribed fire, such as pile burning and broadcast burning, which are required to comply with the NCUAQMD burning requirements, such as obtaining a burn permit, etc. Removal of vegetation within the coastal zone is defined as a "development" project and is subject to permitting by the Coastal Commission or another local government agency that has an approved Local Coastal Plan, which could act as a responsible agency in projects near the coast.

As noted, the NCRWQCB may use this document for any necessary National Pollutant Discharge Elimination System (NPDES) waivers and the California Department of Fish and Game may use it not only for Lake and Streambed Alteration agreements but also for any permits required under the State Endangered Species Act.

The approval process for a PTHP is slightly different from that of a THP. The following describes the approval process for a PTHP:

- PTHP is submitted to CAL FIRE
- Consultation with responsible and trustee agencies occurs and their comments are considered prior to PTHP approval.

- Suggested alternatives, recommendations or mitigation by public agencies may be used by CAL FIRE in determining if the PTHP is within the scope of the analysis in the PTEIR and accurately applied.
- Preharvest inspection (PHI) held, if necessary, to determine consistency w/PTEIR and FPRs – PHIs may be necessary less frequently because PTHPs will rely on standard mitigations developed in the PTEIR in consultation with agencies.
- PTHP approval timelines would remain consistent with FPA and FPRs but without a second review.

1.8 PTEIR and Program Duration

A PTEIR remains in effect until such time as substantial changes in conditions occur or significant environmental impacts are identified which were not previously addressed in the PTEIR. When either of these situations occurs, the PTEIR may be amended or supplemented to address such new information (14 CCR 1092.28(c)). Thus, landowners could file PTHPs well into the future – perhaps as long as 20-50 years into the future - as long as the conditions within the Program area do not change substantially beyond the conditions described in the document. In order to calculate the environmental impacts of the proposed Program and its alternatives, an estimate of harvest under the Program across a 50-year time span was calculated, based on estimated landowner interest and timber stand conditions. For some stand types, the impacts on Timberland Resources were projected farther into the future – long enough to demonstrate that there would be a less than significant (or beneficial) impact on the resource.

1.9 Role of Local Government in PTEIR Process

A number of plans prepared by local governmental and non-governmental entities, regional, state and federal government have been prepared in the Mattole over the past ten years. Most of these plans contain general recommendations about specific components of the forested landscape in the Mattole and do not directly influence nor regulate private land forest management within the basin. These plans contain guidance, which might apply to persons managing forestland within the Mattole River watershed. They are listed below and described in Appendix E.

1. Upper Mattole Fire Plan, 2004 – prepared by Mattole Restoration Council and ForEverGreen Forestry Consultants
2. Lower Mattole Fire Plan, 2002– prepared by Mattole Restoration Council
3. Humboldt County Master Fire Protection Plan (MFPP), 2006 – prepared by Humboldt Fire Safe Council.
4. Humboldt County General Plan Update – 2008 – prepared by Humboldt County Planning Department
5. Humboldt Del Norte Fire Plan, 2005 – prepared by CAL FIRE
6. Resource Management Plan for the King Range Resource Area, 2005, prepared by USDI Bureau of Land Management (hereafter KRNCA) USDI BLM, 2005.
7. Mattole River Watershed Assessment Report, 2003. North Coast Watershed Assessment Program, p. 441 p. plus Appendices, prepared by California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

8. Mattole Watershed Plan Landscape Conservation Strategy by Eric Goldsmith, Sanctuary Forest, 2/4/05.
9. Upper Mattole River and Forest Cooperative Coordinated Resource Management Plan, prepared by Sanctuary Forest, 4/27/06.
10. Foresight 2020: Mattole Integrated Coastal Watershed Management Plan, prepared by the Mattole River and Range Partnership (MRC, Mattole Salmon Group, and Sanctuary Forest), 8/31/09.

1.10 Chapter 1 Bibliography

ISF, 2011. Institute for Sustainable Forestry. (In preparation.) Analysis of Timber Harvest Planning Costs in Northwest California for the Mattole Light Touch Harvest Ecological Restoration Program. Redway, CA.

NCWAP, 2002. (Downie, Scott T., C.W. Davenport, E. Dudik, F. Yee, and J. Clements (multi-disciplinary team leads). 2002). Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program, p. 441 plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

Richard P. Thompson and Christopher A. Dicus, 2005. The Impact Of California's Changing Environmental Regulations On Timber Harvest Planning Costs, The California Institute for the Study of Specialty Crops And The Forest Foundation. San Luis Obispo, California. 40 pp.

Chapter 2: Environmental Setting, Program Description and Alternatives

2.0 Environmental Setting

The following overview and environmental setting provide a brief description of the Program area and the surrounding landscape. A detailed description of the environmental setting precedes each environmental impacts subchapter.

The Mattole River drainage is approximately 189,760 acres in extent (296 sq. mi.). It is located in the California Coast Range, in western Humboldt and northern Mendocino Counties, about 290 miles north of San Francisco and 26 miles southwest of Eureka, the largest nearby city and the county seat of Humboldt County. The watershed drains into the Pacific Ocean near the town of Petrolia.

Precipitation in the Mattole is highly seasonal, with 90 percent falling between October and April. Annual precipitation ranges from about 45" near Petrolia to 115" on Rainbow Ridge. Snowfall occurs occasionally at elevations above 2,000 feet, but rarely accumulates for long.

The total resident population of the Mattole basin in the 2000 census was estimated at about 1,200, or four people per square mile (NCWAP, 2002). The bulk of the population is located around the communities of Petrolia, Whitethorn, Ettersburg and Honeydew. Local residents pursue a variety of economic activities, including stock raising (cattle, sheep, and goats), nonindustrial timber management, logging, agriculture (including orchards, pasture, field crops, and viticulture), and heavy equipment operation. Two large timber companies, Barnum Timber, which practices intensive management, and Humboldt Redwood Company, which practices somewhat less intensive management, own substantial acreage in the drainage. Many residents commute outside the area for their livelihoods, mostly accessing the U.S. Highway 101 corridor.

The current vegetation is predominantly forestland. Mixed conifer/hardwood forestland occupies 57% of the watershed while hardwood forests occupy 17% and more purely conifer forests occupy another 8%. Twenty percent of the area is covered by stands that average greater than 24-inch DBH trees, half of the watershed is covered by trees that have an average size of 12-24 inches diameter at breast height (DBH), and 11% is covered by pole-sized trees 6-11 inches DBH (NCWAP, 2002).

Annual grasslands occupy approximately 15% of the watershed. The size and location of mapped grasslands has experienced a sharp decline in recent decades due to the curtailment of intentional fire and decline in grazing, leading to encroachment by woody vegetation.

In characterizing vegetation, NCWAP states that, *"Studies cited in the Redwood Creek Watershed Analysis suggest that a climatic shift towards the currently cooler and moister climate occurred about 2500 to 2800 years ago. While Native American burning practices prior to the arrival of European settlers suppressed the encroachment of Douglas-fir and other woody*

vegetation, the region-wide loss of about one-quarter of the prairie and oak woodlands since 1850 is attributed to fire exclusion and road building. The hypothesis that the mosaic of vegetation that existed prior to the historic land practices of the last 150 years was probably more varied and in smaller patches was tested by the BLM as part of the BLM Honeydew Watershed Analysis (1996). This study compared the 1948 vegetation as shown on soil and vegetation maps prepared by the USDA Forest Service and the State of California Division of Forestry using 1947-48 aerial photography against current vegetation data acquired as a part of their analysis project. The study indicates that of three sub-watersheds, 90% of the Upper Honeydew sub-watershed has never been harvested, while Beartrap and Eastern Honeydew sub-watersheds were harvested between 1954 and 1966; thus, the patchy and variable 1948 vegetation in Upper Honeydew sub-watershed can be assumed to be relatively characteristic of the pristine vegetation for that time period."

Vegetation types other than forest or grassland occupy only three percent of the watershed. With the exception of the Mattole River estuary and side channels, there are no lakes or other reservoirs of significant size.

The current vegetation is the result of fire history in addition to timber harvesting and grazing. Fire was a natural and frequent occurrence in the Mattole Basin. Interviews of Honeydew Creek watershed residents during compilation of the BLM watershed analysis indicated that many ranchers burned the same areas every two or three years to control poison oak and other brush (Anders 1995). However, active fire suppression efforts beginning in the 1940s changed the nature of wildfire from frequent, low-intensity ground fires to occasional, catastrophic fires. Fires now have the ability to burn through large acreages and to severely damage both upslope and riparian areas, setting back the seral stage. A summer weather pattern of lightning and periods of strong winds, combined with unnaturally high fuel loading may lead to forest stand replacement wildfire as a major upslope contributor to the quality of anadromous fish habitat within the Mattole Basin.

The towns of Petrolia, Ettersburg, Whitethorn, and Honeydew are all listed in the California Fire Plan as being in a high wildfire threat area (http://firesafecouncil.org/fireplanindex.html, May 2002). The Mattole Valley/Prosper Ridge area and the Shelter Cove subdivisions, which extend to the watershed boundary, are identified in the CAL FIRE Humboldt/Del Norte Unit Fire Management Plan as being two of the highest risk areas in the county.

The mainstem Mattole River is approximately 60 miles in length. Seventy-four named tributaries feed the mainstem. Major tributaries include the Lower and Upper North Forks, Bear Creek, Honeydew Creek, and Squaw Creek. The Mattole watershed borders the watershed of the South Fork Eel River on the east and the Bear River watershed on the north. To the west a long ridge separates the Mattole Valley from numerous small watersheds that drain directly into the Pacific Ocean (Mattole Restoration Council 2005).

2.0.1 Land Uses in the Mattole

Land uses in the Program area include cattle ranching, outdoor recreation, forest and timber management, stream restoration, forest preservation and protection, and rural residential use.

Many residents practice agriculture, including marijuana growing and viticulture. The formerly important activities of sheep ranching and orchard fruit production are in steep decline. Residents of the Mattole are flexible in their opportunities for making a living, including commuting to outside jobs. No one community is considered the predominant center of the community, though semi-urban development patterns predominate around the main named communities. A detailed description of land uses and timber harvest history is included in Appendix B of the NCWAP report.

The future of the Mattole watershed is linked to several factors. The Mattole Watershed Plan (Mattole Restoration Council 2005) notes that

> *"...the kind of growth we are likely to see in the Mattole – second homes, trophy ranches, and boutique agriculture. The past decade has seen an influx of retirees, many bringing a deep connection and love of the Mattole, and wealthier individuals purchasing ranchland at prices that are locally expensive, but cheap from a statewide perspective."*

and that:

> *"residential land demand and protection of family-owned ranchlands will likely result in higher land values across the region. As of 2004, 80% of Humboldt County residents could not afford to buy a median-priced house on their income (Smith and Steinberg 2005)."*

Approximately 22% of the Mattole is in public ownership and 78% is private. Public ownership is split unevenly between Bureau of Land Management (BLM) and the State of California. BLM manages 20.2% of the land in the Mattole, while the State holds only about 1.1%. None of the public lands are actively managed for resource extraction. Outdoor recreation primarily occurs on the BLM-managed King Range National Conservation Area or California State Park lands (NCWAP 2002).

Table 2-1 below shows the number of acres by land use category within the Mattole basin while Figure 2-1 shows generally where such lands are located.

Table 2-1
Acres By Land Use Category

Category	Acres
Non-Industrial Private	123,920
Industrial Timberland	24,660
Private Conservation	650
BLM	38,375
State	2,065
Total	189,760

There are two relatively large (>5,000 acres) industrial timber ownerships in the Mattole that constitute 13% of the area (see Figure 2-1). Industrial timberlands are actively managed for timber growth and harvest. However, there has been a trend among the large timberland owners of selling off parcels for conversion to rural residential use, a trend that is expected to continue into the future (NCWAP 2002). Landowners committed to forest preservation, such as Save the

Redwoods League and Sanctuary Forest; own approximately 0.3% of the Mattole. There is limited public access on these lands and no extractive uses.

2.0.2 Land Ownership in the Mattole

The majority of the private land in the Mattole watershed is composed of small and moderate sized ownerships. Over 50% of landowners own 40 acres or less and an additional 35% own 40-160 acres, so 85% of landowners own 160 or fewer acres. The ownerships of 160 or fewer acres account for approximately 40,000 acres or 20% of the analysis area. Moderate sized landowners (160-5,000 acres) account for an additional 85,000 acres or 45% of the analysis area. The two large, industrial forest ownerships in the Mattole own 23,000 acres, or 12% of the analysis area (Table 2-2).

The largest single landowner in the Mattole is the BLM, which manages over 35,000 acres or 18% of the watershed. The other public landowner in the Mattole is the State of California, which owns approximately 2,800 acres, mostly in the Southern subbasin.

Table 2-2
Percentage of Subbasin in each Ownership Class

	Ownership Size Classes (acres)				
Subbasin	**<160**	**160-640**	**640-5,000**	**5,000-20,000**	**>20,000**
East_1	31.17%	31.01%	37.83%	0.00%	0.00%
East_2	55.90%	28.54%	13.93%	1.62%	0.02%
North_1	7.06%	11.17%	64.73%	15.97%	1.08%
North_2	12.23%	13.66%	43.81%	30.30%	0.00%
South_1	34.60%	22.84%	14.40%	21.24%	6.92%
West_1	17.84%	30.40%	22.59%	0.00%	29.17%
West_2	15.63%	14.32%	8.40%	0.00%	61.65%

Small ownerships (<160 acres) are concentrated in the Eastern two subbasins and the Southern subbasin (Table 2-2). The larger ranch and timberlands occur primarily in the North_1, North_2 and West_1 subbasins. The majority of the federal public land occurs in the West_1 and West_2 subbasins, where BLM stewards 29% and 62%, respectively, of the subbasins.

2.0.3 Timber Harvest History

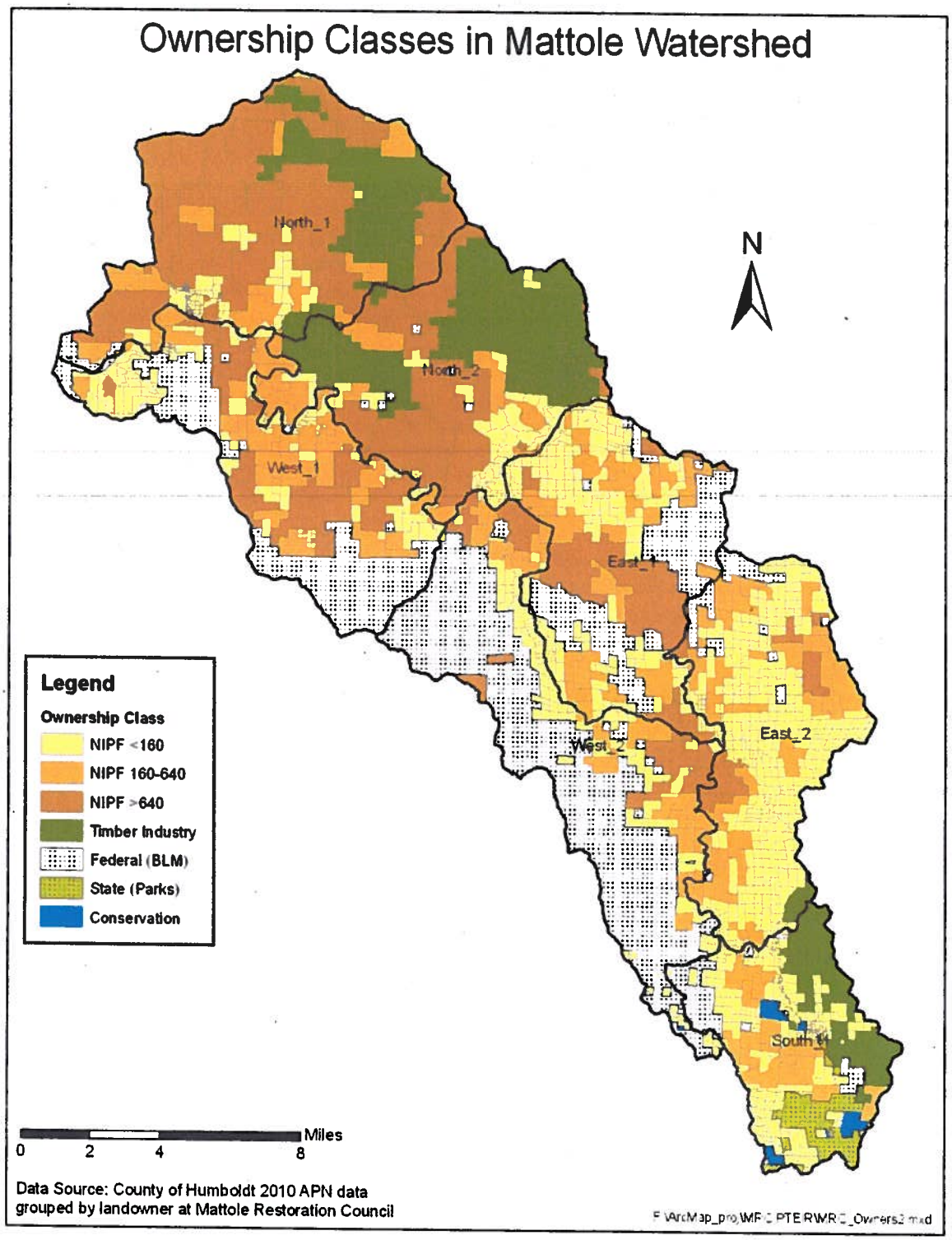
Approximately 93% of the available forested land in the Mattole was harvested between 1945 and 1983; predominantly using even-age systems of clearcut, seed tree or shelterwood harvest (NCWAP 2002). Tractor yarding was the most common logging system, often skidding downhill into the tributary streams and using streambeds for roads and landings. The following discussion and table (Table 2-3) is a summary of the timber harvest history across the Mattole basin that was included in Appendix B of the NCWAP report. Note that Table 2-3 and the following discussion refer to the entire Mattole watershed, not just the timbered portion.

Table 2-3
Timber Harvest History- Entire Watershed*

	Total Harvested Acres	Total Area Harvested (%)	Average Annual Harvest (ac)	Average Annual Harvest Rate
Harvested ~ 1945-1961**	72,897	38%	4,288	2.3%
Harvested 1962-1974**	21,141	11	1,626	0.9%
Harvested 1975-1983**	6,948	4	772	0.4%
Harvested 1984-1989	3,900	2	650	0.3%
Harvested 1990-1999	8,405	4	840	0.4%
Harvested 2000-2001	1,809	1	905	0.5%
Grasslands	33,504	18		
Brush and Hardwoods	38,828	20		

*Does not add to 100% due to data discrepancies, re-harvest areas and uncut timber areas.
** CAL FIRE has not validated the accuracy of this data (obtained from MRC).

Figure 2-1


Ownership Classes in Mattole Watershed
North_1
North_2
West_1
East_1
West_2
East_2
South_1
N
Legend
Ownership Class
NIPF <160
NIPF 160-640
NIPF >640
Timber Industry
Federal (BLM)
State (Parks)
Conservation
0
2
4
8
Miles
Data Source: County of Humboldt 2010 APN data
grouped by landowner at Mattole Restoration Council

From the NCWAP report: "In Table 3.1.3-1, [table 2-3 above] *the harvest periods are broken into irregular time intervals as a result of the way existing data was compiled. For the most part, the first period consists of the post-war logging boom, although a portion of the southern headwaters were harvested just prior to the 1942 aerial photos. This category includes most of the area harvested and roaded before the 1964 flood which is estimated to be a one-hundred-year event, meaning that in any given year there is a one percent chance of the stream carrying the same volume of water. Thirty-eight percent of the watershed was harvested during this time period. The harvest period 1964-1974, also prior to the establishment of the first iteration of the Forest Practice rules authorized by the Z'Berg-Nejedly Forest Practice Act of 1973, brought the cumulative total to 49 percent of the watershed area logged by tractor and skidded downhill to log landings and access roads low on the slopes and often adjacent to streams. The next interval, 1975-1983, is a time period of Forest Practice rules prior to substantive watercourse protection. The acres listed in the years 1984-2001 are based on the completion date of timber harvesting plans (THP) and submission dates for non-industrial timber management plans (NTMP) submitted to the California Department of Forestry and Fire Protection. There were 1,022 acres in NTMPs in the time interval 1990-1999 and 73 acres in 2000-2001. This time period is the most current and harvesting practices reflect increasingly restrictive measures for activities near watercourses. Only about 7 percent of the watershed has been harvested since 1984. These years are broken into intervals that are similar to those used for other analyses in the NCWAP program."*

A rough rate of harvest would indicate that from 1945-1961, an average of 2.2 percent of the watershed was harvested per year, from 1962-74, almost one percent, and about one-half percent of the watershed harvested per year from 1984-2001. Much of the watershed is in young stands of trees. As these grow into harvestable size, one could reasonably anticipate an increased rate of harvest on private lands beginning in the next ten to twenty years."

The NCWAP harvest history analysis extended through 2001. There were 1,534 acres of timber harvested during the 2001 to 2007 time period, or approximately 255 acres/year. This rate of harvest is lower than any of the periods reported in Table 2-3.

The most intensive harvest in the period from 1983 to 2007 occurred in the Southern subbasin, where approximately 3,400 acres or 19% of the subbasin was harvested in the 24-year period using predominantly even-aged or overstory removal silvicultural systems (Table 2-4). The greatest total acreage harvested occurred in the North_1 and North_2 subbasins and exceeded 3,500 acres each. Conversely, the East_2 subbasin was subject to only 283 acres of harvest or 1.1% of the subbasin in the same time period.

Table 2-4
Mattole Harvest By Subbasin 1983-2007 (Complete And Active)

	Silviculture 1 (Acres)	Silviculture 2 (Acres)	Silviculture 3 (Acres)	Total (Acres)	% Of subbasin	Annual Rate (acres)
East_1	632	1,236	433	2,301	8.9%	96
East_2	119	124	40	283	1.1%	12
North_1	1,588	1,213	795	3,597	10.5%	150
North_2	1,662	460	1,482	3,604	12.4%	150
South_1	1,427	1,049	921	3,397	19.3%	142
West_1	242	-	180	422	1.6%	18
West_2	149	116	8	273	0.9%	11
Total	5,819	4,199	3,859	13,877	7.3%	578

Silviculture Category I includes even-aged regeneration prescriptions: clear-cut, rehabilitation, seed tree step, shelterwood seed step and road construction.
Silviculture Category 2 includes prescriptions that remove most of the largest trees: shelter wood prep step, shelterwood removal step and alternative prescriptions.
Silviculture Category 3 includes prescriptions that leave large amounts of vegetation after harvest: selection, group selection, commercial thin, sanitation salvage, transition and seed tree removal step prescriptions.

2.0.4 Roads

Roads were installed throughout the Mattole basin to harvest timber in the twentieth century. According to the TMDL analysis (NCRWQCB, 2002):

> "There are approximately 3,310 miles of active and abandoned roads in the Mattole basin (Perala et al., 1993). The county maintains about 100 miles of road, and about 25 miles are maintained by the BLM. About 385 miles of active roads are maintained at various levels, leaving 2,800 miles of abandoned roads, which are neither managed nor maintained. These old roads still contribute "legacy" sediment to the system. Roads contribute sediment not only through surface runoff, but also through road-construction-related failures such as cut and fill failures, gullies, and landslides."

The density of roads (mi/mi^2) is generally proportional to the quantity of sediment that originates from the road network. According to the TMDL analysis, the density of roads ranges from a low of 3.0 miles per square mile (mi/mi^2) in the Northern subbasin to a high of 9.1 (mi/mi^2) in the Southern subbasin. Table 2-5 below shows road densities as reported in the TMDL analysis (NCRWQCB, 2002) from a data layer compiled by the UC Davis Information Clearinghouse for the Environment (ICE) and as reported in NCWAP.

Table 2-5[1]
Road And Stream Densities By Subbasin

Subbasin	NCWAP Road Density (Miles/mile^2)	ICE Road Density (Miles/mile^2)	ICE Stream Density (Miles/mile^2)
East_1	4.6	6.0	4.1
East_2	4.6	6.0	4.1
North_1	2.3	3.0	4.4
North_2	2.3	3.0	4.4
South_1	7.0	9.1	4.2
West_1	4.8	6.2	4.2
West_2	4.8	6.2	4.2

2.0.5 Vegetation

The Mattole basin is notable for its disturbance regimes. The terrain is geologically unstable, with disturbances ranging from surface erosion on exposed soils to mass-wasting landslides, to active, frequent seismic activity related to the young geologic terrain. Rainfall in the Mattole area is among the highest recorded in the state, which, because of the Mediterranean climate, occurs almost all within the six-month winter season. Single rain events can sometimes yield up to 12 inches in 24 hours (Mattole Restoration Council 2005). The abundance of rainfall results in all dimensions of flood events, from high water events that occur several times during the rainy season to the "100-year" 1955 and 1964 floods that devastated the entire watershed. Lightning-generated wildfires, which can, under the right conditions, sweep across the rugged terrain, are also common natural disturbances.

Through adaptation to disturbance, therefore, all the vegetative types of the basin contain species that can adapt and even thrive through frequent disturbances. Douglas-fir, the most common conifer species in the basin, regenerates quickly by seed fall on bare ground created by landslides or fires; but when mature, has a thick bark that can insulate its living tissue from all but the most intense fires. Hardwoods, such as tanoak, madrone, and pepperwood, sprout abundantly from the root collar when their aboveground portions are damaged or destroyed. Riparian species, such as willow, alder, and cottonwood produce abundant seed that can quickly re-vegetate denuded floodplains.

These natural disturbance regimes have been influenced by human activities. For thousands of years, Native American inhabitants managed their landscape by setting frequent fires. The presence of grassland prairies is at least partly correlated with Native burning, although grazing and other post-settlement activities were contributing factors as well. Stripping and selling the

[1] According to the text of the TMDL analysis (Coates 2002) the road density values reported in the TMDL were based on a combination of the mapped road network GIS layers originally developed for the NCWAP and additional mapping effort completed for the TMDL by UC Davis' Information Center for Environment (ICE) in 2002 (ICE 2002). The RWQCB furnished the resultant ICE road layer to the Mattole Restoration Council, however queries of this dataset by MRC and its contractors yielded different road densities for each subbasin than those reported in the TMDL. RWQCB staff were not able to explain the reason for the apparent disparity (B. McFadin pers comm. 2008).

bark from tanoak trees for use in the tanning industry was a lucrative economic activity practiced by European-descended settlers, and while it did little to reduce the abundance of tanoak in the basin, it led to the widespread loss of large and ecologically and culturally valuable tanoaks.

The pre-European settlement landscape therefore contained a disturbance-related mosaic of vegetation ranging from regeneration in recently disturbed areas to old growth on sites where disturbance was either infrequent or the vegetation was able to withstand its impacts. Until the end of WWII, about 50% of the basin was occupied by old growth conifer forests of varying density; but by 1965, 60% of these stands had been clearcut or high-graded. In the North Fork of the Mattole, Carkeet reported in 1967 that "*...nearly 25 percent of the total watershed area has been logged of 70 percent of the merchantable timber volume within the last five years; whereas only 3.2 percent of the total watershed area has been logged prior to five years, to the extent that no merchantable timber remains to date.*" After the elimination of most of the old growth forests, logged areas were left to regenerate as best they could. In many cases this meant that understory species such as tanoak were able to capture stands denuded of conifer seed trees. Also, because understory tanoaks were ignored by the loggers, it was easy for the tanoaks to capture the site, even if conifer seed was available, because they had a headstart on the fir seedlings. Soils were exposed to rainfall by removal of the tree cover, but even more degraded by the extensive network of skid trails and logging roads that were installed, usually without planning or engineering, for logging. And although the native species are disturbance-adapted, many introduced plant species also found an easy pathway into the area via areas cleared for roads or logging, or on overgrazed pastureland.

Despite enormous impacts within a relatively short time, the current vegetation in the Mattole Basin remains predominantly forestland, with over 80 percent comprised of mixed conifer and hardwood forestland, hardwood forests, and coniferous forests. Vegetation of the watershed includes various successional stages of Douglas fir (*Pseudotsuga menziesii*) mixed with hardwood forest and coast redwood (*Sequoia sempervirens*) near the headwaters, with ridge tops and hillsides being dominated by fescue and oatgrass coastal prairie. The Northern subbasin contains the largest contiguous old growth forest remaining in the entire watershed, but across the rest of the basin the vegetation type is predominantly second-growth mixed hardwood/Douglas Fir forest, with grasslands as a significant secondary component (NCWAP 2002).

The Mattole watershed contains a diversity of vegetation types. For the purposes of analysis in this EIR, land cover in the watershed is divided into four broad categories of vegetation: commercial forest types, non-commercial forest types, grasslands, and other non forested vegetation types not proposed for treatment under the Program (Figure 2-2). These categories are based on the CALVEG 1998 GIS data – a typing and mapping exercise carried out by the USFS Region 5 utilizing LANDSAT imagery as the base layer. Certain forest types, such as Coastal Oak Woodland (COW) and Montane Hardwood (MHW), were eliminated from further analysis due to their low stocking and/or lack of occupancy by commercially viable species. After these areas were eliminated, the 1998 GIS data showed there were 116,831 acres of commercial forest types, 34,134 acres of non-commercial forest types, 33,737 acres of grasslands and 4,762 acres of non-forested types within the Mattole watershed in 1998 (Table 2-6). It is important to recognize that satellite imagery classification is inherently an imprecise process.

Consequently, in the ultimate implementation of the program, it is possible that timber harvest layout may include some areas that were classified as non-commercial forestland from satellite imagery, but which ground-based analysis reveals to be commercial forest. The analysis of the Proposed Project's effects are not dependent on the program of harvest being implemented only within those areas categorized as commercial forestland on in Figure 2-2. Regardless of any such classification errors, the total harvest area analyzed for each sub-basin will still apply for the purposes of limiting cumulative effects of harvest.

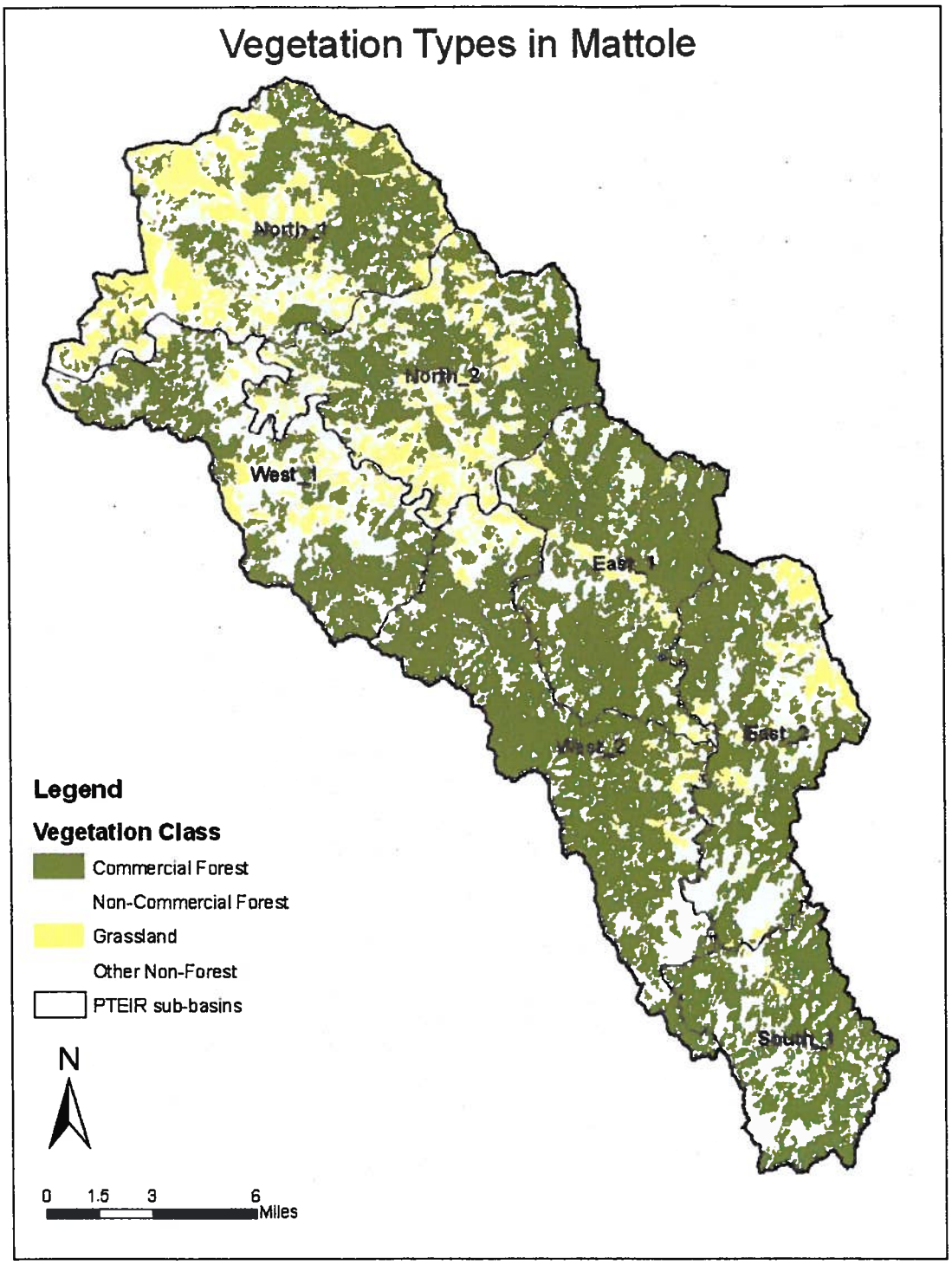
Table 2-6

(Totals for each subbasin preceed the breakdown by diameter class.)

Vegetation Type Categories in Mattole

		Commercial Forest	Non Commercial Forest	Grasslands and Oak Woodlands	Other Non Forested	Grand Total
Sub-basin	**East_1**	**20,351**	**2,996**	**2,151**	**394**	**25,892**
Diameter Class	<1"	-	10	1,874	394	2,278
	1-6"	0	21	-	-	21
	6-11"	1,871	1,200	73	-	3,144
	11-24"	12,142	1,452	193	-	13,787
	>24"	6,338	313	11	-	6,662
Sub-basin	**East_2**	**15,616**	**5,939**	**3,195**	**162**	**24,911**
Diameter Class	<1"	9	10	3,191	162	3,372
	1-6"	13	60	-	-	73
	6-11"	1,447	1,468	-	-	2,915
	11-24"	11,177	3,614	-	-	14,791
	>24"	2,970	787	4	-	3,761
Sub-basin	**North_1**	**15,060**	**4,608**	**13,178**	**1,446**	**34,292**
Diameter Class	<1"	-	157	11,167	1,446	12,771
	1-6"	26	5	4	-	34
	6-11"	1,561	1,542	233	-	3,336
	11-24"	7,777	2,518	1,684	-	11,979
	>24"	5,696	386	90	-	6,171
Sub-basin	**North_2**	**15,313**	**4,704**	**8,359**	**728**	**29,105**
Diameter Class	<1"	-	15	6,777	728	7,520
	1-6"	54	32	-	-	87
	6-11"	1,642	1,471	263	-	3,377
	11-24"	8,771	2,940	1,238	-	12,950
	>24"	4,846	245	81	-	5,172
Sub-basin	**South_1**	**13,164**	**4,163**	**300**	**16**	**17,644**
Diameter Class	<1"	11	10	300	16	338
	1-6"	18	23	-	-	40
	6-11"	948	1,160	-	-	2,109
	11-24"	9,096	2,037	-	-	11,133
	>24"	3,092	933	-	-	4,025
Sub-basin	**West_1**	**13,734**	**5,997**	**4,546**	**1,459**	**25,736**
Diameter Class	<1"	-	55	3,146	1,459	4,660
	1-6"	4	6	-	-	9
	6-11"	1,353	816	106	-	2,275
	11-24"	8,848	4,641	1,264	-	14,753
	>24"	3,529	480	29	-	4,038
Sub-basin	**West_2**	**23,593**	**5,767**	**2,008**	**555**	**31,923**
Diameter Class	<1"	-	14	1,753	555	2,322
	1-6"	14	48	3	-	65
	6-11"	2,126	1,215	24	-	3,364
	11-24"	14,898	3,625	215	-	18,738
	>24"	6,556	865	14	-	7,434
Grand Total		**116,831**	**34,174**	**33,737**	**4,762**	**189,504**

Figure 2-2


Vegetation Types in Mattole
North_1
North_2
West_1
East_1
West_2
East_2
Legend
Vegetation Class
Commercial Forest
Non-Commercial Forest
Grassland
Other Non-Forest
PTEIR sub-basins
N
0 1.5 3 6
Miles

The 1998 vegetation data are based on remotely sensed information using satellite imagery and subsequent ground truthing for verification and slight modification. For the purposes of this EIR, vegetation analysis utilizes the Wildlife Habitat Relationship (WHR) classification system developed by CA DFG. The following table shows the classification system categories for forestlands found in the Mattole. Forest type designations are based on predominant species, size class by average overstory tree diameter, and density by total canopy cover.

Table 2-7
WHR Classification Key for Mattole Forestlands

SPECIES		SIZE CLASS avg dbh of overstory		DENSITY Total Canopy Cover %	
DFR	>50% relative overstory cover by conifers (Douglas fir /redwood)	6	> 24" & multi-storied	S	Sparse 10-25%
MHC	Montane Hardwood/Conifer - relative overstory conifer cover between 25 & 50%	5	> 24"	P	Patchy 25-40%
MHW	Montane Hardwood – relative conifer cover < 25%	4	11" – 24"	M	Moderate 40-60%
		3	6" – 11"	D	Dense > 60%
		2	1" – 6"		
		1	< 1"		

A search of the NDDB database from 2009 and a current list from the USFWS Arcata office for Humboldt County (document Number 55346743-11305) shows that there are 15 "special status" plant species within the basin. Three species are listed as endangered on the federal and state lists, and one species is listed as 'rare' on the state list. Also from the state plant list, CNPS lists six species as category 2.2 (eligible for state listing and "fairly threatened"). All of the plants constituting List 2 meet the definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endangered Species Act) of the California Department of Fish and Game Code, and are eligible for state listing. It is mandatory that they be fully considered during preparation of environmental documents relating to CEQA.

Table 2-8
Special Status Plant Species

Scientific Name	Common Name	# occurrences	Fed List Status 1/	CA List Status 1/	CNPS LIST
Astragalus pycnostachyus var. pycnostachyus	coastal marsh milk-vetch		None	None	1B.2
Calamagrostis foliosa	leafy reed grass	4	None	Rare	4.2
Castilleja affinis ssp. litoralis	Oregon coast paintbrush		None	None	2.2
Erysimum menziesii	Menzies' wallflower	N/a	Endangered	Endangered	1B.1
Erythronium oregonum	giant fawn lily	1	None	None	2.2
Erythronium revolutum	coast fawn lily	7	None	None	2.2
Gilia capitata ssp. Pacifica	Pacific gilia	6	None	None	1B.2
Hesperevax sparsiflora var. brevifolia	short-leaved evax		None	None	1B.2
Layia carnosa	beach layia	1	Endangered	Endangered	1B.1
Lillium occidentale	Western lily	N/a	Endangered	Endangered	1B.1
Montia howellii	Howell's montia		None	None	2.2
Packera bolanderi var. bolanderi	seacoast ragwort		None	None	2.2
Piperia candida	white-flowered rein orchid		None	None	1B.2
Polemonium carneum	Oregon polemonium		None	None	2.2
Sidalcea malviflora ssp. patula	Siskiyou checkerbloom		None	None	1B.2

2.0.6 Water Quality

The NCWAP analysis contains an extensive description of the water quality conditions within the basin as well as an exhaustive description of pool quantity and quality, spawning gravel quality, shade canopy, fish passage and large woody debris conditions within the basin. These descriptions are not repeated in detail here, but instead are summarized below. For a more detailed description of water quality within the Mattole basin, see NCWAP, 2002, pages 110-115, and pages 146-148.

> *"The Mattole River has been placed on a list of water bodies for impairment or the threat of impairment by sediment and temperature as required by Section 303(d) of the Clean Water Act. The 303(d) list describes water bodies that do not fully support all beneficial uses or are not meeting water quality objectives, and the pollutants for each water body that impair beneficial use and water quality.*
>
> *At the time of the listing sediment and temperature were judged to be impacting the cold (COLD) water fishery and associated beneficial uses, described in the Water Quality Control Plan, North Coast Region, Region 1 (Basin Plan, 1996). Nearly all aspects of the cold-water fishery are presumed affected by sediment and temperature pollution, including the migration, spawning and reproduction, and early development of cold-water fish such as coho and Chinook salmon, and steelhead trout.*
>
> *Other beneficial uses of water in the Basin Plan for the Mattole River include municipal, agricultural, industrial, water contact and non-contact recreation, commercial and sport fishing, wildlife habitat and those plant and animal populations associated with terrestrial ecosystems, as*

well as similar attributes in estuarine ecosystems. Aquaculture in the Mattole River is also foreseen as a potential beneficial use in the Basin Plan."

In addition to the NCWAP report, the MRC and its partner groups the Mattole Salmon Group and Sanctuary Forest, recently completed their Integrated Coastal Watershed Management Plan, Foresight 2020 in August 2009, which also contains a description of the water quality within the basin, including discussion of new and emergent issues not described in the 2002 assessment by NCWAP. Excerpts from the Mattole Integrated Coastal Watershed Management Plan Foresight 2020 (MRRP 2009) are reproduced below with the intent to characterize the water quality within the basin to provide the reviewer with sufficient information to make an informed decision about the consequences of implementing the Program.

"There is a large amount of research describing the soft geology and high rate of naturally occurring background sedimentation that occurs in the Mattole, which has been exacerbated by historic and present land use practices (Downie et al. 2003). Due to the high natural and human caused erosion throughout the watershed, the Mattole was listed as Impaired by the EPA and placed on the 303(d) list for both sediment and temperature, and has completed and adopted TMDL allocations from the EPA.

These two pollutants, while not typically thought of as pollutants in the traditional sense, significantly affect the ability of the river to support native salmonids, and have the potential to further impact water quality and other beneficial uses of the watershed. Elevated water temperatures increase the risk of algae blooms, lower the concentrations of dissolved oxygen, and lower the ecosystem's resistance to invasive species and pathogens, further diminishing water quality. The result is degraded salmon and steelhead habitat in most of the basin.

Historic accounts, including early photos (from 1875-1940) and aerial photographs from 1942, portray the Mattole River system with a much different morphology. Pools were deeper. There was far less erosion of main stem river terraces. These historic conditions facilitated thermal stratification, habitat cover, and streamside shading that moderated summertime water temperatures. The river system provided suitable habitat for robust runs of salmonid species, including Chinook salmon, coho salmon and steelhead. Taken together, these changes damaged Mattole salmon and steelhead habitat by reducing aquatic habitat complexity, burying stream channels, and raising summertime water temperatures.

The Mattole's excessive water temperature is the result of reduced streamside trees and increased sedimentation. Without the shade provided by the historic canopy, the river itself is subjected to increased solar radiation. The lack of streamside trees also promotes stream bank erosion, which further perpetuates temperature increases by continually adding sediment to the system, and thus widening stream channels, exposing them to greater solar inputs. The Mattole TMDL document provided a number of maps showing the current and potential shade throughout the watershed, as well as the difference between the two.

The TMDL uses shade as a surrogate measurement for heat entering the stream, as it is a more applicable measurement for land management and decision making (USEPA, 2002). Shade is easily measured in the field, easily modeled, and is the stream temperature factor mostly likely to be altered from natural conditions (USEPA, 2002). Total shade is of most concern on smaller tributaries, which make up the majority of the stream network in the Mattole. Shade has a major

influence on both the mean and maximum water temperatures in any given reach in small tributaries, and is easily affected by human activity (USEPA, 2002).

Shade is less important to main stem temperatures, where water temperature is the result of sediment delivery and channel aggradations (USEPA, 2002). This results in wider channels, shallower maximum depths, and little if any streamside trees. In many cases, the main stem channel is too wide for even tall trees to provide shade. Water temperature is therefore dependent on cold-water inputs from tributaries and groundwater, or the impacts of thermal stratification, where temperature at the bottoms of deeper pools maintains a lower temperature than the water at the surface.

According to the MSG, the upper Mattole provides the majority of thermally suitable main stem over summering habitat for juvenile salmonids (Figure 7-10). Water temperatures in the upper river are significantly cooler than in the lower main stem. However, only the uppermost temperature monitoring locations have suitable summer thermal habitat for juvenile coho; more areas are thermally suitable for steelhead survival due to their greater temperature tolerance.

Other concerns with water quality are just emerging and are not yet well characterized as to severity and extent. These include the likely impacts of diesel spills, nutrient pollution, bacteria and herbicides. Diesel fuel is delivered widely in the watershed to power residential electric generators. Accidents in the storing and handling of diesel are not uncommon. Fertilizers and nutrient fortified soil are used in potentially significant quantities for agriculture. Herbicides are used to aid coniferous forest regeneration on industrial forestlands, which constitute 14% of the watershed.

There is no municipal sewage treatment in the Mattole and all sewage is handled through septic or pit systems. The total number of traditional septic systems in the watershed is unknown due to a lack of permitted building, but it is assumed that every developed parcel either contains a septic or a pit system."

2.0.7 Fisheries and Aquatic-Riparian Conditions

As is the case with water quality, both the NCWAP analysis and the Mattole Integrated Coastal Watershed Management Plan, Foresight 2020 (MRRP 2009) contain detailed descriptions of the fishery conditions within the Mattole neither of which are repeated here. Excerpts from the NCWAP report are repeated below. For a more detailed description of the Fisheries and Aquatic-Riparian conditions within the Mattole basin, see NCWAP, 2002, pages 115-134, and pages 148-151.

"Fishery resources of the Mattole Basin include fall-run Chinook salmon, coho salmon, winter-run steelhead trout, and summer -run steelhead trout. Other fish present in the Mattole Basin include sticklebacks, lampreys, and sculpins (Table 16). Two notable fish species that have apparently been extirpated in the Mattole Basin are spring-run Chinook salmon (CDFG 1972) and green sturgeon (Moyle et al. 1989)."

Table 2-9, from the NCWAP contains a list of fish species that can be found in the Mattole Basin which is reproduced below:

Table 2-9

Table 16. Fish species in the Mattole Basin.

Common Name:	Scientific Name:
Anadromous	
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Rainbow trout	*Oncorhynchus mykiss*
Pacific lamprey	*Lampetra tridentata*
Freshwater	
Coast Range sculpin	*Cottus aleuticus*
Prickly sculpin	*Cottus asper*
River lamprey	*Lampetra ayresi*
Western brook lamprey	*Lampetra richardsoni*
Sacramento sucker	*Catostomus occidentalis*
Threespine stickleback	*Gasterosteus aculeatus*
Marine or Estuarine Dependent	
Pacific staghorn sculpin	*Leptocottus armatus*
Shiner perch	*Cymatogaster aggregata*
Redtail surf perch	*Amphistichus rhodterus*
Walleye surf perch	*Hyperprosopon argenteum*
Speckled sanddab	*Citharichthys stigmeus*
Starry flounder	*Platichthys stellatus*
Surf smelt	*Hypomesus pretiosus*
Topsmelt	*Atherinops affinis*

"Many fish in the Mattole Basin use the estuary during some part of their life history. Anadromous salmonids and pacific lampreys pass through the estuary on migrations. Threespine stickleback (Busby et al. 1988), pacific staghorn sculpin, prickly sculpin, shiner perch, and topsmelt spawn within the estuary. Juvenile Chinook salmon, some steelhead trout, threespine stickleback (Busby et al. 1988), Coast Range sculpin, shiner perch, starry flounder, surf smelt, and topsmelt rear in the estuary."

The NCWAP analysis and report contains a brief discussion of riparian habitat as well as an assessment of amphibian conditions within the basin (pages 134-135) which is excerpted below:

"Southern torrent salamanders (Rhyacotriton variegates) and tailed frogs (Ascaphus truei) are two of the many amphibian species that inhabit the Mattole Basin. Like coho salmon, these two amphibians are sensitive to temperature and sediment. However, they live in small, lower order streams, upstream from coho salmon habitat. Therefore, torrent salamander and tailed frog populations can serve as indicators of environmental stressors such as increased water temperature and excessive fine sediment (Welsh and Ollivier 1998), which are also potential habitat problems for coho salmon."

As expected, the Mattole Integrated Coastal Watershed Management Plan, Foresight 2020 (MRRP 2009) contains a description of the fishery and aquatic resources of the Mattole basin, which is excerpted below (for more information see pages 28-32 of the plan):

"The Mattole supports Chinook salmon, coho salmon, anadromous steelhead, resident steelhead (rainbow trout), as well as sticklebacks, lampreys, and sculpins. Of these, the three species of salmonids, coho salmon, Chinook salmon, and steelhead are listed as threatened under the Federal Endangered Species Act, and as such have been the foci of local monitoring and restoration efforts. Coho salmon are also listed as Threatened under the California Endangered Species Act.

The coho salmon population of the Mattole is part of the Southern Oregon/Northern California Coast (SONCC) coho salmon Evolutionarily Significant Unit (ESU), composed of populations inhabiting coastal streams between Punta Gorda, California and Cape Blanco, Oregon. The Chinook salmon population of the Mattole is part of the California Coastal (CC) Chinook salmon ESU, composed of populations inhabiting coastal streams from Redwood Creek in Humboldt County south through the Russian River (70 FR 52488). The steelhead population of the Mattole is part of the Northern California (NC) Steelhead Distinct Population Segment, composed of populations inhabiting coastal streams from Redwood Creek in Humboldt County south through the Gualala River (70 FR 52488).

The Mattole watershed populations of coho salmon, Chinook salmon, and steelhead are all considered Functionally Independent Populations of their respective ESUs (Bjorkstedt et al. 2005, Williams et al. 2006). This designation outlines the importance and necessity of recovering the Mattole salmonid populations in order for the ESUs to recover as a whole.

In 1960, US Fish and Wildlife personnel extrapolated from the extent of existing spawning gravels that 10,000 pairs could potentially utilize the watershed. DFG (1965) made historical population estimates of 5,000 Chinook salmon, 2,000 coho salmon, and 12,000 steelhead. NOAA Fisheries reported the same historical estimate of Chinook salmon at 5,000 individuals (Myers et al. 1998). Since 1960, declines have been documented in the Mattole, with most observers indicating severe declines in the early 1980s.

Spawning habitat is no longer considered a limiting factor in the Mattole. Surveys find low rates of redd superimposition and spawning locations appear to be primarily determined by the timing and size of flows, so it seems clear that there is far more suitable spawning habitat available than there are spawning adults to utilize it.

Water quality and concurrent salmonid population monitoring indicates rearing habitat is a crucial limiting factor for Mattole salmonids. Temperatures recorded at monitoring locations suggest a lack of suitable thermal habitat for all species of juvenile salmonids in the main stem downstream of Bridge Creek (RM 52.1). Suitable thermal habitat for over summering juvenile coho exists only in the uppermost main stem locations. Low summertime flow and resulting poor water quality, especially low dissolved oxygen, further deplete available habitat in the coolest areas of the main stem. In recent years (2002-2007), MSG dive surveys have documented fewer coho than in the past (1983-2001).

The Mattole Basin contains about 692 miles of blue-line streams (CGS Geologic Report-Table 10). The blue-line streams were chosen because they are a consistent depiction of the major streams within the network and include perennial, ephemeral, and intermittent streams. The river system within the Mattole Basin is arranged in a contorted or irregular drainage pattern. The mainstem of the Mattole River flows in a general northwesterly direction, parallel to the structural grain of the Franciscan Complex. Tributaries to the mainstem flow generally to the northeast or southwest, perpendicular to the Mattole River, and often the larger tributaries branch upstream into channels that trend parallel to the mainstem.

Streams are about evenly distributed spatially throughout the subbasins of the study area. That is the cumulative lengths of streams within a subbasin, expressed, as a percentage of the total stream length for the study area, is similar to the area of each subbasin expressed as a percentage of the total study area. The stream density calculated for the entire Mattole Basin study area is 2.3 (miles/square mile). Stream density varies considerably between areas

underlain by bedrock and alluvial terrains; these density values forms the point of comparison for portions of the study area.

Table 2-10 below shows the miles of anadromous fish habitat by subbasin, according to GIS information on file with the MRC GIS department.

Table 2-10
Miles Of Anadromous Fish Habitat By Subbasin

Subbasin	Steelhead Only	Coho And Steelhead	Coho, Chinook And Steelhead	Chinook And Steelhead	Grand Total	Anadromous Stream Density (Miles/Mile^2)
East_1	13.8		14.5		28.3	0.70
East_2	11.6	2.3	14.6	0.2	28.8	0.74
North_1	13.7	0.0	3.2		17.0	0.32
North_2	10.3		7.9	4.5	22.7	0.50
South_1	12.3	4.8	17.0		34.1	1.24
West_1	8.3	1.0	18.0	9.3	36.6	0.91
West_2	16.7	0.5	28.0		45.1	0.90
Grand Total	**86.7**	**8.6**	**103.2**	**14.1**	**212.5**	**0.72**

A search of the NDDB database from 2009 and a current list from the USFWS Arcata office for Humboldt County (document Number 55346743-11305) shows that there are nine "special status" aquatic or riparian species within the basin. Three species are federally listed as threatened. From the state list, three species (all fishes) are listed as threatened and the balance are listed as species of special concern.

Table 2-11
Special Status Fish and Amphibian Species

Scientific Name	Common Name	# Occurrences	Fed List Status 1/	CA List Status 1/	CNPS LIST
Ascaphus truei	western tailed frog	5	None	SpcSpCon	
Emys marmorata marmorata	Northwestern pond turtle	None	Candidate	SpcSpCon	
Oncorhynchus kisutch	coho salmon – Southern Oregon Northern CA Coast ESU	N/a	Threatened	Threatened	
Oncorhynchus mykiss	Northern California steelhead	N/a	Threatened	Threatened	
Oncorhynchus tshawytscha	CA coastal Chinook salmon	N/a	Threatened	Threatened	
Plethodon elongatus	Del Norte salamander	None	None	SpcSpCon	
Rana aurora aurora	Northern red legged frog		SpcSpCon	SpcSpCon	
Rana boylii	foothill yellow-legged frog	3	SpcSpCon	SpcSpCon	
Rhyacotriton variegates	Southern torrent salamander	N/a	SpcSpCon	SpcSpCon	

1/ SpcSpCon = species of special concern

2.0.8 Terrestrial Wildlife Species

Terrestrial wildlife species (those not dependent on constant access to standing or flowing water for their survival or reproduction) in the Mattole have been much less studied than other resources such as water quality, fisheries and aquatic conditions (water-dependent wildlife species are discussed in Chapter 3.4). Important resources for these species include the BLM King Range Resource Management Plan (BLM 2004), the Mill Creek Cooperative Management Plan (Mill Creek Watershed Conservancy et al. 2004), and the draft Gilham Butte Cooperative Management Plan (Middle Mattole Conservancy and Mattole Restoration Council 2005), which contain excellent descriptions of the relationship between vegetative habitat and wildlife. These general relationships can be expected to approximate wildlife conditions throughout the Mattole watershed. Descriptions from the King Range Resource Management Plan are excerpted:

> *Douglas-fir habitat supports a high abundance of wildlife (Mayer and Laudenslayer 1988). A number of amphibians do well in this habitat type, including the northwestern salamander, Pacific giant salamander, Olympic salamander, black salamander, clouded salamander, tailed frog, and ensatina salamander. Northwest coastal coniferous forests reportedly support higher bird densities than any other forest type in North America (Weins 1975, reprinted in Mayer and Laudenslayer 1988). Typical bird species include western flycatcher, chestnut-backed chickadee, golden-crowned kinglet, Hutton's vireo, solitary vireo, hermit warbler, varied thrush and spotted owl. Common mammals include deer mouse, dusky-footed woodrat, western red-backed vole, creeping vole, Douglas' squirrel, Trowbridge's shrew, and shrew mole.*
>
> *Small areas of coastal oak woodland habitats occur on the eastern edge of the KRNCA, with more extensive acreage on adjoining private lands in the Mattole Valley. This habitat type is home to at least sixty mammal species and 110 bird species (Mayer and Laudenslayer 1988), many of which include acorns for their diet. Several woodpecker species utilize this habitat, especially the acorn woodpecker. Acorn woodpeckers store acorns in granary trees, with the same tree often shared by a family for several generations. Western scrub jays similarly store or cache acorns that are often forgotten and end up germinating. California quail and wild turkeys also rely heavily on acorns during fall and winter. Many rodent species, such as dusky-footed woodrat and western gray squirrels, cache acorns, and deer and black bear also consume them. Oak woodland is also a rich habitat for herpetofauna, supporting approximately 20 reptile and amphibian species; the arboreal salamander, skinks, gopher snake, and slender salamander are common (Mayer and Laudenslayer 1988).*
>
> *Vegetation associated with forested riparian areas is characterized as the Red Alder Series (Sawyer and Keeler-Wolf 1995). This series colonizes substrates that are seasonally or permanently flooded or saturated, such as along the margins of perennial and ephemeral watercourses, and in some forests on the immediate coastline. Even-aged stands of deciduous tree species such as red alder (Alnus rubra) are typical of these habitats, with sword fern (Polystichum munitum), chain fern (Woodwardia fimbriata), and other herbs and shrubs dominating the understory. Such riparian habitats provide food, nesting, and migration/dispersal corridors for many wildlife species. Black salamander, tailed frog, and rubber boa are common herpetofauna (CWHR 2001). Common bird species include Anna's hummingbird, yellow-breasted chat, California yellow warbler, winter wren, orioles, black-headed grosbeak, and many other song birds. Typical mammals include Virginia opossum, skunks, raccoon, gray fox, and river otter (CWHR 2001).*

...grasslands, usually less than one meter in height, [are] composed predominantly of sod/tussock-forming perennial grasses in the California Oatgrass, Idaho Fescue, Pacific Reedgrass, Introduced Perennial Grassland, and California Annual Grassland Series (Sawyer and Keeler-Wolf 1995). These vegetation series are dominated by both native perennial grasses such as California oatgrass (Danthonia californica), Pacific reedgrass (Calamagrostis nutkaensis), seacliff bluegrass (Poa unilateralis), and non-native annual and perennial grasses such as velvet grass (Holcus lanatus), hairy oatgrass (Danthonia pilosa), hedgehog dogtail (Cynosurus echinatus), bromes (Bromus ssp.), and fescues (Festuca ssp.). Isolated islands of native stands of Idaho fescue (Festuca idahoensis) and California melic (Melica californica) also exist along the coast and represent rare examples of remnant, unaltered coastal prairies. Herpetofauna typical of grasslands include red-legged frog, Pacific tree frog, western fence lizard, common garter snake, and western rattlesnake (Mayer and Laudenslayer 1988). Birds that commonly breed within this habitat include savannah sparrow and western meadowlark. Grasslands are important foraging habitat for the turkey vulture, northern harrier, American kestrel, white-tailed kite, peregrine falcon, as well as many song birds. Mammals that utilize this habitat include the black-tailed jackrabbit, Roosevelt elk, striped skunk, California vole, pocket gopher, and coyote.

Chaparral habitats are comprised of dense stands of fire-adapted plant communities such as those characterized as Blue Blossom, Manzanita, Chaparral Whitethorn, and Wedgeleaf Ceanothus Series (Sawyer and Keeler-Wolf 1995). Species such as manzanita (Arctostaphylos ssp.), and ceanothus (Ceanothus ssp.) dominate this habitat, where the vegetation rarely exceeds three meters in height. Chaparral often hosts species adapted for sites with unique or unusual edaphic conditions. Shrubs within this habitat provide important shade during hot weather and moderate protection from wind and temperature in winter. Herpetofauna include Pacific tree frog, fence lizard, gopher snake, and rattlesnake. Birds common in chaparral habitats include turkey vulture, red-tailed hawk, California quail, and Anna's hummingbird. Elk, deer, brush rabbits, black-tailed jackrabbit, squirrel, voles, coyote, and striped skunk all utilize chaparral habitats."

A search of the NDDB database from 2009 and a current list from the USFWS Arcata office for Humboldt County (document Number 55346743-11305) shows that there are 22 "special-status*" terrestrial wildlife species that might occur within either the basin or the Program area, as shown in the following table.

*(*Listed by Federal or State databases as Threatened or Endangered, candidate species, species of special concern, etc.)*

TABLE 2-12
Special Status Species in the Mattole Watershed

Scientific Name	Common Name	Fed List Status [1/]	CA List Status [1/]
Accipiter cooperi	Cooper's hawk	None	SpcSpCon
Accipiter gentiles	Northern goshawk	SpcSpCon	SpcSpCon/BOFsen
Accipiter striatus	Sharp shinned hawk	None	SpcSpCon
Aquila chrysaetos	Golden eagle	None	DFG FP/BOFsen
Ardea alba	Great egret	None	BOF sen
Arborimus albipes	White footed tree vole	Candidate	SpcSpCon
Arborimus pomo	Red tree vole	None	SpcSpCon
Ardea herodias	Great blue heron	None	BOF sen
Bonasa umbellus	Ruffled grouse	None	DFG WL
Brachyramphus marmoratus	Marbled murrelet	Threatened	Endangered
Chaetura vauxi	Vaux's swift	Threatened	SpcSpCon
Contopus cooperi	Olive sided flycatcher	SpcSpCon	SpcSpCon
Corynorhinus townsendii	Townsend's big eared bat	None	SpcSpCon
Dendroica occidentalis	Hermit warbler	SpcSpCon	None
Empidonax difficilis	Pacific slope flycatcher	SpcSpCon	None
Empidonax traillii brewsteri	Little willow flycatcher	SpcSpCon	Endangered
Falco peregrinus	Peregrine falco	Delisted	Endangered/BOFsen
Haliaeetus leucocephalus	Bald eagle	Delisted	Endangered/BOFsen
Pandion haliaetus	Osprey	None	SpcSpCon/BOFsen
Progne subis	Purple martin	None	SpcSpCon
Martes pennanti pacificus	Pacific fisher	Candidate	SpcSpCon
Martes americana humboldtensis	Humboldt marten	Sensitive	SpcSpCon
Strix occidentalis caurina	Northern spotted owl	Threatened	Threatened

[1/] SpcSpCon = DFG species of special concern, BOF sen = Board of Forestry sensitive species. DFG WL = DFG Watch List, DFG FP = DFG fully protected

A search of the California Wildlife Habitat Relationship System online database was conducted on February 15, 2011 for Humboldt and Mendocino Counties and in particular for the WHR types most likely to occur within Program harvest areas (DFR5&6, MHC5&6). The results of this search included eight mammal species, of which four also turned up on an NDDB search and are discussed in detail in Section 3.18, and four species (American badger, California wolverine, hoary bat, and Sonoma tree vole) which were not listed on the NDDB search and which are not known to be found within the basin and are not discussed in Chapter 3. The two bird species noted on the CWHR search, the northern goshawk and ruffed grouse, are discussed in detail in Section 3.18.

Two invertebrates, the Mendocino leptoneitid spider and the Pomo bronze shoulderband snail, both state endemic special species, were noted on the CWHR search as possible residents of these vegetation types, but little information about these species could be obtained and they are not discussed further in this document.

2.1 Proposed Program – Mattole Forest Futures Program

Under the Program, private forest landowners within the 156,484-acre Program area would implement a range of treatments designed to improve forest conditions in the Mattole basin. These treatments would vary depending on existing vegetation, slope stability, and proximity to streams or improvements. Although the PTEIR will be valid until an indeterminate point in the future when conditions will have changed significantly, it was necessary to select a time frame for analysis. Treatments are analyzed in the PTEIR as they might be implemented during the next 50 years (longer for the Greenhouse Gas section and parts of the Timberland Resources section), based on informed assumptions regarding landowner interest, timber quantity and quality, management accessibility, maturity of timber stands; and other resources such as wildlife habitat, terrain, slope stability, access, road conditions, etc. Timber prices and the variation in timber markets over time has been used to model price trends for timber originating from the Program area and help determine the financial feasibility of predicted harvests. (In the event that conditions change substantially enough before the end of that 50-year time horizon to cast doubt on the projected environmental effects and future conditions, a supplemental analysis could then be conducted to extend the lifetime of the EIR.)

The range of permitted prescriptions under the Program is limited to those that are considered "light touch". Intensive silvicultural systems such as Clearcut, Rehabilitation, Variable Retention, Shelterwood (all steps) and Seed Tree (all steps), are <u>not</u> included in the range of acceptable prescriptions. Three standard prescriptions: Selection, Group Selection, and Commercial Thinning (as described in Section 913.2 & 3 of the Forest Practice Rules (FPR)), are considered suitably "light touch", once appropriate "sideboards" particular to this Program are added. Given the conditions of the forests of the Mattole basin (as described herein), standard prescriptions may not be adequate to achieve the goals of the Program. Accordingly, the Program includes an Alternative Prescription customized to the forest conditions of the Mattole that is termed the All-Aged prescription, as described in 2.1.A.2.d below.

For those who choose to participate in the Program, it includes restrictions on silvicultural practices, logging methods, and other timber management-specific practices, as well as requirements that apply to harvest-related operations conducted under the umbrella of the Program, including upgrading of culverts and roadways, avoidance and protection of unstable geological features, restrictions on operations during wet conditions, and limits on new road construction.

The balance of this chapter describes the Program and alternatives to the Program. Section 2.1 describes the detailed Program practices and treatments and how they might be applied to each of the vegetation treatment areas. Section 2.2 details the methodology used to project harvest under the Program. Section 2.3 describes elements that would be common to all alternatives, including the no-project alternative. Sections 2.4 to 2.6 describe three alternatives to the Program, since CEQA requires that a range of feasible alternatives to the proposed Program be developed and compared. Section 2.7 compares the alternatives, while section 2.8 describes several alternatives that were considered but eliminated from detailed consideration. Section 2.9 identifies the "environmentally superior alternative" as required by CEQA Guidelines at §15126.6(e)(2).

Proposed Program (project) activities are projected to take place on about 15,038 acres of private forest lands over the 50-year analysis period, some of which may be entered more than once. All of the forests that the Program is designed to treat have been logged to one extent or another, some several times. One of the Program goals is to encourage landowners who are interested in timber harvest to opt for long-term, sustainable timber management practices on their properties. Stands brought under sustainable management as envisioned in the Program are expected to produce timber in approximately 15- to 20-year re-entry cycles, with increasing inventory and growth over time as stands are managed for larger, more mature trees.

A. Silvicultural Prescriptions

Background: The Mattole basin has been extensively harvested over the last 60 years, with less intensive harvest documented in coast redwood stands as far back as 125 years ago. Today, however, the landscape is recovering and much of the basin contains well-developed mid-successional forest stands. Many of these stands are not currently suitable for long-term sustainable timber management because they either contain a preponderance of low-value Group B species (as defined in Section 895.1 of the FPR) or because the higher-value Group A species they do contain are not yet of commercial size. In some stands, recovery lags because wildfire or the tenacity of tanoak sprouts has affected the trajectory of post-logging succession.

Goals: The Program silvicultural treatments are designed to accomplish a variety of goals, as follows:

- Encourage the development of mature to late successional stands
- Maintain or improve wildlife habitat, particularly by developing late-seral habitat for listed species
- Increase the average size of trees so that timber stands become more commercially and ecologically valuable over time
- Improve water quality through reduction of controllable sediment sources
- Improve stocking of Group A species so that long-term sustainable timber management becomes more feasible
- Reduce the danger of catastrophic fire
- Manage existing stands, rather than "clearcut and start over"
- Retain legacy trees that are large and old to provide stand structural diversity
- Maintain or improve the health and structure of riparian stands

1. Range of Silvicultural Prescriptions:

The range of permitted prescriptions under the Program is limited to those that are considered "light touch". Intensive silvicultural systems such as Clearcut, Rehabilitation, Variable Retention, Shelterwood (all steps) and Seed Tree (all steps), are not included in the range of acceptable prescriptions. Some standard prescriptions (as described in Section 913.2 & 3 of the FPR) can be considered suitably "light touch" once appropriate sideboards are added particular to the Mattole Forest Futures Program. These include Selection, Group Selection, and Commercial Thinning. However, given the conditions of the forests of the Mattole

basin, these prescriptions may not be adequate to achieve the goals noted above. Accordingly, the Program contains an Alternative Prescription customized to the forest conditions of the Mattole that is termed the All-Aged prescription, as described below. The following four silvicultural prescriptions are available under the Program:

a) **Commercial Thinning** is removal of trees from a young-growth stand to improve the health and growth rate of the stand. Post-harvest stocking requirements, as measured by basal area, are specified in the FPRs. On Site II or III lands, the most common site classes, 100 square feet basal area per acre (sq ft/ac) must be retained across the stand after timber operations are completed (See the FPRs for other site classes). However, additional requirements to retain higher stocking levels after harvest apply under the Program, as described below.

b) **Individual Tree Selection** is used to establish or maintain a balanced uneven-aged stand structure: Uneven-aged management promotes growth on leave trees across a broad range of diameter classes and encourages natural regeneration. According to the FPR's, on Site II and III lands, 75 sq. ft. ba/ac must be retained on average across the stand after harvest (See the FPRs for other site classes). However, additional requirements apply to retain higher stocking levels after harvest, as described below. Also, at least 15 ft^2 per acre of seed trees greater than 18" dbh must be retained.

c) **Group Selection**, like individual tree selection, promotes an uneven-aged structure across the stand, while deliberately creating openings where regeneration is to be established. No more than 20% of the stand may be comprised of group openings in any entry. Outside of the openings, the same stocking standards as for the Selection method apply, including the retention of 15 ft^2 per acre of seed trees greater than 18" dbh. Special provisions for the Program specify that no openings larger than 1 acre may be created unless there is retention in the opening: openings of 1 to 2.5 acres may be created as long as 15 ft^2 of basal area per acre are retained in structural stand elements such as snags, wildlife habitat trees, legacy trees (of Group A or B species), and/or patches of advance reproduction of Group A species. Where appropriate and feasible these retention elements should be dispersed across the opening and clearly within the confines of the polygon boundary. The survey protocols described in 14CCR 913.2(a)(2)(B) shall be employed to assess achievement of the stocking standards.

d) **The All-Aged Prescription** is specific to this Program and is designed to address specific on-the-ground challenges to forest management faced by landowners in the Mattole watershed. Many forested acres in the Mattole are so dominated by hardwoods that commercial harvest is not economically viable, and landowners are not interested in or cannot afford to use intensive rehabilitation prescriptions. The all-aged prescription has been developed in order to allow landowners to increase the proportion of Group A species in stands currently dominated by Group B species, through both initial and successive entries. The goal of the prescription is to move hardwood-dominated stands toward a multi-aged stand with a higher proportion of Group A (conifer) timber species, containing a diversity of age classes and forest structures across the management area, which can be commercially and sustainably managed over time.

Conifer-dominated stands are not eligible for this prescription. The all-aged prescription may only be used if the conifer basal area is less than 50 percent of the total basal area in the proposed PTHP unit, and if the total basal area of conifers over 5 inches in diameter is less than 150 ft^2 per acre.

The all-aged prescription incorporates elements of both the even-aged and uneven-aged prescriptions defined in the FPR, allowing for more flexibility in harvest and reforestation methods and in assessing post-harvest stocking levels than is represented by either prescription alone. It is most similar to the Transition prescription (14CCR 913.2(b)) with some important differences explained below.

Under the all-aged prescription, trees are removed individually across the stand and/or in small groups. Upon completion of operations, at least 100 sq ft/acre basal area must be retained outside of group openings, 50 sq ft of which must be conifers. Notable differences from the transition and group selection prescriptions include: group openings must be planted with conifers, stocking plots may not be offset to avoid group openings, and planted seedlings may be used to meet stocking requirements.

After harvest, not more than 20% of the harvest area may be occupied by small group openings. An individual small group opening may not exceed 2.5 acres in size, and groups must be separated by logical logging areas (these could be unharvested areas or areas treated by individual tree selection harvest). Under the all-aged prescription, group cuts over 1 acre in size must retain structural stand elements such as snags, wildlife habitat trees (see Stocking Standards below), legacy trees (of Group A or B species), and/or patches of advance reproduction of Group A species. These residual stand components must equal at least 15 sq ft ba/ac in the group openings.

In addition, outside the group openings but within the PTHP area, the RPF must address retention of seed trees as defined in the Transition prescription [913.2(b)(6)]. In summary, this requires retention of 15 sq. ft. BA of seed trees >12 inches dbh for all site classes. For the sake of practicality, no distinction is made between site classes for this retention requirement. The seed trees to be retained must be in the 18-inch or greater diameter classes, if enough are present to meet the basal area requirement. If not, all trees >18 inches dbh must be retained, along with enough trees >12 inches dbh to fill out the seed tree basal area requirement.

Application of the all-aged prescription must increase the proportional stocking of Group A vs. Group B species by means of leave-tree retention and post-harvest regeneration. Group B species will need to be removed in order to meet this requirement. Those removals shall take place within the lifetime of the same PTHP as the conifer harvest. The RPF shall explain in the PTHP what methods will be used to ensure that the prescription results in a substantially greater proportion of Group A versus Group B species.

Regeneration – all aged prescription: Group openings shall be planted with conifers. The plan submitter must control competition such that all Group A trees counted toward

stocking can achieve a free-to-grow condition (i.e., their crowns must be above the level of hardwood competition and show a rate of growth indicating that they will eventually move into overstory stocking).

In all-aged harvest entries subsequent to the first harvest entry, the post-harvest conifer % of BA must be 10% higher than the pre-harvest proportion from the previous entry. If it appears during or after the harvest that the stand may not meet the +10% standard, the situation can be remedied by cutting additional hardwoods. After two or at the most three entries, the stand would necessarily contain over 50% conifers by basal area, and, under the Program, would be managed under the selection system with its associated requirements. The all-aged prescription shall not be used more than three times in any stand.

2. Special requirements for the application of these prescriptions:

Growing Larger Trees
To support the project's goal of growing larger trees, a restriction designed to prevent high-grading and thinning from above will apply to **all prescriptions** in the Program. The restriction is that half of the largest-diameter conifer trees within each stand must be retained. The largest-diameter trees in each stand are defined as those whose diameters are within the upper 30% of the conifer basal area by diameter class distribution. Additionally, at least 25% of the trees within the top 15% of the basal area distribution must also be retained. Trees within zones mandated as no-cut under the Program do not count toward this retention. (See RPF responsibilities below.) The objective of this provision is to ensure that the pre-harvest diameter distribution is generally maintained by removing trees from across this 30% range and not concentrating removals in the largest diameter classes. Unless clearly explained and justified in the PTHP and approved by CAL FIRE, concentrating large tree removals in the largest size classes is not considered an appropriate application of the Program. Financial elements such as high log prices or landowner hardships are not justifiable causes for CAL FIRE to grant variances against this provision.

Developing Higher Conifer Densities though Time: In order to ensure that harvesting under the Program contributes to the goal of improving the stocking of conifer species, a graduated leave requirement shall apply to the commercial thinning, individual tree selection, and group selection prescriptions (but not the all-aged prescription as described below). These requirements are intended to facilitate building conifer stocking until it can be maintained above 150 ft2 of basal area.

1. <u>Constraints on conifer stocking for first PTHP</u>:

If pre-harvest conifer basal area is less than 140 ft^2: leave 70% of pre-harvest conifer BA, else
If pre-harvest conifer basal area 140 to 165 ft^2: leave 100 ft^2 of conifer BA, else
If pre-harvest conifer basal area greater than 165 ft^2: leave 60% of pre-harvest conifer BA.

2. Constraints on subsequent PTHP's:
   Leave 20% more conifer BA than was left after the previous entry, or 150 ft^2 of conifer, whichever is less. In any case, at least 60% of the conifer BA present before the current harvest must be retained post-harvest even if this is greater than 150 ft^2.

3. Stocking Standards:

For the commercial thinning, individual tree selection and group selection prescriptions, stocking must be met immediately post-harvest and shall be assessed using the sampling methods described in Article 5, sections 1070 – 1075. In addition, application of all the above-noted prescriptions must maintain or increase the proportional stocking of Group A vs. Group B species immediately post-harvest. If group B species need to be removed in order to meet this requirement, those removals shall take place at the same time as the conifer harvest. If the post-harvest stand is considered "obviously stocked" then the post-harvest inventory (data-collection) survey is not required.

For the all-aged prescription: Upon completion of operations, outside of group openings at least 100 sq ft/acre total must be retained, including at least 50 sq ft of conifers, or all conifers if the pre-harvest conifer stocking was below 50 ft^2/acre. Within group openings planted conifers can be used to meet stocking following the procedure found in 14CCR 913.5. Stocking shall be measured using the sampling methods described in Article 5, sections 1070 – 1075 and can be a combination of basal area and 300 point-count standard. Stocking plots may not be offset to avoid group openings.

4. Responsibilities of RPF under all Program Prescriptions:

The RPF shall delineate **stands** to be managed under the Program for which individual inventory data will be collected. Stand typing shall make use of aerial imagery of sufficient quality and at a proper scale such that stands can be accurately delineated. Further guidance on stand delineation is provided in Appendix C. Generally 10 acres should be considered the minimum mapping unit, but delineation of smaller polygons may be warranted if their inclusion in the surrounding type would compromise development of an accurate inventory estimate now and into the future. In general, any stratum that comprises more than 15% of the total plan area, whether in a single polygon or multiple distinct stands geographically dispersed across the PTHP, should be considered a separate stand.

Harvest units can contain multiple stands (each with their own dataset) that will all be treated under the same silvicultural system (e.g. Single Tree Selection, Group Selection, etc.). In order to facilitate tracking stand conditions over time, it is recommended that, whenever feasible, identifiable features such as roads, streams, ridges and property lines be used as polygon boundaries. *(Note: Please see Appendix C for additional discussion related to PTEIR requirements to differentiate proposed PTHP areas into unique stand types.)*

RPFs shall employ standard cruising techniques recognized in forestry texts. Each PTHP shall include a section that describes the inventory sampling scheme that was employed to establish the pre-harvest conditions. The description of the cruise design shall

at minimum describe instruments used in the cruise, plot layout (fixed, variable, strip, and spacing), variables measured, and how borderline trees were addressed. Besides demonstrating that the baseline has been properly assessed, this information will be necessary so that RPFs in the future can conduct comparisons between the new and old inventory in order to demonstrate ownership progress in meeting goals of the program.

Further, at the time the inventory is conducted, each cruise plot shall at least be temporarily identified with flagging at plot center. The inventory design shall further be documented by including a cruise plot map consisting of either a topographic or planimetric map that identifies plot locations and stand type boundaries.

Development of **stand tables** that provide estimates of the pre- and post-harvest stocking and basal area per acre are a required element of each PTHP submission. For each stand, stand tables shall be provided for trees over 5 inches in diameter. For conifers, the tables must show trees per acre by 2-inch diameter class, and basal area per acre by 2-inch diameter class. For hardwoods, the tables need only to show the total basal area per acre. The purpose of this requirement is to document the status of conifer vs. hardwood stocking in each stand before harvest and to develop the large-tree retention requirements.

The PTHP submitter shall indicate the diameter above which 30% of the conifer basal area exists and will be restricted to harvesting fewer than half the conifers above this diameter. The PTHP submitter will also have to disclose the diameter above which 15% of the conifer basal area exists and be restricted to harvesting less than 75% of the conifers above this diameter (at least 25% of upper 15% must be retained). Areas of group openings within a stand are included in the stand average metrics, but it is not required to leave half of the largest trees in each opening as long as enough trees are retained in the rest of the stand to balance out those removed from group openings.

Inventory data must have a standard error no greater than +/-15% based on total stand basal area. Areas in which no harvesting is allowed under the Mattole Forest Futures Program due to watercourse or geologic restrictions should not be included in the stand average metrics. Any inventory plots landing in these zones must be either offset or dropped.

The RPF must designate cut or leave trees for each harvest entry. Conifers retained in individual tree selection areas shall be phenotypically superior trees that are free to grow, not over-topped by hardwoods, and with little or no logging damage.

3. Slash treatment (all prescriptions)

After operations, slash shall not exceed 36" in height across 90% of the harvest area.

4. Snags and LWD (all prescriptions)

All snags shall be retained unless they are a hazard to the operator's safety. LWD recruitment to Class I and II watercourses is assumed to occur as a result of Watercourse and Lake Protection Zones (WLPZ) requirements on all Class I and II watercourses.

5. Old-growth protection (all prescriptions)

No old-growth trees present on the landscape in 1850 and meeting certain minimum diameters per species, may be cut under the Program. The minimum diameters are 42 inches for coast redwoods, 40 inches for Douglas-fir and grand fir, and 32 inches for hardwoods. In case of suspected violation, standard silvicultural techniques shall be used to infer the dbh of the tree from its stump diameter.

6. Late seral habitat (all prescriptions)

Stands of trees that meet the definition of late seral habitat (defined in the FPR as late successional forest stands of WHR class 5M, 5D, or 6, with an open, moderate, or dense canopy, with multiple canopy layers, and at least 20 acres in size) will be managed to maintain or enhance the late seral nature of the stand during the application of any PTHP.

7. Herbicide use (all prescriptions)

Within the Program, landowners will agree to forgo the use of synthetic herbicides to suppress native vegetation during implementation of a PTHP.

CAL FIRE will take responsibility for enforcing this agreement during implementation of a PTHP, until the PTHP is signed off by CAL FIRE as completed.

8. Re-evaluation of Silviculture Prescriptions with Program Goals

As part of the continuing monitoring process for an approved PTEIR, at each five year anniversary date beginning from the date of original PTEIR approval, the Department will initiate and conduct a review to evaluate the general success of the program's silviculture prescriptions, as staffing permits. The Department shall complete its review within 120 days. Where necessary, modifications to these prescriptions may occur following CAL FIRE's consideration of the need for additional review and disclosure per CCR §§ 15162, 15163 or 15164.

B. Roads, Watercourses, Haul, Winter Season and Other Management Prescriptions

Each PTHP will be subject to the California Forest Practice Rules that are in effect at the time of filing. The following measures (which were more restrictive than the 2011 FPRs) were included in the PTEIR in order to further decrease the risk of impacts to watercourses due to forestry operations.

1. New road construction requirements

New road construction is limited to 1000 linear feet per PTHP, unless accompanied by a Sediment Prevention Plan (SPP) and justified as having less impact than the re-use of existing roads. The required components of an SPP are described in Appendix F and shall be submitted to CAL FIRE along with the PTHP.

2. Operations in Class I and II WLPZs (Watercourse and Lake Protection Zones) and Class III ELZs (Equipment Limitation Zones)

If ground-based equipment or other heavy equipment is proposed for use in a watercourse or lake protection zone (WLPZ) or equipment limitation zone (ELZ), the Project shall contain a Sediment Prevention Plan (SPP). Exceptions include: use and maintenance of existing permanent roads (not requiring reconstruction according to standards in the geological flow chart); use of existing bridges and culverts as skid trail crossings; and maintenance of associated drainage facilities or structures. Upgrading of roads to permanent standards by rocking, paving or other suitable surfacing materials to establish a stable operating surface prior to the start of hauling operations, is allowed.

An SPP is not required for log hauling within a WLPZ on existing permanent or seasonal roads from May 1st to October 15th. An SPP is required for construction or use of new roads or temporary crossings in a WLPZ.

Class I WLPZ requirements

Within a WLPZ for all Class I waters, no harvest is allowed within 75 feet of the watercourse or lake transition line or within the channel migration zone, and at least 80 percent overstory canopy must be maintained within the remainder of the WLPZ out to 100 ft or to the edge of the flood prone area (defined in 14CCR 895.1) whichever is greater. For the first 50 feet beyond the edge of the WLPZ, no openings greater than 0.25 acre would be allowed. The overstory canopy within the WLPZ must be composed of at least 25 percent overstory conifer canopy post-harvest, if there was at least 25% conifer canopy prior to harvest.

Class II WLPZ requirements

Within a WLPZ for all Class II waters, no harvest may take place within 30 feet of the watercourse and lake transition line. PTHP filers must distinguish between Class II-Standard (S) and Class II-Large (L) watercourses according to 14CCR 916.9(g)(1) to determine protections in the remainder of the WLPZ. Under the Program, a Class II-S WLPZ must retain at least 70 percent overstory canopy outside the no-cut buffer. Otherwise the Program rules match the new ASP rules. In summary, WLPZs along Class II-S streams have slope-dependent widths of 50, 75 and 100 feet, while Class II-L WLPZ's are always 100 feet wide with 80% canopy retention required outside the no-cut buffer. Conifers must account for at least 25% of the post-harvest overstory canopy, if there was at least 25% conifer canopy prior to harvest. In addition, trees whose roots visibly contribute to bank stability may not be cut.

In addition to information found in 14CCR 916.5 table 1, foresters shall use the presence of the following indicators, to guide their delineation of Class II watercourses, along with additional guidance from DFG:

- Free water during the dry season
- Aquatic plants

- Water-dependent stages of aquatic insects
- Physical characteristics of the channel (e.g., pools, substrate)
- Position of the watercourse in the landscape.

The determination that a watercourse is a Class II does not depend on a minimum number of these indicators being met, and may apply to a spring or seep as well as a stream reach. Any one or more of these indicators and other visible evidence is to be used in the field by the RPF in deciding how to classify a given stream reach.

Class III ELZ

The following protections would apply to Class III watercourses throughout the Mattole watershed and are drawn from the Anadromous Salmonid rules (14 CCR 916.9 (h)) except as noted.

- A 30- to 50- foot Equipment Limitation Zone (50 feet for slopes >30%; 30 feet otherwise)
- Within 30 feet from the high water mark, to protect bank stability, retain 50% canopy closure when slopes are 50% or less, and 75% canopy closure for slopes 50-65%. Other provisions prohibit cutting on slopes greater than 65% leading directly to a watercourse, until the break in slope. (Program-specific)
- Retain trees whose boles are within or overlapping the channel, or whose roots contribute to bank stability. The latter criterion is clearly met when tree roots visibly appear in the channel bed and/or banks. Further, because crown extent closely mirrors root extent below ground, trees whose crowns extend substantially over the channel should also be considered for retention.
- Retain hardwoods where feasible
- Retain at least 50% of pre-existing understory (Program-specific)
- Retain all snags and large woody debris
- Retain countable trees needed to meet standards in 14CCR 912.7 (50 ft^2 basal area)
- No group selections or openings > 0.25 acre within the 30- to 50-foot ELZ (Program-specific)
- Exceptions pursuant to 14CCR 916.9 (e)(1)(A)-(F) are permitted

Seeps and springs

Seeps and springs shall be evaluated based on similar criteria as are used to determine whether a watercourse should be categorized as a Class II. Any that meet the Class II criteria shall receive the same protections of no-cut buffer and equipment exclusion as if they were part of a watercourse.

3. Limitations on operations due to soil erosion/slope steepness.

No operations shall be allowed which result in a soil Erosion Hazard Rating (EHR) of Extreme, or in the upper half of "High," labeled for the purposes of this PTEIR "Very High."[2] In order to prevent operations from resulting in an "Extreme" or "Very High" erosion hazard rating (greater than 75), the removal of vegetative cover shall be limited so that the sum of the factors contributing to the Erosion Hazard Rating remains at 70 or below.

4. Limitations on operations due to slope stability/geology.

Timber harvest activities on slides and unstable areas that have been mapped as high or very high hazard by CGS (2002) are governed by the accompanying Geologic Flow Charts (Appendix B). Instead of requiring a geologic report for all slides and unstable areas within PTHP areas, a set of three Mattole-specific slope stability flow charts have been prepared by a Professional Geologist (PG) to guide silvicultural prescriptions, yarding methods and road construction under the Program. The flow charts guide the RPF through a site review and delineate the kinds of operations suitable for the site. The intent is for an RPF to use the flow charts and available CGS maps to evaluate each site and apply a set of prescriptions developed by a PG. For silviculture, for instance, the flow charts determine which of the following outcomes applies to each unstable area rated as high or very high hazard:

a. standard Program prescriptions may be used;
b. standard Program prescriptions may be used, but without the creation of group openings;
c. low-risk prescriptions developed for the flowchart by a PG may be used, requiring retention of at least 100 ft^2 of basal area, and only the use of Individual Tree Selection or Commercial Thinning prescriptions; or
d. site needs review by an PG in order to proceed, and a Geologic Report will be required in order to operate on the site.

Mapped slides or unstable areas that have been rated as moderate or lower hazard may be available for standard Program prescriptions, unless otherwise indicated by the geologic flow chart.

No timber harvest is allowed on inner gorges as defined in the FPRs: "a geomorphic feature formed by coalescing scars originating from landsliding and erosional processes caused by active stream erosion," or on a category defined as "Steep Stream-Side Slopes" (SSSS), which includes any slope of 65% or greater rising directly from a stream channel. At the head-wall of an inner gorge, the no-cut zone extends 10 feet beyond the break in slope.

---

[2] The Erosion Hazard Category "VERY HIGH" is defined for this PTEIR as occurring where the sum of the erosion rating factors is between 71- and 75, a sub-set of the "HIGH" category which ranges from 66-75 (See Appendix II of the FPRs, Tech. Rule Addendum No. 2). The goal of defining a new category of EHR and prohibiting PTHPs from exceeding it is to reduce the potential for surface erosion due to excess removal of vegetative cover.

5. **Skid road limitations.**

   Ground-based heavy equipment operations on slopes greater than 50% are prohibited unless the Project contains an SPP.

   There shall be no construction of new skid trails on slopes over 40% within 200 feet of a watercourse unless the Project contains an SPP.

   The Geologic Flow Chart for Yarding (Appendix B) prepared for the PTEIR by a Professional Geologist must be utilized by the RPF in determining the location and treatment of skid trails.

6. **Operations during winter operating period.**
   No ground-based yarding, road construction, road reconstruction, or road rocking shall occur during the winter period (November 15 to April 1). This measure does not apply to erosion control maintenance of existing roads and watercourse crossings or timber falling.

7. **Logging and log haul limitations due to wetness.**

   No timber harvest activities may take place during measurable rain events (defined as greater than 0.25" in a 24-hour period) with the exception of non-mechanized timber falling, fuels treatment such as hand piling and burning, hand fire line construction, or other activities which do not involve the use of heavy equipment or timber hauling. This measure does not apply to maintenance of existing roads and watercourse crossings. No log hauling will occur during the winter period, except from rocked permanent roads that will not generate waterborne sediment in amounts sufficient to cause a turbidity increase in downstream Class I, II, III, or IV waters, or in amounts sufficient to cause a turbidity increase in drainage facilities that discharge into Class I, II, III, or IV waters or that is visible or would violate applicable water quality requirements.

8. **Inventory of controllable sediment discharge (CSDS) sources and schedule for implementation.**

   An inventory of controllable sediment discharge sources must be developed and implemented for timber harvesting, including the logging area, roads and skid trails used to access or haul timber harvesting materials that are owned by or under the control of the Discharger. The inventory and implementation plan must be designed to prevent and minimize the discharge or threatened discharge of sediment from existing controllable sediment discharge sources into waters of the state. The inventory and implementation plan are commonly known as an "Erosion Control Plan" or ECP, and the specific requirements for the ECP are described in Appendix F.

C. Miscellaneous Management Requirements

1. Archaeology survey requirements

All requirements in the FPRs in effect at the time a PTHP is submitted shall be adhered to.

2. Threatened and Endangered (T&E) survey requirements

MRC intends to make NDDB, CWHR or BIOS search results available to RPFs preparing PTHPs.

Apart from the survey requirements for NSO and murrelets (see below), survey requirements shall be commensurate with the likelihood of species presence. In addition, MRC and USF&WS may develop an incidental take avoidance strategy to provide specific guidance for PTHP submitters.

Large down wood that can provide denning cover for animals may not be salvaged.

3. Owl/Murrelet survey requirements

Before harvest, plan submitters will have to address the possible presence of the northern spotted owl using one of the methods contained in 14 CCR § 919.9. and will apply the most current survey protocol. Murrelet survey requirements must be complied with in areas with potential habitat.

4. Cumulative impact limit on rate of harvest

In order to prevent the potential for cumulative effects due to Program Timber Harvests within the Mattole watershed, a limit on the rate of harvest will apply to PTHPs. No PTHPs will be considered for review by CAL FIRE if the average annual rate of harvest exceeds 1.5% of the watershed area within the subbasin where a PTHP is proposed. The rate of harvest calculation includes plans of operation of any kind filed over the previous 10 years within the subbasin (THPs, NTOs, PTHPs, etc., but not NTMPs or SYPs). The method for calculating the rate of harvest will follow the Clear Cut Equivalent area method described by Klein et al. (2008). The limit on rate of harvest applies only to PTHPs; landowners may submit other harvest plan documents after the 1.5% rate of harvest level has been exceeded.

As a service to landowners, and subject to available funding, MRC intends to maintain planning-watershed-level calculations of ground disturbance by updating harvest history at the start of each year. CAL FIRE maintains records of approved THPs, PTHP's, NTMPs and their Notices of Operations, which will enable plan submitters to calculate the intensity of ground-disturbing activities that have taken place within the decade preceding the submission of a PTHP. PTHP submitters may obtain data from CAL FIRE at: ftp://ftp.fire.ca.gov/forest/ Data is publically available and is organized by county and the georeferenced plan maps are in a directory labeled plan maps. Data is refreshed regularly. Maps are georeferenced and posted to the ftp site within the timeframe of 1st review. New plans are entered into the GIS

after approval. Old data is systematically corrected as new plans and recent aerial imagery inform changes.

5. Monitoring elements

Water quality monitoring may not be required if the NCRWQCB determines that proposed PTHP practices "do not pose a significant threat to water quality." This determination may vary by practice, i.e., some projects may need monitoring while others don't. If monitoring is required, watershed-scale monitoring coordinated by and potentially conducted by MRC is recommended. Monitoring parameters must be negotiated; hillslope monitoring of BMPs is least expensive while water quality monitoring is most expensive, particularly for sediment parameters.

All monitoring data should be coordinated by the MRC and the data stored at MRC for wider use in the basin. Landowners filing PTHPs may be required to participate in monitoring efforts, particularly for tracking wildlife surveys that may be done at a larger scale than individual parcels. Participation in monitoring programs may relieve individuals of obligation to do site-specific monitoring. Monitoring needs must be sensitive to concerns about individual privacy, but benefits in the form of reduced survey costs may be significant for landowners, if larger scale strategies can be employed. Monitoring protocols will need to be negotiated with agencies.

6. Sudden Oak Death

The following practices and standard BMPs to minimize the spread and potential impacts of SOD during PTHP implementation shall be followed. The RPF should inform personnel that they are working in an area with Sudden Oak Death disease, unauthorized movement of plant material is prohibited, and the intent of mitigation measures is to prevent disease spread (14 CCR 1035.2).

A. The RPF shall query the APHIS website and list the species within the PTHP area that are known hosts for SOD [http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/7cfr30192-10.txt].

B. Host material shall not be removed outside of the regulated area without amendment of appropriate state and federal permits into the PTHP.

C. The PTHP shall serve as a compliance agreement for movement of host material within the regulated area:

1. The RPF shall describe the destination for all products to be removed from the PTHP area. Additional destinations may be designated and communicated by minor amendment.
2. Firewood in the form of rounds or split bolts shall not be transported out of the regulated area.

3. Material smaller than 4" in diameter must be moved in a closed container except split firewood bolts.
4. Material greater than 4" in diameter does not require a closed container

D. The LTO shall take reasonable steps to check and remove any host plant debris from log trucks, crummies, loaders, pickup trucks, etc., leaving the plan area to ensure that host plant material does not move from the site. This includes branches, limbs, leaves, etc. stuck in log loads as well as leaves of hosts encased in mud.

E. To the extent practical and feasible, route equipment away from host plants and trees, especially in areas with disease symptoms. Locate landings, log decks, logging roads, tractor roads, and other sites of equipment activity away from host plants, especially areas with disease symptoms.

F. After working in an infested area, remove or wash off accumulations of soil, mud, and organic debris from shoes, boots, vehicles and heavy equipment, etc. before traveling to an area that is not infested with Sudden Oak Death

G. If water is drafted and used for dust control, draft water from areas upstream of known infestations or from uninfested drainages.

H. If drafting from known infested watercourses, do not water roads with that source in areas that are not known to be infested.

I. Approaches to drafting sites should be sufficiently rocked to minimize accumulating infested soil on drafting vehicles.

J. The PTHP shall be amended to update the above restrictions if the standard restrictions have changed.

K. Particular to the PTEIR - If SOD kills more than 80% of tanoak on 35% or more of the acres in any one subbasin, then the Program's practices associated with the All Aged prescription in that subbasin will be modified to mitigate for the loss of hardwood canopy and mast. If healthy hardwoods are present on site, at least 50 square feet of hardwood basal area must be retained post-harvest in units harvested with the all-age prescription. (Openings may be created, but stocking levels will be averaged across the entire unit.) In the event this provision comes into effect, at least 90 percent of the hardwoods other than tanoak or bay laurel should be left to count toward that hardwood minimum leave requirement, up to an average of 50 ft^2 basal area per acre. Only healthy live hardwoods apparently free from disease would be countable towards meeting stocking targets.

7. Reasonably Foreseeable Related Activities

CEQA requires a project description to include "the whole of an action" (CCR § 15378). In this case reasonably foreseeable actions which may be outside of CAL FIRE's approval authority under the FPRs, but are considered part of the project and may require the permitting or approval of other federal, state or local agencies, include, but are not limited to the following:

- prescribed burning of slash created by logging,
- herbicide applications which might take place either before a PTHP is approved, or take place after the completion period has expired for a PTHP. Herbicides would not be allowed during the life of the PTHP,

- in-stream work associated with the PTHP requiring Fish and Game Approval such as projects/work requiring a 1602 permit,
- precommercial treatment of forest stands,
- operation of existing quarries or development of new quarries for purposes of road rocking associated with PTHPs, and noncommercial forest clearing aimed at slowing the spread of Sudden Oak Death.

2.2 Methodology For Calculating Projected Acreage Harvested For Program And Alternatives

Ownership-Based Analysis

Most landscape level timber management planning documents (Habitat Conservation Plans (HCPs), Sustained Yield Plans (SYPs), USFS Forest Plans, etc.) are developed for single ownerships where the owner is able to state what they intend to do, where and how. In contrast, the Mattole Forest Futures Program could include any of the approximately 900 private forestland landowners in the Mattole watershed who choose to participate. Therefore, evaluating the environmental effects that may occur due to implementation of the Mattole Forest Future Program (and the alternatives required by CEQA) necessitates developing predictions (estimates) of how many acres will be harvested, where the harvests will occur and which treatments will be used (See Appendix A for detailed description of how this was carried out).

Summary of Methods

1. Identify Commercial Timber Landbase

As noted, 156,484 acres of private lands held by approximately 900 landowners in the Mattole Basin support or could support forest or woodland vegetation types in the Mattole Basin. Certain types, such as Coastal Oak Woodland and Montane Hardwood, were eliminated from further analysis due to their lack of occupancy by commercial species, leaving 116,831 acres as shown in Table 2-6. This area was further reduced to exclude stands that are too small or sparse to have commercial value at present or over the first cutting cycle of the Program (20 years). After these areas were eliminated, approximately 86,671 acres within the Program landbase were considered occupied by vegetation types containing trees of the size, species, and density of stocking that potentially could support a commercial timber harvest during the planning horizon (potentially commercial types were "grown forward" in time using computer growth models to estimate their future merchantability).

The distribution of vegetation types was analyzed based on remotely sensed vegetation typing data, i.e. LANDSAT data (see Appendix A). These data are expected to be accurate in terms of quantifying the relative distribution of the vegetation types in the Mattole watershed. However, the precision of the location of each vegetation type polygon is variable. Thus, the total extent of commercial timber types within the Mattole is expected to be accurate, although the location of these vegetation types may vary from the locations depicted on Figure 2-2.

2. Identify Available Landbase

The pool of potential acres based on timber type as described above was then reduced by eliminating areas designated as no-harvest zones by either state regulation or to meet the goals of the Program or alternatives. No-harvest watercourse buffers and (for some alternatives) unstable slopes of certain classifications made up the bulk of the excluded acreage. After elimination of no-harvest areas, an available landbase was calculated for the Program and each alternative. For the proposed Program, the available landbase is estimated at 57,601 acres.

3. *Identify Feasible Landbase*

The identified available landbase was then subjected to a financial feasibility analysis to determine if particular landowners could likely conduct a viable economic timber harvest operation, considering the size of their timbered landbase, volume of harvestable timber, accessibility, etc. After elimination of non-commercial operations, a feasible landbase was calculated for each alternative. For the proposed project, the feasible landbase as of the beginning of the Program is 22,465 acres. Over time, more acres will grow into feasibility as they develop greater stocking.

4. *Identify "Footprint" Landbase*

In order to assess the landscape effects of implementing the program, the feasible landbase was reduced in accordance with the propensity of landowners to engage in timber harvest activities, as identified in the public opinion survey conducted during early PTEIR preparation. For each of the first four five-year harvest periods, MRC "rolled the dice" for each landholding to determine whether it would be modeled as being logged. The footprint landbase for the proposed program is estimated at 15,038 acres.

5. *Identify Projected Landbase*

The final step involved calculating the total number of acres projected to be impacted by timber harvest over the entire period of analysis. While the footprint landbase represents each individual acre projected to take part in the Program and harvested at least once, the projected landbase includes the total area of logging plans expected to be filed for harvest under the PTEIR, including multiple entries on the same property. For NIPF and industrial landowners the Projected total area of logging units over the 50-year analysis period was estimated at 41,718 acres.

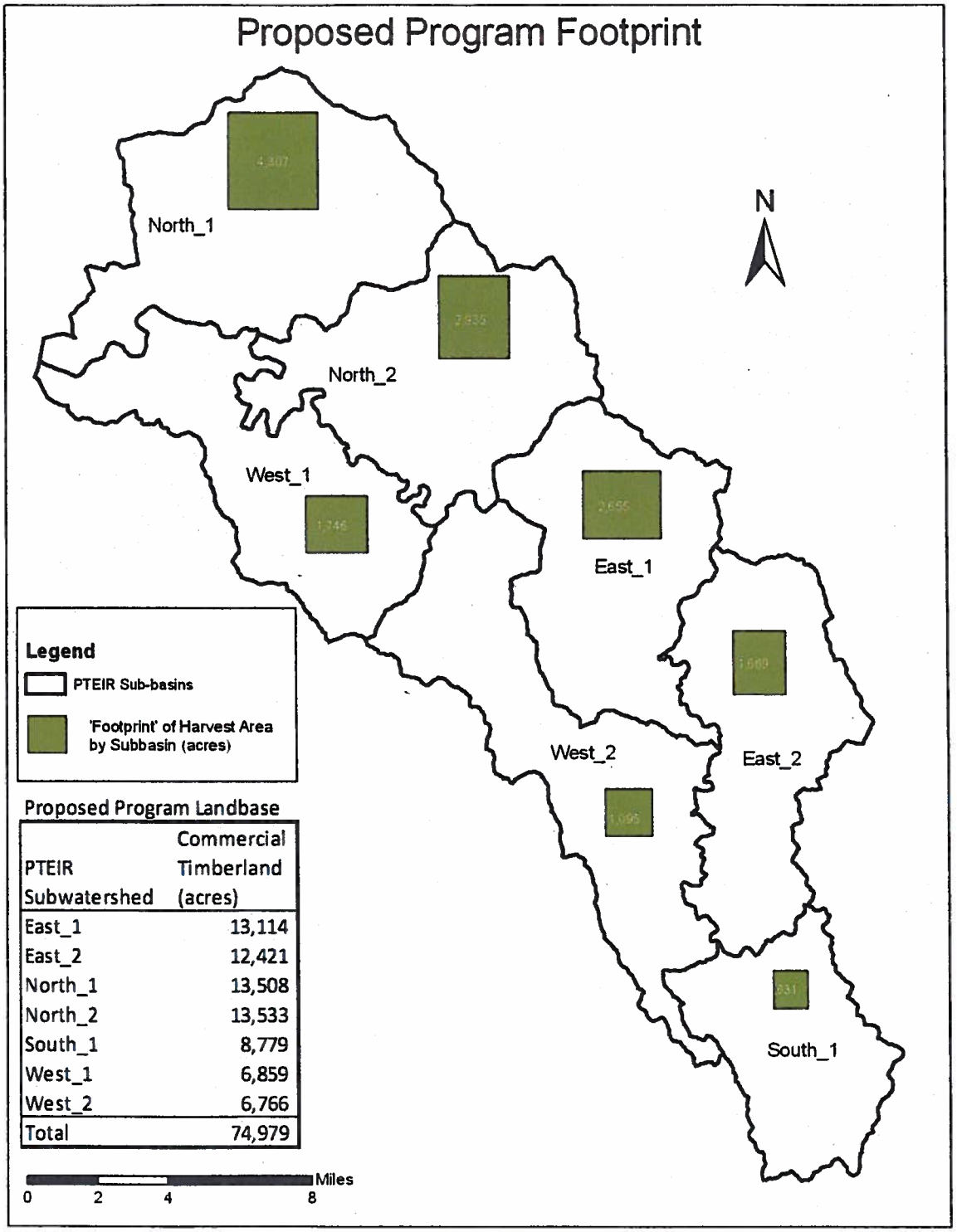
Table 2-13 below shows the breakdown of the proposed Program landbase identified by application of the methodology described in Appendix A, while Figure 2-3 shows the location of the potentially harvestable area in 2010.

To further determine the environmental effects of proposed treatments, the operational harvest landbase was further subdivided into areas projected for harvest using one of the allowed silvicultural prescriptions and related treatments (e.g., slash treatments, road crossing repair). These acres by treatment were analyzed over the 50-year planning horizon and include multiple harvest entries, regeneration and growth, and variability in timber prices projected over time.

Table 2-13
Breakdown of Program Landbase by Acreage

Landbase	Area (acres)
Private land in watershed	156,484
Commercial forest vegetation types	116,831
Commercial Timberland (commercial forest type + adequate stocking)	86,671
Commercial Timberland outside of riparian buffers	74,979
Available Landbase (minus areas excluded from harvest because of geologic instability)	57,601
Feasible Landbase (commercial harvest >=$30,000 net profit)	22,465
Program "footprint" – Estimated harvest acres enrolled in program during analysis period	15,038* **Includes only first-time entries, and does not re-count acres that are reentered during the analysis period (see projected acreage below).*
Projected total acreage of harvest, based on propensity-to-harvest data from public survey). Acres harvested twice are counted twice.	41,718* ** Total acreage of harvest, counting acres with multiple harvests multiple times.*

Figure 2-3



Proposed Program Landbase

PTEIR Subwatershed	Commercial Timberland (acres)
East_1	13,114
East_2	12,421
North_1	13,508
North_2	13,533
South_1	8,779
West_1	6,859
West_2	6,766
Total	74,979

Distribution of Program Harvest Acres by Subbasin by Landowner Type

The distribution of likely harvest across the Mattole during the analysis period was allocated based on the amount of operationally harvestable land in each Program subbasin, and is shown in Table 2-14, for the proposed project.

Table 2-14
Total Acres Projected to be Harvested and Harvest "Footprint" By PTHP's 2011-2060 Under The Proposed Program Acres By Ownership Type By Subbasin

	NIPF	Industrial	Total	"Footprint" 1/
East_1	8,094		8,094	2,655
East_2	5,149		5,149	1,669
North_1	7,594	3,500	11,094	4,307
North_2	3,492	3,500	6,992	2,935
South_1	1,777		1,777	631
West_1	5,007		5,007	1,746
West_2	3,605		3,605	1,095
Total	34,718	7,000	41,718	15,038

1/ See definition of footprint in Table 2-13 above.

The total landbase in the proposed program is comprised of 57,601 acres. On this landbase, it is projected that logging plans totalling 34,718 acres will be filed during the 50-year analysis period by NIPF owners, and another 7,000 acres by industrial owners. It should be noted, however, that many of these acres will represent re-entry harvests on the same acres and not previously unharvested acres brought into the program. The analysis recognizes that some landowners who employ the Program will not conduct subsequent harvests, but that some additional landowners who have not participated will enter the program during the analysis period; these effects are assumed to balance out over the analysis period.

In order to predict the future acreage of THPs and PTHP's, the 1993-2007 time period was used to estimate the acreage of each silviculture type for Non-Industrial Forest Landowners (NIPFs). NIPFs used even-aged methods on approximately 30% of the acres and uneven-aged or thinning methods on 70% of acres during this period. For analysis of the program it was assumed that all uneven-aged methods would convert over to PTHP's, while the 30% of even-aged harvests would still use THPs. (For HRC, data obtained directly from the company was used to estimate harvest for that ownership. In order to conservatively estimate potential impact from the Program, the entire projected HRC harvest was estimated to be implemented under the Program. If some of HRC's harvest is carried out under other FPR permitting methods, such as THPs, the Program's impact would be less than projected in this EIR.)

Based on these assumptions, the 2011-2060 projected harvest level represents a 74% increase in harvest levels compared to the '93-'07 time period. This harvest acreage is projected to increase

over time due to increased volume on WHR size class 4 and 5 stands (stands with diameters > 11" DBH). However, the projection also recognizes that some landowners who employ the Program will not conduct subsequent harvests; therefore, for analysis purposes the additional new acres and non-repeated PTHP acres are projected to balance each other out, so that the 11,239 NIPF acres harvested by 2034 is carried over as the analyzed landbase through the remainder of the analysis period (2060). While it is not known whether in-growth of feasible land and interested owners will exceed or fall short of the number of owners who drop out of the program, there is no particular reason to believe that balance would tend one way or another.

The projected NIPF harvestable acreage represents 71 ownerships that can support a feasible harvest, which were chosen randomly based on the propensity of landowners of their size class to conduct a timber harvest. Fifteen of these landowners own 160 acres or less and 56 own more than 160 acres. Table 2-15 below shows estimated harvest by subbasin by NIPF landowner class across the 50-year analysis period. *(Note: Wide fluctuations in totals by period shown in the table are related to the estimated volume of mature timber per modeled parcel combined with the modeled price of timber per period. In one five-year cycle, the model did not predict any high-log-value years. Minor variations in numbers are caused by rounding).*

Table 2-15

Projected PTHP Harvest 2011-2060
For The Proposed Program
NIPF Owners By Size Of Ownership By 5-Year Period

Analysis Period	Acres Harvest NIPF =<160 Acres	Acres Harvest NIPF >160 Acres	Total
2011-15	638	4,242	4,880
2016-20	145	1,196	1,341
2021-25	182	2,462	2,664
2026-30	598	4,178	4,776
2031-35	135	2,538	2,673
2036-40	143	2,052	2,196
2041-45	781	5,782	6,562
2046-50	0*	265	265
2051-55	134	3,395	3,528
2056-60	744	5,108	5,852
TOTAL	3,500	31,217	34,718

*Modeled timber harvest prices for this period were projected to be too low to support commercial harvest.
**Please note that the acres projected to be treated under the Program (and Alternatives 2 and 3) are not directly comparable to treatment acres for Alternative 1 (see Table 2-16), since the Program includes 'off-Program' harvest, but Alternative 1, being entirely 'off-Program' includes no additional off-Program acres.

2.3 Elements Common to All Alternatives and Alternative Development

2.3.1 Provisions that apply across program and alternatives

The sections below describe development of alternatives and the differences in practices and acres treated between the Program and its alternatives. However, there are several activities critical to achieving approval of a timber harvest plan which are identical to the Program and to each alternative. These include requirements for:

- Protection of cultural, archaeological and historical resources
- Northern spotted owl/marbled murrelet surveys and management requirements
- Other T&E species surveys and management requirements
- Sudden oak death mitigations

2.3.2 Alternative development

In accordance with Section 15126.6 of the CEQA Guidelines, the PTEIR must analyze a range of reasonable alternatives to the Proposed Program, which could feasibly attain most of the objectives of the Program but would avoid or substantially lessen any significant effects of the project. The CEQA Guidelines provide the following direction for analysis of the alternatives:

- Describe a range of reasonable alternatives to the project, or to the location of the project.
- Evaluate the comparative merits of the alternatives.
- If there is a specific proposed project, explain why other alternatives were rejected in favor of the proposal.
- Focus on alternatives capable of avoiding or substantially lessening significant adverse environmental effects or reducing them to a level of less than significant, even if these alternatives would impede to some degree the attainment of the Program objectives, or would be more costly.
- If an alternative would cause one or more significant effects in addition to those that would be caused by the Program as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the Program as proposed.

Alternatives to the Proposed Program are based, in part, on public comments received during the initial scoping of the Project. Stakeholders cited potential impacts to fisheries and water quality, along with interruption of terrestrial dispersal corridors, as significant concerns.

2.4 Alternative 1: No Program - Continue Status Quo

CEQA requires the evaluation of a "no project" alternative (CCR 15126.6(e)) in order to allow decision makers to compare the impacts of approving the Program with the impacts of not approving any project at all. The no Program alternative shall describe the existing conditions as well as what would reasonably be expected to occur in the future if the Program was not approved.

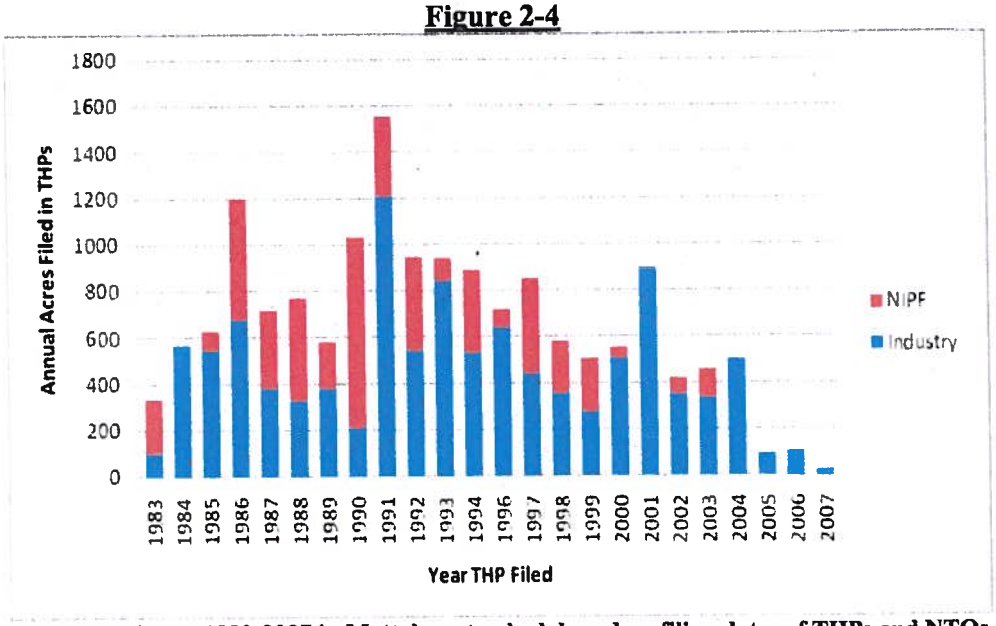
Under the No Program alternative, the Program/PTEIR/PTHP process would not be used to

implement commercial timber harvest in the Mattole. Individual landowners would continue to file THPs, NTMPs and Exemptions to the Forest Practice Rules to harvest timber as they do today and as some would also do even if the Program is approved, but the 'all-aged' silvicultural prescriptions developed for the Program would not be available to them, and the light-touch application of standard prescriptions would be economically infeasible for many owners.

After the elimination of riparian buffers from the area of private commercial timberland, the private landbase for Alternative 1 is estimated at 76,759 acres. After eliminating areas for geologic unsuitability, the acreage available for harvest in Alternative 1 is less than under the Proposed Program (at 52,108 acres compared to 57,601 acres in the Program) because only 65% of acres in the most extreme geologic hazard class in this Alternative were considered available for harvest due to the requirement to have an engineering geologist review these areas compared to 80% in the Program as a result of use of the Geologic Flow Chart. The acres projected to be harvested under this Alternative, however, is far less at 12,334 acres of NIPF lands and 11,717 acres of Industrial lands because this Alternative tries to replicate "current conditions" where harvest has been low. The process for predicting harvest trends under this Alternative is described below. In addition, the even-aged harvests would typically represent one or at most two entries during the course of the time horizon, whereas any given acre could be entered two or three times in 50 years under the Program's light-touch harvests.

While the entire data set of harvest by acres by treatment (1983-2008) was useful to understand certain elements of the harvest history, the most recent 14 years from 1993 to 2007 were most instructive for predicting future harvests under the No Program Alternative (Figure 2-4). This is because the Forest Practice Rules and regulatory environment in general have become much more prescriptive and expensive to operate within over the past 14 years (Thompson and Dicus 2005).

Figure 2-4



Harvest history 1983-2007 in Mattole watershed, based on filing dates of THPs and NTOs.

From 1993 to 2007, the acres of THPs and NTMP Notice of Timber Operations (NTOs) filed in the Mattole averaged 508 acres/year, 25% on NIPF land and 75% on industrial land. However, the year-to-year variation is quite high, with total harvest ranging from less than 50 acres to almost 1,000 acres/year. During this period, silviculture on NIPF lands was approximately 70% uneven-aged and 30% even-aged, and just the inverse on industrial lands.

It is assumed that under the No Program alternative, the choice of silviculture on NIPF lands will remain approximately the same as it has been. However, on industrial lands the choice of silviculture is likely to change in the future since the change in ownership of Pacific Lumber Company (PALCO) forest lands to Humboldt Redwood Company (HRC). HRC has stated that they will implement uneven-aged silviculture on well-stocked conifer stands in the Mattole, whereas PALCO tended to implement even-aged prescriptions in these stand types.

Where historical (pre-FPR) logging in the Mattole has left stands with high hardwood stocking, HRC will likely continue the policies of its sister company, Mendocino Redwood Co. (which has taken over and rehabilitated 42,000 acres of former Louisiana Pacific holdings in Mendocino County, with about 40,000 to go (Mike Jani, personal communication 2010)). HRC treatments apply the Variable Retention (VR) prescription to hardwood-dominated stands, first reducing the hardwoods with basal herbicide injection followed by removal of a portion of the conifer overstory, after which the stand is regenerated by planting with conifers. As the title of the prescription indicates, a certain proportion of the pre-harvest stand is retained during and after stand treatments and harvest (FPR 913.4.d.(3)).

Over the projected timeline of the Program, the rate of harvest using FPR prescriptions is likely to increase (compared to the 1993-2007 period), as the volume of harvestable timber (through growth and ingrowth) of Group A species on many ownerships increases. The acreage of land in the Mattole considered feasible to harvest using a THP (see Appendix A) is projected to increase 21% from 2011 to 2030. The increase in harvested acres is likely to be similar, which would mean an increase in the average annual harvest rate (base '93-'07) from 508 acres/year to 613 acres/year by 2030.

Table 2-16

Total Acres Projected to be Harvested and Harvest "Footprint" By THP's or NTOs 2011-2060 For Alternative 1 (Status Quo) Acres By Ownership Type By Subbasin

	NIPF	Industrial	Total	Footprint
East_1	3,451		3,451	1,950
East_2	1,458		1,458	770
North_1	3,949	5,000	8,949	5,330
North_2	1,959	5,000	6,959	4,292
South_1	253 1/	1,717	1,970	1,717
West_1	562		562	277
West_2	702		702	379
Total	12,334	11,717	24,051	14,715

1/ Parcel sizes are such that little harvest from NIPF's likely. Also, timber volumes are small compared to costs of road rehabilitation measures, and there is little evidence of recent timber harvest in this basin.

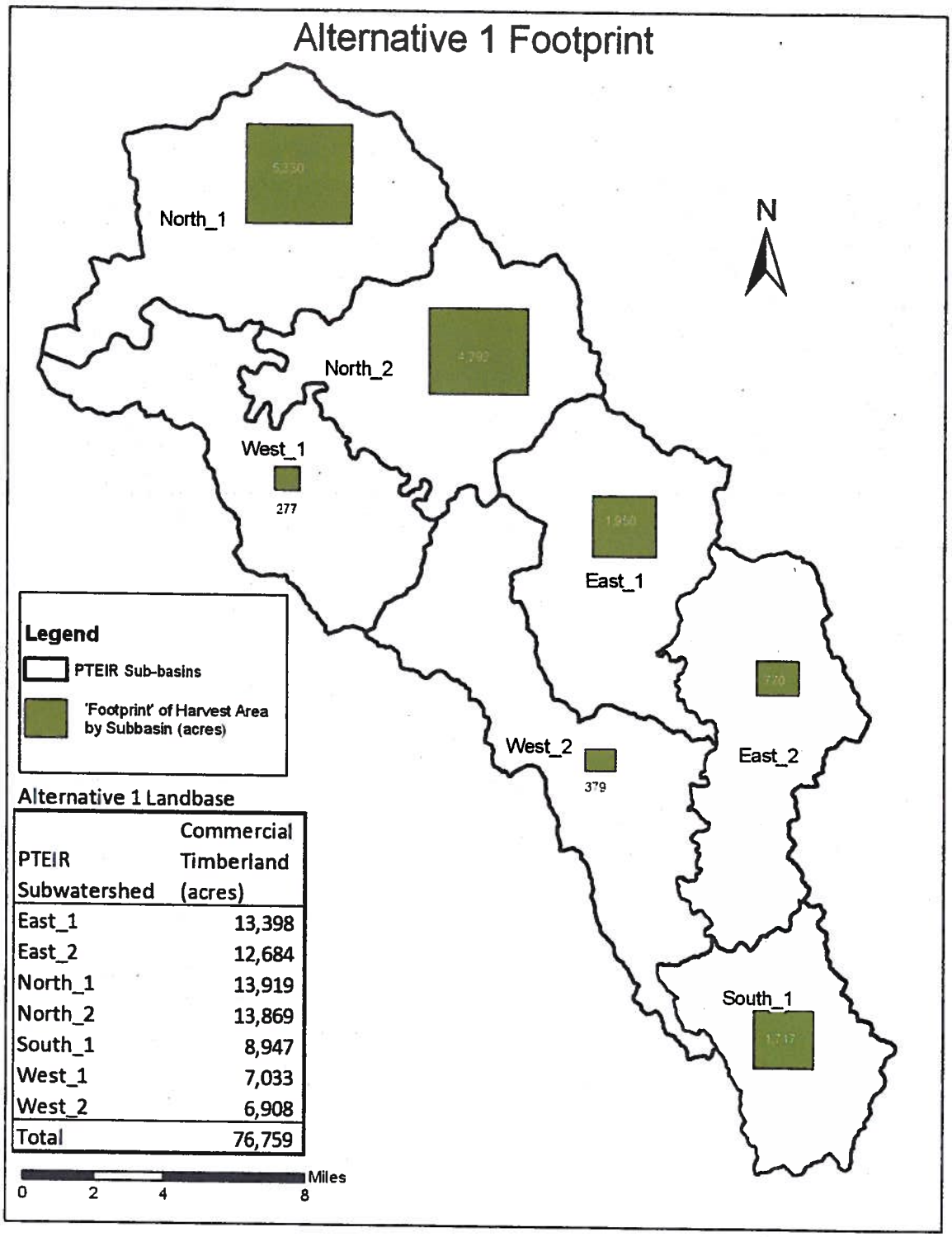
Table 2-17

Projected Harvest 2011-2060 For Alternative 1 (Status Quo) NIPF Owners By Size Of Ownership By 5-Year Period

Analysis Period	Acres Harvest NIPF =<160 Acres	Acres Harvest NIPF >160 Acres	Total
2011-15	231	1,103	1,334
2016-20	40	420	460
2021-25	56	1,146	1,202
2026-30	201	1,183	1,384
2031-35	98	1,171	1,269
2036-40	40	917	957
2041-45	257	1,861	2,118
2046-50[1]	0	271	271
2051-55	98	1,613	1,711
2056-60	241	1,387	1,628
TOTAL	1,262	10,072	12,334

[1] Note that, as with the projections of harvest under the Program, harvest levels during this five-year period are low — an artifact of the log-value model having projected no years from 2046 to 2050 with high log values. The same dip in harvest projections can be seen for all the other alternatives as well.

Figure 2-5



Alternative 1 Landbase

PTEIR Subwatershed	Commercial Timberland (acres)
East_1	13,398
East_2	12,684
North_1	13,919
North_2	13,869
South_1	8,947
West_1	7,033
West_2	6,908
Total	76,759

70% of harvests are projected to utilize uneven-aged silviculture, and the other 30% will use even-aged prescriptions, based on historical trends. HRC is expected to utilize uneven-aged prescriptions 70% of the time and Barnum is expected to use only even-aged methods.

2.5 Alternative 2: Broader Buffers While Allowing Even-Aged Management

Alternative 2 addresses the widespread and longstanding interest of the Mattole community in restoring the once-abundant fisheries of the watershed. All of the Program requirements apply to this Alternative with the exception of those described below, including using the Appendix B Geologic Flow Chart, no harvest on extreme erosion hazard rated soils, no harvest on inner gorges, T&E species requirements, road building requirements, etc.

The major differences between the Program and Alternative 2 are associated with extra protections for wildlife and water quality purposes, but in return, even-aged prescriptions are allowed outside of those buffers. Alternative 2 attempts to increase protection of wildlife and water quality by widening no-harvest buffers along watercourses and prohibiting harvest on areas delineated as "Very High" landslide hazard. Under Alternative 2, no-harvest buffers are 150' wide on Class I streams, 100' wide on Class II streams and 50' wide on Class III streams (both sides of stream, slope distance). Because of the increase in no-harvest areas, the available landbase on NIPF lands for Alternative 2 is the lowest of the considered alternatives, at 46,644 acres, even before the elimination of potentially unstable areas. In addition, Alternative 2 would not allow any harvest on geologic hazard category 5 (the most landslide prone).

In contrast to restricting the potential harvestable acreage, Alternative 2 would allow the full suite of FPR silvicultural prescriptions to be applied on the remaining manageable landbase, subject to some constraints. Under this alternative, clearcuts and variable retention harvests would be limited to 10 acres in size, and shelterwood and seed tree harvests would be limited to 40 acres, with no size restriction on the other FPR prescriptions. The flexibility to apply the full range of FPR prescriptions is designed to allow landowners to harvest a larger volume of timber from fewer acres compared to the Program's prescriptions, helping offset the negative economics of the increased no-cut stream buffers.

Table 2-18 below shows projected harvest by subbasin for Alternative 2, and Table 2-19 projected harvest by NIPF size class.

Table 2-18

Total Acres Projected to be Harvested and Harvest "Footprint" By PTHP's 2011-2060 For Alternative 2 Acres By Ownership Type By Subbasin

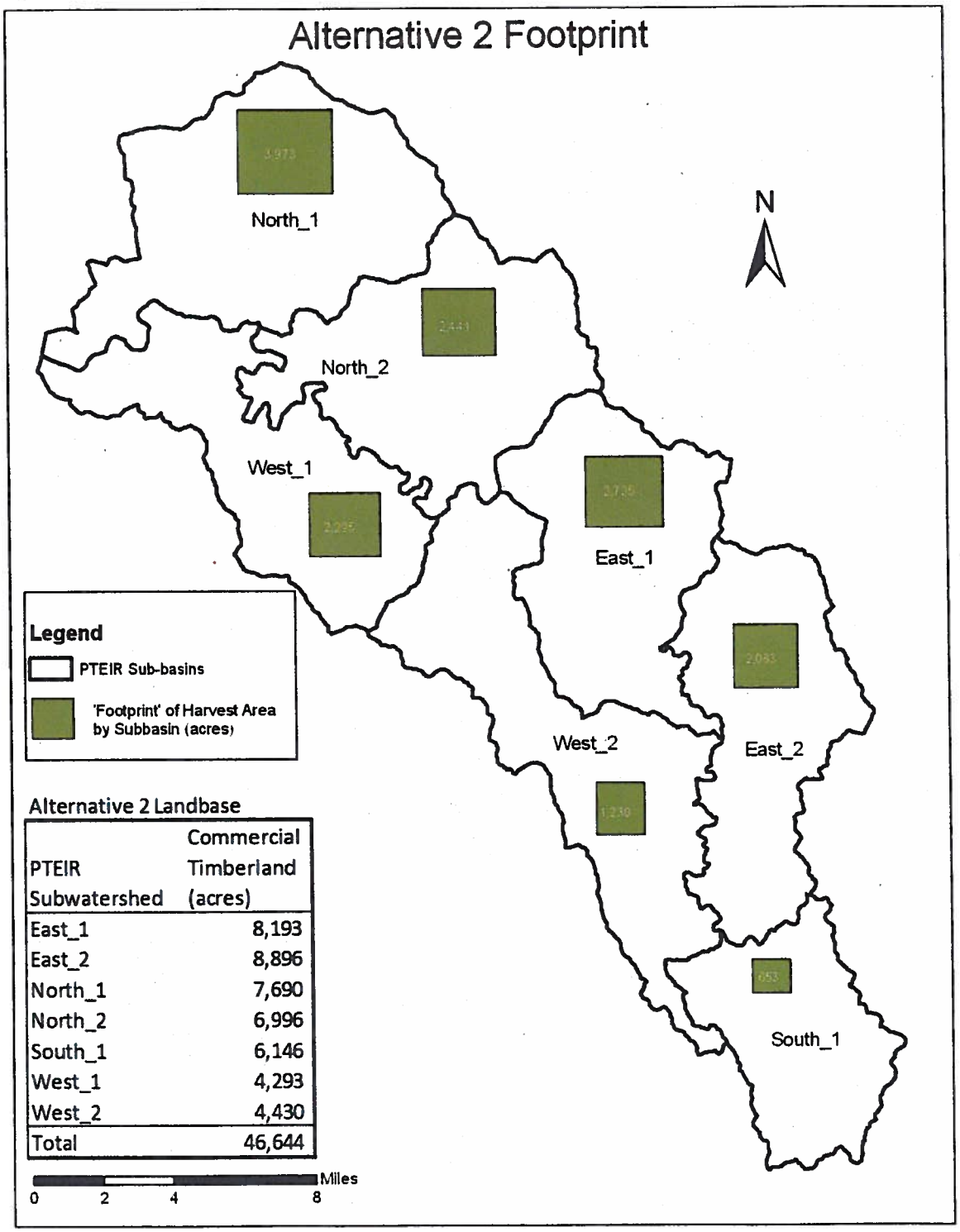
Program Subbasin	NIPF	Industrial	Total	Footprint
East_1	4,965		4,965	2,725
East_2	3,927		3,927	2,083
North_1	5,602	1,750	7,352	3,973
North_2	2,489	1,750	4,239	2,441
South_1	1,209		1,209	653
West_1	4,112		4,112	2,295
West_2	2,353		2,353	1,230
Total	24,657	3,500	28,157	15,400

Table 2-19

Projected Harvest 2011-2060 For Alternative 2 NIPF Owners By Size Of Ownership By 5-Year Period

Analysis Period	Acres Harvest NIPF =<160 Acres	Acres Harvest NIPF >160 Acres	Total
2011-15	497	2,332	2,819
2016-20	168	1,208	1,376
2021-25	270	1,685	1,995
2026-30	479	2,482	2,961
2031-35	229	2,206	2,435
2036-40	229	1,537	1,766
2041-45	642	3,541	4,183
2046-50	65	866	931
2051-55	281	2,225	2,506
2056-60	591	3,134	3,725
TOTAL	3,451	21,206	24,657

Figure 2-6



Alternative 2 Landbase

PTEIR Subwatershed	Commercial Timberland (acres)
East_1	8,193
East_2	8,896
North_1	7,690
North_2	6,996
South_1	6,146
West_1	4,293
West_2	4,430
Total	46,644

2.6 Alternative 3: Fire and Fuels Alternative

The private timberland landbase for Alternative 3 is 76,759 acres before allowing for geological exclusions, the same as Alternative 1, as no acres available under the FPR's are excluded from treatment by this alternative. There are substantial differences in some elements of this alternative, compared to the Program and Alternative I as described below. However, all of the Program requirements associated with using the Appendix B geologic flow chart, restrictions on harvest in inner gorges, no harvest on extreme erosion hazard rated soils, limitations on road building, T&E species requirements, etc. would be retained.

The California Defensible Space Guidelines specified under SB 4291 require reduction of fire hazard in areas where significant values are at risk from wildfire. Alternative 3 shares that goal and applies fuels reduction treatments to the 19,888 acres of NIPF and 10,000 acres of industrial land that are potentially harvestable under this alternative (over the 50-year analysis period). Under this alternative, all operations-related slash would have to be either piled and burned, lopped to 18" from the ground surface, removed, or chipped so that flame lengths in a subsequent fire would not exceed 2' in height.

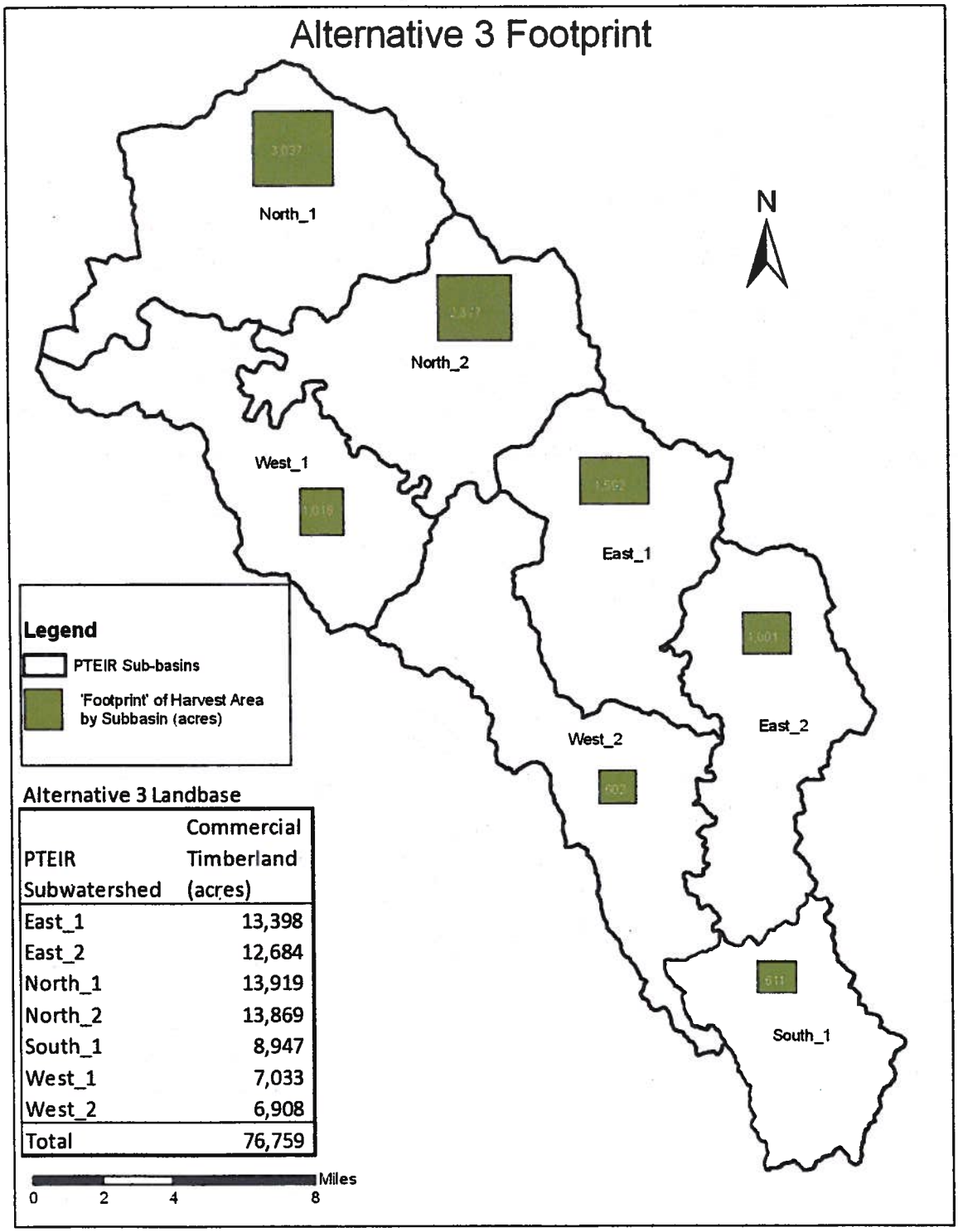
Alternative 3 also requires that at least 60% canopy cover be retained in all harvested areas, to provide shade sufficient to retard the growth of flammable understory vegetation and buildup of fire ladders. For this reason, no group selection openings are allowed under Alternative 3, whereas the other Program-specific prescriptions (AA (without the group selection option), STS & CT) would be allowed. However, unlike the Proposed Program and Alternative 2, Alternative 3 would allow limited timber harvest within portions of riparian buffers (as described below), with the goal of reducing fuel loading and fire hazard across a larger portion of the Program acreage.

The only prescription allowed in riparian buffers would be thinning from below. Specifications of this Program prescription require that the treatment result in an increase in the quadratic mean diameter (QMD) of the trees in the treated stand (within the buffer). In addition, no tree 20" DBH or larger could be harvested from a riparian zone.

Table 2-20
Total Acres Projected to be Harvested and Harvest "Footprint" By PTHP's 2011-2060 For Alternative 3 Acres By Ownership Type By Subbasin

Program Subbasin	NIPF	Industrial	Total	Footprint
East_1	4,915		4,915	1,592
East_2	3,114		3,114	1,001
North_1	3,537	3,500	7,037	3,027
North_2	1,769	3,500	5,269	2,377
South_1	1,718		1,718	611
West_1	2,937		2,937	1,018
West_2	1,899		1,899	602
Total	19,889	7,000	26,889	10,228

Figure 2-7



Alternative 3 Landbase

PTEIR Subwatershed	Commercial Timberland (acres)
East_1	13,398
East_2	12,684
North_1	13,919
North_2	13,869
South_1	8,947
West_1	7,033
West_2	6,908
Total	76,759

Table 2-21

Projected Harvest 2011-2060
For Alternative 3
NIPF Owners By Size Of Ownership By 5-Year Period

Analysis Period	Acres Harvest NIPF =<160 Acres	Acres Harvest NIPF >160 Acres	Total
2011-15	235	2,867	3,102
2016-20	46	817	864
2021-25	132	967	1,099
2026-30	231	2,659	2,890
2031-35	33	1,631	1,663
2036-40	46	817	864
2041-45	364	3,625	3,989
2046-50	0	0	0
2051-55	33	1,631	1,663
2056-60	278	3,476	3,754
TOTAL	1,399	18,489	19,888

2.7 Comparison of Treatments

Table 2-22 below contains an overview of practices required and allowed under the Proposed Program compared to the Alternatives.

Table 2-22

Comparison Of Proposed Program Practices To Alternatives

Provisions and Restrictions	Proposed Program	Alt 1	Alt 2	Alt 3
Class I Watercourse Provisions	100' wide each side, 75' no cut each side 80% canopy retention, No group openings adjacent to WLPZ	FPR – 150', 30' inner no cut zone, 80% canopy retention 30-100', 50% in 100-150 band	150' all no cut	100' wide each side, 30' no cut, commercial thin to increase avg diam outer band
Class II Watercourse Provisions (higher #s are for large IIs)	50'/75'/100' slope dependent width each side 30' no cut inner band 70-80% canopy retention outer band	FPR- 50-100' based on slope, 0'-30'no cut inner band, 50-80% canopy retention in outer band	100' all no cut	50-100' based on slope, 15'-30' no harvest, commercial thin to increase avg diam outer band
Class III Watercourse Provisions	30' or 50' off-limits to heavy equipment no harvest of trees within or overlapping the channel or whose roots contribute to bank stability 50-75% overstory and 50% understory retention, no group selection	30' or 50' off-limits to heavy equipment no harvest of trees within or overlapping the channel. Retain 50 ft^2/acre	50' all no cut	Same as Program

Provisions and Restrictions	Proposed Program	Alt 1	Alt 2	Alt 3
Geological Review of Harvest Units	Program Geology Flow Charts	Completed by RPF except that Geologist required for any operations on areas of instability	Same as Program	Same as Program
Very High Landslide Class	Potential limited harvest after Geologist review	Harvest according to Geologist recommendation	No harvest	Same as Program
Silvicultural Prescriptions Allowed	Single Tree and Group Selection (STS & GS) Commercial Thinning (CT) All-Aged Prescription (AA)	FPR -Clearcut, Seed Tree, Shelterwood, STS, GS, CT, Rehab, Transition	Same as Alt 1	STS, CT, AA (no GS) CT allowed in Stream Buffers
Old Growth Trees	No Harvest of pre-1850 Trees that are > 40" diameter (32" hdwd)	No restriction	No Restriction	Same as Program
Trees Comprising Upper 30% Diameter Classes	Retain 50%	No Restriction	No Restriction	Same as Program
Herbicides	None for life of PTHP (except control of exotics)	No FPR restriction	State Regs	Same as Program
New Road Construction	<=1000' per PTHP, except where justified as having less impact than existing roads	No restriction	Same As Alt 1	Same as Program
Inventory Build-up	AA prescription requires increasing conifer proportion to >50%. Selection requires conifer basal area increase to >150 ft^2 over time.	No restriction	No Restriction	Same as Program
Leave Tree Requirement	All conifer leave trees must be high quality trees free from logging damage, no whips	All conifer leave trees must be high quality	Same as Program	Same as Program
Stream Reconnaissance	Requires walking all Class I, II and III streams courses	Same as Program	Same as Program	Same as Program
Inventory, growth and yield	Requires plot based sampling of each stand, statistical standards established	No Restriction	No Restriction	Same as Program
Demarcate all Streams	Requires flagging all WLPZ and EEZ boundaries	Same as Program	Same as Program	Same as Program
Disconnect Roads from Streams	FPR requirements, essentially disconnect all roads from all streams	Same as Program	Same as Program	Same as Program
Diversion Potential	Eliminate diversion potential on all temporary and permanent roads appurtenant to the plan area	Same as Program	Same as Program	Same as Program

Table 2-23 below shows the treatment acreage by prescription for the Proposed Program and Alternatives. For comparison, prescriptions with similar environmental effects have been combined; for example, the all-aged prescription with its emphasis on conifer restoration, has been separated from the other Program prescriptions, which are generally intended to remove mostly conifers from conifer-dominated stands; likewise for the landscape treated by FPR prescriptions under Alternatives 1 and 2, even-aged prescriptions have been combined into one category and uneven-aged into another.

Table 2-23

Comparison Of Treatment Acreages By Prescription By Alternative

Alternative	ACRES BY PRESCRIPTION TYPE				
	All-Aged	Program Selection, Group Selection, Commercial Thinning 1/	FPR Uneven-aged 2/	FPR Even-Aged 3/	Total
Proposed Program	12,766	28,952 1/			41,718
ALT. 1	0	0	16,836	7,215	24,051
ALT. 2	0	0	19,710	8,447 4/	28,157
ALT. 3	8,328	18,561			26,889

1/ Prescriptions as defined in the Proposed Project, with additional restrictions over and above FPR requirements for these prescriptions.
2/ Includes Selection, Group Selection, and Commercial Thinning as defined in the Forest Practice Rules.
3/Includes all FPR prescriptions except those listed under FPR selection.
4/In Alternative 2, clearcut prescriptions are limited to 10 acres, seed tree and shelterwood to 40 acres; no acreage limit on other even-aged prescriptions.

Table 2-24 shows the footprint acreage, by sub-basin, for the Proposed Program and the Alternatives.

Table 2-24

Comparison Of Footprint Acreage By Alternative and subbasin

Subbasin	ALTERNATIVE			
	Proposed Program	Alt. 1: Status Quo	Alt. 2: Broader buffers, even-aged	Alt. 3: Fire and Fuels
East_1	2,655	1,950	2,725	1,592
East_2	1,669	770	2,083	1,001
North_1	4,307	5,330	3,973	3,027
North_2	2,935	4,292	2,441	2,377
South_1	631	1,717	653	611
West_1	1,746	277	2,295	1,018
West_2	1,095	379	1,230	602
Total	**15,038**	**14,715**	**15,400**	**10,228**

2.8 Alternatives Considered But Eliminated From Detailed Analysis

Enhanced Stream Buffer Alternative

An "Enhanced Stream Buffer" Alternative was considered to address landscape level processes, particularly the role that small upper stream channels play in supporting downstream aquatic life

and enhancing ecosystem integrity. The premise of this alternative was that much more stringent stream protections than customary would be necessary to promote the recovery of coho salmon and sensitive amphibians such as the tailed frog and southern torrent salamander.

The specific standard chosen was to extend no-cut buffer widths to include all streamside slopes greater than 30% (see below), in order to decrease the potential for timber harvest to trigger or accelerate landslides which degrade aquatic habitat.

Under this alternative, no-cut buffers would have been established alongside Class II and III watercourses, extending 10 meters beyond the point where slopes that led directly to the watercourse decreased to <=30%, above which point any of the Program prescriptions could be applied. In addition, Class II stream buffer widths would have been measured not from the edge of the wetted channel (as is currently the case), but from the break in slope above the channel.

This alternative was submitted during scoping and the interdisciplinary Mattole Technical Advisory Committee (MTAC – a body of agency and university scientists who review restoration work in the Mattole) appointed a subcommittee to review it. The conclusion of this subcommittee was that scientific research does not support concern about mass-wasting where slopes are less than 50% – a cutoff point identified by geomorphologists concerned with landslide hazards. As a result, the underpinning of this proposed alternative – concern for landsliding on slopes all the way down to 30 % – could not be supported. In addition, this alternative did not meet many of the Program objectives associated with controlling sediment sources, increasing tree size and reducing the potential for catastrophic fire. Also, very few acres would have been available for management, resulting in an alternative that was projected to be infeasible to implement.

In addition, Alternative 2, as described above and analyzed in this document, incorporates the concept of broader buffers for enhanced watercourse and aquatic life protection. Another consideration was that the Proposed Program requires the application of geologic flow-chart analyses to determine appropriate management responses to slope instability problems; and includes stream buffer requirements exceeding those in the FPR; this combination of approaches was felt to be more science-based than those of this proposed alternative. While this alternative might meet some of the project objectives, it was considered infeasible to implement because the vast acreage of Class III no harvest buffers would have eliminated timber harvest virtually everywhere. Because this alternative was considered infeasible along with the combination of the other factors discussed above, this alternative was eliminated from more detailed analysis.

Corridors and Refugia Alternative

An alternative was considered to increase protection of wildlife and water quality within a corridor encompassing the East_1, West_2 and South_1 subbasins. This alternative was generated from comments received during public meetings and from public scoping. These three subbasins form a corridor between Gilham Butte and the Humboldt Redwoods State Park, on the northeastern side of the Mattole, and the King Range National Conservation Area on the southwestern side of the Mattole. This corridor would provide a functional link for terrestrial species to move through the Mattole watershed within forests of improved structural

composition. The alternative had as a goal enhancing protection of valuable salmonid spawning and rearing habitat in the Southern subbasin.

Protection of habitat within the corridor would be accomplished by requiring landowners choosing to file PTHP's in the 3 subbasins to adhere to the following measures:

- minimum post-harvest residual stocking levels of 125 sq.ft. BA/acre;
- group selection harvests prohibited;
- prohibition of harvest on areas delineated as "Very High" landslide hazard;
- no-cut buffers 150' wide on Class I streams; 100' wide on Class II streams and 50' wide on Class III streams.

For the other 4 subbasins it was expected that watercourse protection measures would be loosened somewhat, but this was not finalized before the alternative was eliminated from consideration.

The PTEIR team concluded that this alternative, because of its restriction of the landbase in three subbasins and the corresponding decrease in available land for timber management, would deter most landowners from using the Program to manage their timber making this alternative infeasible to implement. Instead, at least in the three affected basins, they would opt to utilize the existing FPR rather than this alternative, thereby having much the same environmental effect as Alternative 1. As a result, many of the Program objectives would not be met in these three subbasins.

This alternative was eliminated from further analysis because it was considered infeasible to implement due to the acreage of Class III no harvest buffers in these three subbasins which would have eliminated timber harvest virtually everywhere. Because this alternative was considered infeasible along with the combination of the other factors discussed above, this alternative was eliminated from more detailed analysis in favor of Alternative 2, based on the argument that, if larger buffers and restrictions on harvest would substantially improve wildlife habitat and corridor function, application of these provisions across all seven subbasins rather than just three should be considered. Restriction of these provisions to a subset of the subbasins as proposed in the alternative also made analysis of the effects of the alternative more complex than Alternative 2, which applies enhanced buffers across the landscape.

Fire Hazard Reduction and Fuel Break Alternative

This alternative aimed to both limit new road construction (thereby reducing inputs of sediment into streams) and encourage the development of a network of shaded fuel breaks within the Mattole watershed. Under this alternative, the same prescriptions would apply as in the proposed project, but operations would be limited to areas within 150' of an existing roadway.

Drawbacks to this alternative included a likely reduction in the financial viability of the Program/PTHP option for many landowners, given that much of the forestland owned by landowners in the basin would not be included in the area available for harvest, making it harder to meet the FPR requirement to demonstrate maximum sustained productivity. In addition, to the

extent that re-opening roads for PTHP's would lead to increased maintenance and storm-proofing of those legacy roads, a restriction on re-opening roads for harvest purposes could actually increase sediment yields over the long term, as untreated, failed roads delivered sediment to streamcourses. In addition, a number of non-commercial treatments (e.g., understory removal, brush suppression) would be required to construct logical and effective firebreaks, and the added costs of these treatments tended to exacerbate the already questionable economics of this alternative.

Another critique of this alternative was that some Program silvicultural prescriptions did not logically lend themselves to establishment of functional fuelbreaks (e.g., group selection, all-aged) and thus the suite of prescriptions (and the ability to address silvicultural conditions in the Mattole) would be reduced.

It was also noted that AB 2420, Forest Fire Prevention Exemption 14 CCR 1038(i) already allows landowners to apply many of the provisions of this alternative without filing a THP or other harvest plan, thus negating the benefit promised by the Program of streamlining the timber harvest permit process.

A final argument against conducting a detailed analysis of this alternative was that the fuels reduction measures it contained would be awkward to analyze because of the difficulty in identifying the Program landbase, because of the difficulty inherent in defining 'existing' roads, which occur in many states of openness and condition.

As a result of the concerns above, it became apparent that the proposed alternative would not meet many of the Program goals and in large measure would likely be infeasible to implement. However, the concept of developing an alternative which provided enhanced fire protection for the basin was carried over into Alternative 3, as described and analyzed in this document.

Silvicultural Prescription Eliminated from Detailed Analysis – Oak and Prairie Restoration

Earlier versions of the Mattole Forest Futures Program considered a silvicultural prescription, which, like the All-Aged Prescription, was specific to the Mattole. The Oak/Prairie Restoration Prescription was designed to maintain or restore areas of native grassland prairie or deciduous oak woodland/savannah, through commercial harvest of invading conifers. It is recognized by the MRC that hundreds if not thousands of acres across the Mattole basin were, in prehistoric and historic times, occupied by oak woodland or savannah (savannah is comprised of 5-7 trees/acre while oak woodland carries a heavier stocking), but have declined sharply in extent over the last 50 years due to the decline in cultural burning and grazing, allowing many of these areas to be invaded by conifers, particularly Douglas-fir. Oak stands and native grasslands are a valuable resource for wildlife and grazing activities, and the Program was originally seen as a vehicle to offset the loss of these vegetation types.

The treatment areas for the oak/prairie maintenance prescription consisted of those areas shown as true oak stands and native prairies on Soil Conservation Service maps from the early 1950s, which are in GIS shapefiles housed at the MRC. Under this prescription the areas in question were proposed to be returned to their 1950s vegetative type by conifer removal. The prescription

proposed requiring any person filing a PTHP with this prescription to include a detailed plan demonstrating how the oak stands and prairies would be returned to their 1950s condition and maintained in that state (e.g., by periodic burning and/or intensive grazing). Protection measures for the oak component of the stands were also required during harvest and slash treatment. In addition to removal of commercial timber, removal or reduction of seedling and sapling-size conifers also had to be addressed in any harvest plan with this prescription.

As the Program developed and public input was collected, the question arose as to whether this prescription met the definition of 'light-touch' silviculture as described in the Program goals and objectives. Although it would apply to a limited landscape as defined by the maps noted above, application of the prescription amounted to more or less clearcut-style removal of all the merchantable conifer trees at one entry over a still-significant acreage. Initially this concern was addressed by development of mitigation measures for the prescription, including limitations on operable slope classes, size of harvest units, and frequency of application. But when the prescription was reviewed by CAL FIRE, it was brought to the attention of the PTEIR planning team that such a treatment was currently allowed by the FPR under a Conversion Exemption; and if an attempt were made in the Program to obtain approval for this treatment specifically for oak stands and prairies (as is currently allowed for aspen stands in the Sierras) it would have to be approved by the Board of Forestry as an amendment to the FPR. Given the regulatory difficulties associated with such an effort and the questions about the environmental effects of its application, this prescription was eventually dropped from the Program because it appeared to be infeasible to implement.

2.9 Environmentally Superior Alternative

CEQA Guidelines §15126.6(e)(2) requires a lead agency in an EIR to identify an Environmentally Superior Alternative.

The Proposed Program treats the most acres with "light touch" prescriptions compared to any of the alternatives, and helps to achieve more of the goals identified by the MRC during development of the Program. The proposed program sets a course for future forest management in the Mattole Basin that is conservation-oriented but economically viable over the long term. Under this program, overt efforts would be made to bring maturing timber stands under management while incorporating measures to encourage development of mature and late-successional stands, improve stocking of conifers, increase the average size of trees in managed stands, and improve water quality through reduction of controllable sediment sources. Attempts to bring hardwood-dominated stands into commercial management through application of special prescriptions, but without the use of herbicides or broad-scale clearing of forest stands would be encouraged. Filing of timber harvest plans would be easier and more cost-effective for the limited range of prescriptions allowed under the program (compared to the normal THP submission process) for those utilizing the Program.

Alternative 1, continuation of the status quo, assumes that forest management activities will continue to occur under the wide range of prescriptions now available to landowners under the FPR. Landowners would continue to file standard timber harvest plans or other harvest

documents, incurring the steadily increasing costs related to the increasing complexity of the FPR..

Fewer acres are projected to be harvested per decade under Alternative 1 compared to the program or the other alternatives. However, many of these acres are expected to be one-time even-aged entries rather than re-entries into previously harvested uneven-aged prescription areas. These even-aged silvicultural prescriptions, such as clearcutting and variable retention harvest, are estimated to be applied at rates approximate to those that have occurred during past decades, with no additional attempts (i.e., Program provisions) to limit their less desirable ancillary effects, such as reliance on herbicides and exposure of large areas of mineral soil to erosion. Much of the harvest that is projected to occur would tend to remove larger, more merchantable trees when prices are high, in order to maximize net present value, while doing little to encourage forest stands to develop mature structures and the variety of tree sizes that are conducive to selection management, and that enhance wildlife habitat for interior-dwelling species. Modifications of treatments to address unstable slopes would be limited to those required by law, as would watercourse protection measures. Fewer controllable sediment sources would be reduced under this alternative than the program or other alternatives, because the area covered by harvest plans would be smaller. As timber stands in the Mattole basin mature over time, the likelihood of a period of high timber prices initiating a boom of intense logging, followed by an eventual bust as the timber was depleted, would be more likely under this alternative than the program or alternatives.

Alternative 2, with its emphasis on protection of watercourses, reduces the potential landbase to 62% of that of the proposed program, and is 60% of the landbase considered for the status quo and Alternative 3. Its requirements for large no-harvest buffers would create refugia and travel corridors that could provide definite wildlife benefits over the long term. However, tree retention and enhanced stand development in riparian areas under this alternative is offset by the allowance for application of standard FPR silvicultural prescriptions including even-aged silviculture (with its attendant soil exposure and resetting of maturing stands back to regeneration status) across much of the remaining manageable landscape, in order for this alternative to be economically viable. Alternative 2 has the lowest manageable landbase of any of the alternatives and therefore causes the least overt effect in terms of acres disturbed by timber harvest. However, fewer miles of road would be rehabilitated under this alternative compared to the program and Alternative 3. Fuel reduction treatments are not an emphasis under this alternative, and the large no-harvest buffers could potentially represent high fire hazard zones during periods of extreme fire conditions. Although the large untreated buffers could prevent some delivery to watercourses; this could be offset by fewer controllable sediment sources being treated compared to the program or Alternative 3.

Alternative 3, with its emphasis on fuels reduction following harvest, would be the most expensive alternative to implement and therefore require higher timber prices before harvest under it would be feasible, or cause a concomitant reduction in feasible acres of harvest which would be limited to better-stocked stands. Unlike the other alternatives or the program, wildland fire hazard would remain the same as before harvest or be reduced below this level, after post-harvest slash treatments. Unlike the program or other alternatives, Alternative 3 would reduce high fuel loading within WLPZs while adding these areas to the projected acreage of the

alternative, which is nevertheless lower (at 19,889 NIPF acres plus 7,000 industrial acres, for a total of 26,889 acres) than any of the alternatives except the status quo (Alt. 1). Under this alternative, more soil disturbance would occur closer to streamcourses compared to the program or other alternatives.

Table 2-25 below summarizes the potential environmental impacts described in chapter 3, which shows that the Program is the environmentally superior alternative. The effects of the Program are projected to be less than significant, or beneficial, in all resource areas — a finding that does not apply to any of the other alternatives.

Table 2-25
Summary Of Effects

Resource Area	Prog	Alt 1	Alt 2	Alt 3
Air Quality	-	-	-	+
Fish & Aquatic	-	-	-	-
Cultural	-	-	-	-
GHG	+	+	+	+
Geology	-	- -	-	- -
Soils	-	- -	-	-
Noise	-	-	-	+
Pop/Housing	-	-	-	+
Recreation	-	-	-	-
Hazardous Mat	-	- -	-	-
Transport/Traffic	-	-	-	+
Utilities/Energy	o	o	o	o
Vegetation	+	+	+	+
Visual/Aesthetic	-	-	-	o
Water Quality	+	+	+	+
Wildlife	+		-	+
Wildfire	-	- - -	- - -	+

"-" less than significant, "- -" potentially significant
"- - -" significant [before mitigation]
"o" no effect, "+"beneficial

2.10 Chapter 2 Bibliography

Anders, Jentri, 1995. The History and Sociology of the Human Presence in the Honeydew Creek Watershed, Mattole River, Southern Humboldt County, California for the US Bureau of Land Management, Arcata Resource Area, Arcata, CA. November 1, 1995.

BLM 2004. King Range National Conservation Area. Proposed Resource Management Plan and Final Environmental Impact Statement. Arcata, Calif.

CGS, 2002. Geologic and Geomorphic Features Related to Landsliding. Mattole River Watershed. Humboldt and Mendocino Counties. California. Various Plates. California Division of Mines and Geology, Sacramento, CA. 2002.

Klein, R.D, W.J. Trush and M. Buffleben. 2008. Watershed Condition, Turbidity, And Implications For Anadromous Salmonids In The North Coastal California Streams. Report to North Coast Regional Water Quality Control Board, Santa Rosa, CA.

Mattole Restoration Council, 2005. Mattole Restoration Council, et. al. Mattole Watershed Plan. Prepared by Mattole Restoration Council, Mattole Salmon Group, Sanctuary Forest, Bureau of Land Management and the State Coastal Conservancy, Petrolia, CA.

Mill Creek Watershed Conservancy, Mattole Restoration Council, and Kate Crockett, 2005. The Community Plan for the Mill Creek Watershed. 145 pp.

Middle Mattole Conservancy and Mattole Restoration Council 2005. Final Community Management Plan for Gilham Butte and the Scattered Parcels. 96 pp.

MRRP (Mattole River and Range Partnership: Mattole Restoration Council, Mattole Salmon Group, and Sanctuary Forest) 2009. Mattole Integrated Coastal Watershed Management Plan: Foresight 2020. Petrolia, Calif. 190 pp.

NCRWQCB, 2002. Mattole River Watershed Technical Support Document for the Total Maximum Daily Loads for Sediment and Temperature. California Regional Water Quality Control Board North Coast Region. Santa Rosa, CA. 2002.

NCWAP, 2002. (Downie, Scott T., C.W. Davenport, E. Dudik, F. Yee, and J. Clements (multi-disciplinary team leads). 2002). Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program, p. 441 plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

Chapter 3
Environmental Impacts and Mitigation Measures

3.0 Introduction and Overview of Chapter

The purpose of Chapter 3.0 is to summarize the environmental impacts that might occur as a result of implementing either the Proposed Program or the Alternatives. Environmental impacts are a function of both the extent and the intensity of the impacts. *Intensity* of impacts refers to the degree of change in biological and physical characteristics that are likely to result from carrying out the treatment. *Extent* of impacts refers to the number of acres affected and their distribution across the landscape.

Chapter 3.1 first provides an overview of the environmental setting for the Mattole Forest Futures Project. After the overview a short description of the potentially significant environmental impacts (chapter 3.2) summarizes the more detailed discussion of the impacts found in each resource section that follows. After the summary of the potentially significant impacts, the environmental impacts for each resource area are described in detail (Chapters 3.3 to 3.19). For each resource area there is a more detailed description of the environmental setting than is contained in the overview followed by CEQA significance criteria for that resource, then the determination threshold for that resource area, followed by data and assumptions. After the data and assumptions subsection for each resource area, the potential environmental impacts from implementing the Program or the alternatives are discussed. The last section within each resource area is a description of any mitigation measures that are proposed to reduce potentially significant impacts below the level of significance.

3.1 Comparison of Program and Alternatives Practices and Landscapes

Chapter 2 describes the landscape where the Program's practices would take place, as well as the landscape for each alternative. Table 3-1 below summarizes the information from Chapter 2 as to the Program and Alternatives' "footprint" acres, i.e., total acres harvested between 2011-2060 by the silvicultural prescription that would be applied on those acres. As explained above, "footprint" harvest are the actual acres upon which logging operations would occur during the 50 year planning period; however, many of these acres are projected to be entered several times. The reason for this is that the Program prescriptions are all light-touch, partial-cut prescriptions that remove low to moderate timber volume from the stands each entry and continually build volume for future entries. Because of the ability of well-managed stands to grow successively more volume per acre over time, any harvested area might be entered three or more times during the 50-year projection period.

The table below contains a summary of the acreage available for harvest, the acreage of landowners with a feasible harvest at some point in the first 5 years, and the acreage that is projected to be harvested from each. A feasible harvest is defined as a harvest that generates more than $30,000 of net income after all expenses. Feasibility in terms of acres that can be harvested and the number of feasible landowners changes each period depending on prices and

stand conditions. Acres are added to the footprint as the harvest model incorporates randomly chosen acres based on the different propensity to harvest of large versus small landowners.

Table 3-1
Summary Of Landscape

Element	Program	Alt 1	Alt 2	Alt 3
Acreage of landbase after WLPZ adjustments	74,979	76,759	46,643	76,759
Acreage of landbase after geologic hazard withdrawals	57,601	52,108	34,259	52,108
Feasible acreage 1st period	22,465	18,134	14,846	15,748
Footprint acres logged 2010-2060	15,038	14,715	15,400	10,228

Alternative III, the fuel hazard alternative, has the smallest number of feasible landowners due to the high cost of treating slash. Alternative II has the smallest acreage of land available to harvest, by virtue of the wide stream buffers; however it has relatively high number of landowners who are able to harvest by virtue of being able to use even-aged practices, staying away from stream buffers, which are relatively expensive to log and utilizing the relatively less expensive PTHP process rather than the THP process. Table 3-2 below summarizes the "footprint" and total acres that would be harvested between 2011-2060 for each of the subbasins.

Table 3-2
Summary Of Harvest Acres For "Footprint" And Total Acres Projected To Be Harvested 2011-2060

Sub-Basin	Total Sub-Basin Acres	Program			Alt 1			Alt 2			Alt 3		
		Foot Print Acres	Foot Print %	Total Harv. Acres	Foot Print Acres	Foot Print %	Total Harv Acres	Foot Print Acres	Foot Print %	Total Harv Acres	Foot Print Acres	Foot Print %	Total Harv Acres
East_1	25,875	2,655	10.3%	8,094	1,950	7.5%	3,451	2,725	10.5%	4,965	1,592	6.2%	4,915
East_2	24,983	1,669	6.7%	5,149	770	3.1%	1,458	2,083	8.3%	3,927	1,001	4.0%	3,114
North_1	34,401	4,307	12.5%	11,094	5,330	15.5%	8,949	3,973	11.5%	7,352	3,027	8.8%	7,037
North_2	29,123	2,935	10.1%	6,992	4,292	14.7%	6,959	2,441	8.4%	4,239	2,377	8.2%	5,269
South_1	17,637	631	3.6%	1,777	1,717	9.7%	1,970	653	3.7%	1,209	611	3.5%	1,718
West_1	25,820	1,746	6.8%	5,007	277	1.1%	562	2,295	8.9%	4,112	1,018	3.9%	2,937
West_2	31,919	1,095	3.4%	3,605	379	1.2%	702	1,230	3.9%	2,353	602	1.9%	1,899
Total	189,760	15,038		41,718	14,715		24,051	15,400		28,157	10,228		26,889

Table 3-3 below shows the average annual harvest in each subbasin by period for all ownerships participating in the Program. After approximately 2030, virtually all Program harvest is modeled as re-entry of previously entered stands.

Table 3- 3
Average. Annual Harvest By All Owners Participating In Program By Period And By Subbasin

Subbasin	Ac 2010-15	Ac 2015-20	Ac 2020-25	Ac 2025-30	Ac 2030-35	Ac 2035-40	Ac 2040-45	Ac 2045-50	Ac 2050-55	Ac 2055-60
East_1	250	56	121	240	104	91	323	8	138	288
East_2	154	52	63	149	65	75	183	7	87	195
North_1	257	133	224	259	177	182	368	87	226	305
North_2	152	102	141	154	121	127	200	80	146	176
South_1	48	16	11	45	52	16	56	0	52	61
West_1	116	28	82	114	123	69	162	11	164	131
West_2	140	20	26	134	32	20	161	0	32	154
Annual Total	1,116	408	669	1,095	675	579	1,452	193	846	1,310

Table 3-4 summarizes the annual harvest by time period for the Program and each of the alternatives.

Table 3-4
Annual Harvest Acres For Program And Alternatives 2010-2060

	Program	Alt 1	Alt 2	Alt 3
Ac 2010-15	1,116	467	634	760
Ac 2015-20	408	292	345	313
Ac 2020-25	669	440	461	360
Ac 2025-30	1,095	477	662	718
Ac 2030-35	675	511	557	473
Ac 2035-40	579	449	423	313
Ac 2040-45	1,452	681	907	938
Ac 2045-50	193	311	256	140
Ac 2050-55	846	599	571	473
Ac 2055-60	1,310	583	815	891

Table 3-5 summarizes the acreage by prescription by alternative by showing the proportion of total acres treated by prescription type.

Table 3-5
Comparison Of Total Acres By Prescription By Alternative

Alternative	Prescription				
	All Aged	Program Selection, Group Selection Commercial Thin	FPR Uneven-Aged	FPR Even-Aged	Total
Program	37%	63%			100%
Alt 1			70%	30%	100%
Alt 2			70%	30%	100%
Alt 3	42%	58%			100%

In projecting the harvest, the combination of harvest volume, prescriptions, property size and delivered log price all interact together. As a result, in the Program, a total of 15,038 acres are likely to be entered by 2035, with a total of 41,718 acres of logging occurring by 2060 (all of the 26,680-acre difference is assumed to be reentry of previously logged areas—no new acres are assumed to be added to the Program). The same concept holds for Alternative III where 10,228 acres are logged using the Program prescriptions by 2035, with 16,661 acres of additional reentry on the same ground.

Harvest under the status quo and Alternative II is by a combination of even-aged and uneven-aged harvest. These alternatives were modeled assuming 70% uneven-aged harvest and 30% even-aged harvest. For the uneven-aged harvest in these alternatives, all acres entered by 2035 are assumed to be new acres and thereafter no new acres are entered; the only harvest that occurs between 2035 and 2060 is reentry of previously entered acreage. For the Status Quo, this assumption of 30% even-aged vs. 70% uneven-aged prescriptions equates to about 9,550 uneven-aged harvest acres having a first time entry until 2035, whereupon no new acres of uneven-aged harvest are added to the footprint between 2035 and 2060. For the Status Quo, the footprint even-aged acreage begins accumulating acres in 2010 and continues through 2060 since no reentry occurs during the 50 year time period.

In addition to the above harvest, an additional number of acres are assumed to be harvested "off-Program" for the Program, Alternative II and Alternative III. By definition, there is no "off-Program" acreage in the Status Quo. These off-program harvests are not accounted for above. Instead, these harvests are accounted for in Chapter 4 in the cumulative impacts analysis. The estimate for off-program acreage whether in the Program or in Alternatives II and III is estimated at 30%, that is, an additional 30% of landowners are projected to harvest timber using THP's or other permits rather than PTHP's, in addition to the acreage harvested under the Program or Alternatives as described above

From a slash treatment standpoint, Program practices require lopping all activity-created slash to 36" above the ground. In modeling Program slash treatment, all hardwoods in the All-aged and Selection prescriptions are lopped to 36", which, for modeling purposes, is simulated by

removing 30% of the branches. In Program group selections, all slash, including felled hardwoods, is piled and burned. In the even-aged prescription under the Status Quo and Alternative II, all hardwoods are assumed to be left on site and no slash treatment is prescribed, other than what would be required by the FPR's, which is essentially treatment along "public" roads. In Alternative III, the fuel hazard alternative, all slash is required to be lopped to within 18" of the ground, such that flame lengths would not be projected to exceed 2'.

3.2 Potentially Significant Impacts Generated During Scoping

The Program is designed to improve a number of resources within the basin including improving the drainage of existing haul roads as well as installation of larger culverts, limited harvest and expanded requirements for leave trees and residual basal area which are designed to improve habitat and to accelerate the progression to late seral characteristics.

However, timber harvest has the potential to significantly impact a number of resources in the watershed. Although the Program is designed to keep these effects within more-than-acceptable limits, they must still be analyzed and evaluated. During public scoping, the following impacts that might result from Program implementation were identified as being potentially significant:

- Landslides resulting from the loss of vegetation
- Impacts to treated areas from wildfire
- Potential for cumulative watershed effects due to timber harvest and road construction, and
- Impacts to water quality.

Accordingly, the possibility of those impacts was examined in particular detail during the analysis.

The remainder of this chapter analyzes the anticipated impacts of the Program and the alternatives to it with regard to seventeen different resource areas.

3.3 Impacts of Program/Alternative Implementation on Air Quality

This section summarizes the impacts to air quality due to implementing either the Proposed Program or any of the alternatives. The analysis is based on the CEQA environmental checklist criteria contained in Appendix G of the CEQA Guidelines.

3.3.1 Environmental Setting – Air Quality

The assessment area for assessing the direct impacts from implementing the Program's practices on air quality is the Program area itself.

The Program area is located within North Coast Air Basin (NCAB), which includes all of Humboldt, Del Norte, Trinity, and Mendocino Counties, as well as a portion of Sonoma County. The North Coast Unified Air Quality Management District (NCUAQMD) regulates air quality in the Humboldt, Del Norte and Trinity County portions of the NCAB, while the Mendocino County Air Quality Management District regulates projects in Mendocino. Less than 2.5% of the entire Mattole watershed and 2.0% of the Program area lie within Mendocino County.

Air quality in the Mattole watershed in general, and in the Program area in particular is excellent, mostly due to the lack of stationary sources such as power plants, cement factories, etc., as well as the very low density of both human population and vehicles. The two primary unregulated sources of air pollution that can originate within the Program area are smoke from fires and dust generated from road use, maintenance, and rehabilitation. Air quality within the NCUAQMD area is in attainment for all criteria air pollutants save for respirable particulate matter (PM10). All other pollutant concentrations are below state and federal standards.

Air Quality is affected by both the rate and location of pollutant emissions and by meteorological conditions that influence movement and dispersal of pollutants. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and air quality. In the NCAB, air quality is predominantly influenced by the climatic regimes of the Pacific. In summer, warm ground surfaces draw cool air in from the coast, creating frequent thick fogs along the coast and making northwesterly winds common. In winter, precipitation is high, wintertime surface wind directions are highly variable, and weather is more affected by oceanic storm patterns (Humboldt County 2002).

Total tons of pollutants produced in 2008 in the NCUAQMD area are estimated from data gathered by staff at NCUAQMD and shown below in Table 3-6.

As a result of the region's topography and coastal air movements, inversion conditions are common in the NCAB (Humboldt County 2007). Inversions are created when warm air traps cool air near the ground surface and prevents vertical dispersion of air. Valleys, geographic basins, and coastal areas surrounded by higher elevations are the most common locations for inversions to occur. During the summer, inversions are less prominent, and vertical dispersion of the air is good. However, during the cooler months between late fall and early spring, inversions

last longer and are more geographically extensive; vertical dispersion is poor, and pollution may be trapped near the ground for several concurrent days.

The NCUAQMD monitors ambient criteria pollutant concentrations within the NCAB, upon which the above determinations of "attainment" and "nonattainment" are based, through a series of air quality monitoring stations (table 3-6). NCUAQMD air monitoring stations closest to the Mattole watershed/Program area include the Eureka-Jacobs station (717 South Ave.) and the Eureka-I Street station (6th/I St). PM10 levels at these stations exceeded the state 24-hour standard during years 2004-2009 and the federal annual standard during two of the years (2004-2009), while ozone and PM2.5 did not exceed applicable standards. While some state standards were exceeded at these stations during the time period above, these stations occur in an urban setting versus the Program area, which occurs in a more rural setting. Hence, it is likely that criteria pollutant concentrations of PM10 and PM2.5 in the Program area are lower than at the monitoring stations. The NCUAQMD monitoring data show that the NCAB is in attainment for ozone, and while the monitoring stations are quite a distance from the Program area, the dispersed nature of the emitters of ozone precursors within the Program area (e.g. cars, trucks, etc.) compared to the Eureka monitoring station make it likely that the Program area is in attainment for ozone along with the balance of the NCAB which is also in attainment.

Table 3-6
2008 Emissions Inventory For NCUAQMD Area

Category	TOG	ROG	NOX	SOX	PM10	PM2.5
	Tons/Day of Emissions					
Fuel Combustion	0.67	0.30	5.96	0.50	0.77	0.73
Waste Disposal	37.00	0.24				
Cleaning And Surface Coatings	0.81	0.75				
Petroleum Production And Marketing	3.04	2.00				
Industrial Processes	1.53	1.20	1.76	0.06	1.30	0.85
Solvent Evaporation	4.20	3.99				
Residential Fuel Combustion	5.05	2.22	0.78	0.16	4.77	4.59
Paved Road Dust					3.24	0.49
Unpaved Road Dust					28.05	2.80
Fires						
Managed Burning And Disposal	9.09	5.08	0.13	0.02	9.46	8.44
Miscellaneous Processes Subtotal	32.81	8.82	0.91	0.18	47.23	16.60
On-Road Motor Vehicles	6.85	6.34	12.21	0.02	0.43	0.31
Other Mobile Sources	4.84	4.41	21.33	8.40	1.73	1.63
Subtotal Manmade	91.75	28.05	42.17	9.16	51.46	20.12
Biogenic Sources (emissions from non human biological decomposition such as decay of wood, plants, etc.)	235.34	222.91				
Geogenic Sources (emissions that originate in the soil)	0.26	0.05				
Wildfires	42.48	8.95	13.49	4.16	40.11	34.03
Subtotal Natural	278.08	231.91	13.49	4.16	40.11	34.03
Total For District	369.83	259.96	55.66	13.32	91.57	54.15

1/ TOG are gaseous organic compounds, including ROG, which are photochemically reactive chemical gases. NOX are compounds of nitric oxide and nitrogen dioxide, which may contribute to smog. SOX A strong smelling, colorless gas that is formed by the combustion of fossil fuels, PM10, a criteria air pollutant consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs where they may be deposited PM10 also causes visibility reduction. PM2.5: Includes tiny particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs

Table 3-7
PM10 And PM2.5 Pollutant Concentrations In Eureka Area of NCAB 2004-2008 1/

Pollutant	State Std	Fed Std	2004	2005	2006	2007	2008
PM10 Highest 24-hour average, ug/m3	50	150	64	71	72	54	47
PM 10 days over State Std			2	1	12	4	Nd
Annual average ug/m3	20	No std	21	14	20	No std	No std
PM2.5 Highest 24-hour average ug/m3	No std	65	26	32	35	34	31
Days over National Std		0	0	0	0	0	0
Annual average ug/m3	12	15	8	nd	8	8	Nd

1/ Data presented are the closest measured data to the Program area within the NCAB.

Land uses such as schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because infants and children, the elderly, and people with health afflictions, especially respiratory illnesses, are more susceptible to ailments resulting from poor air quality than is the general public. Residential areas are also considered to be sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods, resulting in sustained exposure to any nearby pollutants. There are no sensitive receptors either on or immediately adjacent to the Program area. There are a limited number of sensitive receptors (schools) within the Mattole basin.

While portions of the KRNCA were designated as wilderness on November 12, 2004, those areas are not listed as part of the mandatory list of Class I Federal areas for visibility purposes in 40 CFR 81. As such, the visibility requirements of 40 CFR 81 and Class I designation does not apply to the King Range, or within the Program area.

3.3.2 Regulatory Setting – Air Quality

CEQA requires that potential impacts to aesthetic resources be analyzed. Regulation of air quality is achieved through implementation of national and state ambient air quality (concentration) standards and enforcement of emissions limits for individual sources of air pollutants. The federal Clean Air Act requires the US EPA to identify National Ambient Air Quality Standards (national standards) to protect public health and welfare. National standards have been established for ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), suspended particulate matter (PM10 and PM2.5), and lead. These pollutants are called "criteria" pollutants because the corresponding ambient standards satisfy criteria specified under the Clean Air Act. The State of California has established its own air quality standards (state standards) that are generally more stringent, or health-protective, than their national counterparts. Table 3-8 presents the federal and state ambient air quality standards for the criteria pollutants.

Table 3-8
State and National Ambient Air Quality Standards

Pollutant	Averaging Time	California 1/		National 1/		California Violation Threshold	National Violation Threshold
		ppm	Mg./cu meter	ppm	Mg./cu meter		
Ozone	8 hours	0.07	137	0.075	160	If exceeded	If 3-year average of annual third-highest daily 8-hour maximum exceeds standard
	1 hour	0.09	180	NS	NS	If exceeded	If exceeded on more than 3 days in 3 years
Carbon monoxide (CO)	8 hours	9	10,000	9	10,000	If exceeded	If exceeded on more than 1 day per year
	1 hour	20	23,000	35	40,000	If exceeded	If exceeded on more than 1 day per year
(Lake Tahoe only)	8 hours	6	7,000	NS	NS	If exceeded	N/A
Nitrogen dioxide NO2	Annual average	0.03	57	0.053	100	N/A	If exceeded
	1 hour	0.18	339	0.1	NS	If exceeded	If exceeded
Sulfur	Annual average	NS	NS	0.03	80	N/A	If exceeded

dioxide (SO2)	24 hours	0.04	105	0.14	365	If exceeded	If exceeded on more than 1 day per year
	1 hour	0.25	655	0.075	NS	N/A	If 1 hour concentration exceeds the 3 year average of the annual 99th percentile of 1 hour daily maximum, effective 8/23/10
Respirable particulate matter	Annual arithmetic mean	NS	20	NS	NS	N/A	If exceeded
	24 hours	NS	50	NS	150	N/A	If exceeded on more than 1 day per year
Fine particulate matter	Annual average	--	12	NS	15	N/A	If spatial average exceeded on more than 3 days in 3 years
	24 hours	No state std			35	N/A	If exceeds 98th percentile of concentrations in a year
Lead	30 day average		1.5	N/A	N/A	If equaled or exceeded	N/A

1/ NS = No standard

As noted above, the Program area is within the NCAB. Authority for air quality management within each basin has been given to local Air Pollution Control Districts, which regulate stationary source emissions and develop local non-attainment plans within their jurisdiction.

When a region falls outside of attainment, individual air districts or groups of air districts prepare air quality management plans designed to bring an air basin into compliance with relevant ambient air quality standards. Those plans, which are submitted to the CARB for approval, usually contain an emission inventory and a list of rules proposed for adoption. The districts regulate emissions from stationary sources while the State regulates emissions from mobile sources such as cars and trucks.

Each air quality district maintains its own air quality rules and regulations, including specific regulations regarding open burning. Open burning regulations encompass both agricultural burning and prescribed wildland burning. The air quality district controls emissions by limiting the acreage per day that can be burned and requiring a permit from the applicable air district. All open burning is restricted only to burn days permitted by the California Air Resources Board (CARB). The CARB uses information on existing air quality conditions and meteorological predictions to determine whether to allow burning and the volume of burning it will allow. However, each air district, fire control agency, or burning permit agency has the authority to be more restrictive than the ARB to avoid air quality impacts.

The NCUAQMD is the regional agency empowered to regulate air pollution emissions from sources in the Humboldt, Trinity, and Del Norte County portions of the NCAB. The Mendocino Air Quality Management District (MAQMD) regulates air pollution emissions from sources within Mendocino. As with the other air districts in the state, NCUAQMD and MAQMD operate independently and have their own set of regulations and programs to address emissions from stationary, area and mobile sources consistent with state and federal laws, regulations, and guidelines. Both air districts regulate air quality through their permit authority over most types of stationary emissions and through its planning and review activities. Both also operate air

quality monitoring stations that provide information on ambient concentrations of criteria air pollutants (COE 2008).

The California Clean Air Act of 1988 differs from the Federal Clean Air Act in that no sanctions or specific timelines for attainment of the California Ambient Air Quality Standards (CAAQS) have been established. The CAAQS were enacted in response to the need for new air quality requirements, which are more protective of public health. California has also set standards for some pollutants that are not addressed by federal standards. This act requires air quality attainment at the earliest practicable date, and reasonable progress must be made each year. Similar to the Federal Clean Air Act, the California Clean Air Act requires that attainment plans be prepared for designated non-attainment areas.

To address the NCAB's "nonattainment" status for PM10, the NCUAQMD prepared a draft PM10 attainment plan identifying cost-effective control measures that can be implemented to bring ambient PM10 levels to within California standards. The control strategies include transportation control measures (public transit, ridesharing, vehicle buy-back program, traffic flow improvements, bicycle incentives, etc.), land use measures to reduce reliance on automobiles, and open burning measures (NCUAQMD 1995). Only the open burning portion of the PM10 plan would apply to practices being used in the Program.

Within the Program area, participants can burn only when sanctioned by the CARB or the NCUAQMD/MCAQMD (California Health and Safety Code, Section 41855). All Program participants must comply with the guidelines set forth in the NCUAQMD Particulate Matter (PM10) Attainment Plan (1995) in order to achieve the California Ambient Air Quality Standards for PM10. Smoke management concerns must be addressed in all prescribed fire plans. For all prescribed burns over ten acres in size, a Smoke Management Plan must be submitted to the NCUAQMD for approval prior to ignitions.

NCUAQMD/MCAQMD Registration Program for Naturally Occurring Asbestos.

The NCUAQMD and MCAQMD are required by State law to implement and enforce all State Airborne Toxic Control Measures (ATCMs). The two air districts have instituted a registration program for construction, grading, quarrying, and surface mining operations, and applicants must register with the districts prior to engaging in specific activities covered by the regulation. As part of the registration process, the applicant may be required to submit a dust control plan. Notification must be made to the districts at least 14 days before activity begins. However, the program includes a series of exemptions. One of these exemptions is for projects that are located in an area not designated as an ultramafic rock unit area by the California Department of Conservation Division of Mines and Geology (COE 2008; NCUAQMD 2009). In general, very little of the Program area is underlain by ultramafic rock. Forest types that grow on ultramafic rock are not part of the Program in that they are usually designated as MHW, which are excluded from the Program by forest condition, e.g. they are not considered commercial.

The Humboldt County portion of the Program area is subject to the requirements of the Humboldt County General Plan, including the Framework Plan (1984) and the ECP (1999). These do not contain specific air quality policies (e.g., leave the issue of emission

minimization/reduction to the NCUAQMD). The General Plan does contain policies that would reduce operational air emissions, but these policies are not associated with forest management.

The purpose of smoke management techniques is to minimize the impacts of smoke on urban and residential areas, heavily used recreation areas, Class I areas, and other sensitive areas. Methods available include meteorological scheduling for good atmospheric dispersion, pre-ignition modeling of downwind particulate concentration, active-phase smoke monitoring, and choosing conditions that encourage cloud scavenging. (Radke 1990)

The application of best available control measures (BACM) for prescribed fire is a required element of State Implementation Plans for PM10 non-attainment areas that are significantly impacted by prescribed fire smoke (EPA 1992).

When a burn plan is completed for a project it should include the following smoke management components:

- Actions to minimize fire emissions – The steps taken prior to the burn and actions that will be taken after the burn to reduce air pollutant emissions.
- Evaluate smoke dispersion – Fire prescriptions submitted prior to the day of the fire must specify minimum requirements for the atmospheric capacity for smoke dispersal such as minimum surface and upper level wind speeds, desired wind direction, minimum mixing height, and dispersion index.
- Public notification and exposure reduction procedures – Actions that will be taken to notify populations and authorities at sensitive receptors, including those in adjacent jurisdictions, prior to the fire. The plan should also identify contingency actions that will be taken if smoke intrusions occur.
- Air Quality Monitoring – The plan should identify how the impacts of the fire on air quality at sensitive receptors, and visibility in mandatory Class I Federal areas will be monitored.

In the event of an uncontrolled wildfire in the Program area, the NCUAQMD Regulation 2 (revised 1987 and adopted by the Basin Control Council of the California North Coast Air Basin and Mendocino County Air Pollution Control Board, 1988) contains provisions for the setting of backfires necessary to save life or valuable property (California Public Resources Code, Section 4426). The regulation also allows prescribed burning activities for the abatement of fire hazards (California Health and Safety Code Section 13055) and for forest management, range improvement, disease or pest prevention, or the improvement of land for wildlife and game habitat (California Health and Safety Code Section, 39011[a]).

3.3.3 Significance Criteria – Air Quality

Based on Appendix G of the CEQA Guidelines, an air quality impact would be considered significant if the Program and Alternatives would:

a. Conflict with or obstruct implementation of the applicable air quality plan;
b. Violate any air quality standard or contribute to an existing or projected air quality violation;

c. Result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
d. Expose sensitive receptors to substantial pollutant concentrations;
e. Create objectionable odors affecting a substantial number of people;
f. Otherwise degrade the atmospheric environment; or
g. Expose workers or the public to hazardous toxic emissions or substantial pollutant concentrations.

3.3.4 Determination Threshold – Air Quality

As noted above, the NCUAQMD and the CARB have set air quality standards for the NCAB and thus for the Program area. Table 3-8 describes the standards and what constitutes a violation of that standard. If a pollutant concentration is lower than the standard, the pollutant is classified as "attainment" in that area. If an area exceeds the standard more times than allowed under the established violation criteria (see Table 3-8 above), the pollutant is classified as "non-attainment". Currently the NCUAQMD is in attainment for all pollutants except for PM10. The Program and Alternatives will create a significant effect if the air quality impacts would exceed the California Violation Threshold described in Table 3-8 above.

3.3.5 Data and Assumptions – Air Quality

Three types of emissions might result from implementing the Program's practices; emissions from operations associated with harvest (generally emissions from gasoline and diesel engines and dust from skidding and log hauling), emissions associated with prescribed burning and emissions from potential wildfire.

Emissions from Logging Equipment and Log Truck Hauling Including Dust From Unpaved Roads

Emissions from gasoline and diesel engines associated with logging equipment are based on the CARB emission factors for off road vehicles (including chainsaws) from the CARB OFFROAD2007 computer program as well as for on-road heavy-duty trucks (representing log trucks) from the CARB EMF2007 emission factors for on-road vehicles. Dust from unpaved roads in terms of PM10 and PM 2.5 due to log hauling was estimated from NCUAQMD emissions inventory data for 2008, which shows unpaved road dust PM10 emissions at 28.05 tons/day within the district. Given that the Mattole represents about 3.6% of the entire district, the daily emissions of PM10 and PM 2.5 were projected to be 3.6% of the NCUAQMD wide emissions. The resulting rate of 1.02 tons/day of PM10 and 0.1 tons/day of PM 2.5 probably drastically overestimates the dust produced from log truck hauling, as the Mattole likely generated a much smaller proportion of total log haul within the District than its size would dictate. However, given a lack of other data, the rate above (1.02 and 0.1 tons/day for PM10 and PM 2.5 respectively) was set as the rate for the Status Quo. Estimates of the amount of dust generated by the Program or the Alternatives are based on a combination of acreage and volume treated, since the Status Quo generates a proportionally higher amount of volume per acre resulting in more trips per acre than the Program or the other two alternatives.

Emissions from Prescribed Fire

Emissions from prescribed fire are based on estimates of the tons per acre of fuel and the pounds of emissions per ton of fuel consumed from Sugihara (2006), table 3-9. For the all-aged and selection prescriptions, slash load is estimated as fuel model J or K (light to intermediate slash) at 14-35 tons/acre, for the even-aged prescriptions, slash load is based on fuel model I, heavy slash at 55 tons/acre. For the Program, prescribed fire is estimated to be applied to 10% of all treated acres since few people are likely to under-burn selectively managed stands while up to 25% of acres are prescribed burned in Alternatives I, II and III. Alternatives I and II have a higher treatment rate than the Program since much more slash is likely to be generated and the need to treat slash for both the purpose of tree planting and the FPR requirements to treat slash within 100' of all public roads. Alternative III is expected to have a higher rate of prescribed fire, since a goal of this alternative is to reduce fuel loadings such that flame lengths on average are less than 2 feet.

Of the 10% of acres projected for treatment with prescribed fire in the Program, ½ of the acres are expected to be broadcast burned, and the other ½ are expected to be tractor piled. About 10% of the tractor pile acreage is expected to be in piles and 90% of the piles are expected to be burned. For Alternative I - III, broadcast burning is assumed to be applied to 10% of all acres and an additional 15% of all acres are tractor piled with 10% of the tractor piled area in piles of which 90% of the piles are burned. Emission rates by fuel/fire configuration are as shown below:

Table 3-9
Emission Factors in Tons/Acre For Prescribed Fire In Uneven-Aged And Even-Aged Prescriptions

Item	PM10	PM2.5	CO	CO2	CH4	NMHC
Uneven-Aged Prescriptions Tons/Acre						
Broadcast burn/acre	0.577	0.530	6.816	73.848	0.290	0.216
Pile Burn/acre	0.456	0.410	4.056	76.968	0.398	0.278
Even-Aged Prescriptions Tons/Acre						
Broadcast burn/acre	1.323	1.216	15.620	169.235	0.666	0.495
Pile Burn/acre	1.045	0.941	9.295	176.385	0.913	0.638

Emissions from Wildfire

The tons of wildfire related emissions of PM10 and PM2.5 reported by the NCUAQMD for 2008 throughout the three county area were combined with the acreage of fire perimeters reported by CAL FIRE in the same area in 2008 to give tons of emissions per acre. The resulting emissions are calculated as 0.059 tons/acre/year for PM10 and 0.051 tons/acre/year for PM2.5. Sugihara (2006) also reports PM10 and PM2.5 emissions from wildfires, however the Sugihara rates at 0.15 and 0.13 tons/acre/year of PM10 and PM2.5 (from 1996) are substantially higher than the NCUAQMD rates. Based on a different analysis, Sugihara suggests rates of 30 and 27 pounds of PM10 and PM2.5 per ton of fuel consumed which equates to about 0.36 tons/acre to 0.89 tons/acre of PM10 for fuel model J,K compared to fuel model I. Because the projected tonnage

of slash is known by Alternative, Sugihara's rates of 30 and 27 pounds of PM10 and PM2.5 per ton of fuel consumed are used in this analysis, which overemphasizes the production of particulates generated by wildfires compared to the NCUAQMD rates. NCUAQMD rates for production of TOG, ROG, NOX and SOX are used since Sugihara does not have rates for these pollutants.

These emission rates are then applied to the acreage and tons of fuel/acre to arrive at a projected tonnage of emissions from wildfires burning through recently logged areas burning at the historical subbasin rates experienced between 1950 and 2009. During the historical period, an average of 926 acres/year burned in wildfires throughout the Mattole based on CAL FIRE fire perimeter data. Chapter 3.17 describes the proportion of each subbasin burned during the historical period. These rates were annualized and applied to the Program and alternatives acreage in each subbasin to arrive at an estimate of the emissions from wildfires burning through treated areas at the subbasin level.

3.3.6 Direct Impacts to Air Quality Common to the Program/Alternatives

Program and Alternatives Air Quality Emissions from Prescribed Fire

Prescribed fire emissions from the Program or Alternatives are directly related to the acres treated by both broadcast burning and pile burning. In addition, acreage treated varies between subbasins and across time. Also, pile burning emits slightly fewer tons of PM10, PM 2.5 and CO and slightly more tons of CO2, CH4 (methane) and NMHC (non-methane hydrocarbons), the only values reported by Sugihara. For this analysis, the emission rates for broadcast burning are applied to all types of prescribed fire including pile burning. The main impacts from prescribed fire are the production of particulates in smoke, such as PM10 and PM 2.5, which have the greatest potential to affect human health and the production of CO2.

The NCUAQMD tallied an estimated 3,452 tons of PM10 and 3,080 tons of PM2.5 emissions from "managed burning and disposal" for the year 2008. 2008 undoubtedly was a year with extremely low production of prescribed fire generated PM10 and PM2.5 given the series of lightning storms that took place in June causing over 245,000 acres of the NCUAQMD to burn from wildfire during the summer. As a result of these wildfires and the corresponding smoke being produced, the likely number of prescribed fires allowed by the NCUAQMD is estimated to have been lower than normal.

Annual harvest acreage in the Program during the first five-year period is projected to be approximately 1,116 acres/year, varying from a low of 48 acres/year in the South_1 subbasin to a high of 257 acres/year in the North_1 subbasin. Program acreage treated is projected to vary over time as a function of timber prices and volume per acre. The annual acreage treated by the Program varies from a low of 193 acres/year across all subbasins to a high of 1,452 acres/year. The average acreage treated per year is projected at about 834 acres.

For the Program, PM10 and PM2.5 emissions vary from a low of 6.5 and 5.6 tons/year of PM10 and PM2.5/year, respectively across all subbasins to a high of 45 and 42 tons/year of PM10 and PM2.5. The annual average of PM10 and PM2.5 emissions is estimated at 26 and 24 tons/year.

During the first five-year period when about 1,116 acres are projected to be treated, the Program might produce about 35 and 32 tons/year of PM10 and PM 2.5 respectively. These projected emissions represent about 1.01% and 1.04% of all PM10 and PM2.5 emissions tallied by the NCUAQMD in 2008, even though the Mattole Basin represents about 3.6% of the land area within the District.

For the Status Quo, emissions of PM10 and PM2.5 vary from a low of 37 and 34 tons/year of PM10 and PM2.5 to a high of 81 and 73 tons/year of PM10 and PM2.5, which represents about 2.1% and 2.0% of total district emissions in 2008. Alternative II varies from a low of 37 and 32 tons/year of PM10 and PM2.5 to a high of 108 and 97 tons/year of PM10 and PM2.5, which represents about 2.5% of total PM10 and PM2.5 emissions in 2008. Alternative III is projected to have the lowest PM10 and PM2.5 emissions varying from a low of 9 and 8 tons/year to a high of 61 and 57 tons/year of PM10 and PM2.5 respectively with an average emission of about 1.4% of district emissions per year.

The District is in attainment status for PM2.5 but not for PM10. However, implementation of the Program would likely result in less PM10 (and PM2.5) being generated than the Status Quo (on average about 26 and 24 tons/year for the Program compared to 57 and 51 tons/year from the Status Quo of PM10 and PM2.5). As a result, implementing the Program would likely result in a projected reduction in the amount of PM10 and PM2.5 being generated in the NCUAQMD compared to the Status Quo. Alternative II is likely to slightly increase the production of PM10 and PM2.5 compared to the Status Quo, while implementation of Alternative III would likely result in a substantial reduction of PM10 and PM2.5 compared to the Status Quo.

Program and Alternatives Emissions from Logging Equipment and Log Truck Hauling

Emissions of particulate matter (PM which includes PM10 and PM2.5), CO, CO2, NOX, SOX and TOG are based on emission factors for chainsaws, tractors, loaders and log trucks operating over various time periods per job. The number of jobs in any one-year is a function of the number of randomly selected landowners chosen during the random selection process described in chapter 2.2. The number of randomly selected landowners varies from an average of 70 in the Program in any one-year, to 27 landowners in the Status Quo to 90 landowners in Alternative II to 51 landowners in Alternative III. The number of landowners in the Status Quo is so low because projected permitting costs only allow a limited number of landowners with enough land and timber volume to be randomly selected to harvest, particularly given the low propensity of small landowners to harvest.

Total tons/year of exhaust related particulate matter generated by the Program is approximately 1.8 tons/year compared to about 1.39 tons/year in the Status Quo to 1.61 tons/year in Alternative II to 1.16 tons/year in Alternative III. These emissions range between 0.012% of total PM emissions within the District for the Program to 0.008% of District emissions for Alternative III. Tonnage per year in the Status Quo is lower than the Program due to fewer acres being harvested and production rates that are higher than in the Program lessening the number of days of production per million board feet of logs moved.

Production of CO varies between the Program and Alternatives from about 112 tons/year and

Alternative I to 130 tons/year for Alternatives II and 72 tons/year for Alternative III. Tonnage of CO2 is about one order of magnitude higher than for CO and ranges from 3,443 tons for the Program to 2,841 tons for the Status Quo and 3,309 and 2,2181 tons/year for Alternatives II and III.

The emission of SOX is extremely minor and varies between 0.4 tons/year in the Program to 0.3 tons/year for Alternative III. Production of NOX and TOG are two orders of magnitude greater and range between 33.9 tons/year for the Program to 26.3 tons/year in the Status Quo to 31 and 14 tons/year for Alternatives II and III. For TOG, the Program generates about 63 tons/year while the Status Quo generates about 64 tons/year. Alternatives II and III generate about 74 tons/year and 40 tons/year of TOG.

Dust generated by log trucks on unpaved roads is expected to be in the range of 180 tons/year of PM10 and 18 tons/year of PM2.5 for the Status Quo. Since more acres are logged and volume is slightly higher total PM10 and PM2.5 generated from dust from the Program is expected to be about twice as high on average as the Status Quo. Alternatives II and III are expected to be proportionately more than the Status Quo or less than the Status Quo depending on the number of acres logged and the volume of timber produced. Comparatively speaking, dust from log trucks hauling logs on unpaved road within the Mattole represents about 4-6% of the total amount of dust projected to be created by implementing either the Program or the Alternatives.

Production of exhaust related PM, SOX, NOX and TOG generated by the Program's practices or the Alternatives is relatively insignificant compared to total emissions within the district. Total production of exhaust related particulate matter from the Program is about 0.012% of the total exhaust related particulate matter generated in any year within the NCUAQMD. Production of other gases such as NOX, SOX or TOG are in the same range, e.g. these pollutants generated by the Program and Alternatives are in the range of 0.003% of total production of SOX to 0.7% of NOX and 0.4% of TOG compared to district wide production.

Program and Alternatives Emissions from Potential Wildfires Burning in Mattole

The production of PM10 and PM2.5 from wildfires in 2008 (a year with a substantially greater number of acres burned than on average) resulted in a total of approximately 14,600 tons of PM10 and 12,500 tons of PM2.5. Wildfires also produced about 15,000 tons of TOG which are emissions linked to the production of smog. For assessment purposes, total tons of slash produced and assumed to be untreated and on the ground are the basis for the prediction of emissions from wildfire, in this case 24 tons/acre for the Program and Alternative III and 55 tons/acre for the Status Quo and for Alternative II. These tonnages equate to about 0.36 tons of PM10/acre burned for the Program and Alternative III to 0.86 tons/acre for the Status Quo and for Alternative II.

As noted below in chapter 3.17, the likelihood that any particular acre in one of the subbasins might burn in a particular year is a function of the fire history of that subbasin since 1950. Proportions burned in each subbasin range from 5% of the East_1 subbasin to a high of 34% of the West_1 subbasin. There is a substantial difference between the tendency for a subbasin to be burned by wildfire and the annual acreage that might be treated. Generally, the subbasins with

the highest acreage burned have the smallest number of acres being treated in the Program or the alternatives.

Based on the amount of PM10 and PM2.5 and CO2 from Sugihara and for SOX, NOX and TOG from the NCUAQMD, the Program and Alternatives might produce the following tons/year of these emissions. For the Program, an average year with 834 acres treated per year would produce around 40.2 tons/year of PM10 from wildfires burning untreated slash in treated areas and 36.3 tons of PM2.5. About 8,034 tons of CO2 would be generated. SOX, NOX and TOG amounts are relatively minor at around 1.7, 3.2 and 7.8 tons/year respectively. For an average year, the Status Quo would treat about 481 acres which is substantially less than the Program however, because slash loads are expected to be much higher, total tonnage of PM10, PM2.5 and CO2 are slightly higher than the Program at 45.3, 40.9 and 9,087 tons/year of PM10, PM2.5 and CO2. Output of SOX and NOX is similar to the Program, while smog precursors associated with TOG are about half of the Program at 7.8 tons/year. Alternative II has the highest PM10, PM2.5 and CO2 output since it has the highest average annual acres being treated over the projection period. Amounts of PM10, PM2.5 and CO2 are somewhat higher than the Status Quo at 64, 58 and 12,932 tons of PM10, PM2.5 and CO2 respectively. Rates for SOX, NOX and TOG are slightly higher than the Status Quo and slightly less than the Program. As expected, Alternative III would have the least amount of emissions of the pollutants PM10, PM2.5 and CO2 at 26, 23.5 and 5,139 tons/year. Although SOX, NOX and TOG rates are less than the Program they are similar to the Status Quo.

Overall, likely emissions from wildfires burning areas treated under the Program where slash is assumed not to have been treated, represents an extremely low proportion of total emissions from wildfires burning in the NCUAQMD area, generally on the order of between 0.07% to 0.08% of total emissions. Even if wildfires burned an order of magnitude fewer acres in a particular year (e.g. instead of using 2008 acreage burned at 247,000 acres within the District, 24,700 acres burned), the emissions from wildfires burning treated acreage from the Program would still be in the range of around 0.7 to 0.8% of total emissions in the District. The Status Quo and the other alternatives are all in the same range of emissions as the Program. Essentially, emissions from wildfires burning the Program area are insignificant compared to total wildfire emissions in the District.

3.3.7 Indirect Impacts to Air Quality of Implementing the Program/Alternatives

Over 70% of the total mass of CO2 emissions are from the burning of fossil fuels to skid, load and haul logs as compared to the CO2 given off by prescribed fire and wildfire. As a result, impacts to greenhouse gases, which are discussed elsewhere, are affected by the different treatments among the alternatives. Thus, while the impact of the Proposed Program may be negligible with respect to the emission of criteria pollutants, there may be indirect and adverse impacts to climate from the Proposed Program. There is a potential nuisance effect from prescribed fire on visibility.

3.3.8 Determination of Significance – Air Quality

Table 3-10 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-10
Summary Of Impacts to Air Quality 1/ From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

Based on the projected emissions from prescribed fire, wildfire and from use of heavy equipment, the Program would:

a. not conflict with or obstruct implementation of any NCUAQMD air quality plans and air quality regulations
b. not exceed the California Violation Threshold for criteria air pollutants and thus would not violate any air quality standard or contribute to an existing or projected air quality violation;
c. not result in a cumulatively considerable net increase of any criteria pollutant for which the region is in non-attainment under an applicable federal or state ambient air quality standard since emissions of PM10 from the Program are not "considerable". In fact, implementation of the Program would result in a reduction of prescribed fire PM10 compared to the Status Quo, and would result in an insignificant increase across the district of 0.03% of PM due to exhaust particulate matter and a projected 0.07% increase in PM10 from wildfires,
d. not expose sensitive receptors to substantial pollutant concentrations, generally since operations under the Program do not take place adjacent to such receptors,
e. not create objectionable odors affecting a substantial number of people;
f. not otherwise degrade the atmospheric environment since emissions would not exceed the California Violation Thresholds for criteria air pollutants; and
g. not expose workers or the public to hazardous toxic emissions or substantial pollutant concentrations in excess of the California Violation Thresholds.

Program emissions of criteria pollutants (other than PM) from prescribed fire, heavy equipment use and the potential emissions from a wildfire are all less than significant, because all are far below the emission thresholds for these criteria pollutants. For PM10, emissions from the Program's prescribed fire activities are expected to be around 1-2% of total annual prescribed fire PM10 emissions and only around 0.012% of heavy equipment PM emissions within the NCUAQMD area. As a result, PM10 emissions are expected to create a less than significant

effect to air quality as a result of the limited number of tons produced annually as well as the requirement that all prescribed burning be completed using the Districts' Burn Permitting requirements.

Continuation of the Status Quo emissions of criteria pollutants (other than PM) from prescribed fire, heavy equipment use and the potential emissions from a wildfire are all less than significant, because all are far below the emission thresholds for these criteria pollutants. For PM10, emissions from the Status Quo's prescribed fire activities are expected to be around 2.0 % of total annual prescribed fire PM10 emissions and only around 0.009% of heavy equipment PM emissions within the NCUAQMD area. As a result, PM10 emissions are expected to create a less than significant effect to air quality as a result of the limited number of tons produced annually as well as the requirement that all prescribed burning be completed using the Districts' Burn Permitting requirements.

Implementation of Alternative II results in emissions of criteria pollutants (other than PM) from prescribed fire, heavy equipment use and the potential emissions from a wildfire that are all less than significant, because all are far below the emission thresholds for these criteria pollutants. For PM10, emissions from implementing Alternative IIs prescribed fire activities are expected to be around 2.5 % of total annual prescribed fire PM10 emissions and only around 0.011% of heavy equipment PM emissions within the NCUAQMD area. As a result, PM10 emissions are expected to create a less than significant effect to air quality as a result of the limited number of tons produced annually as well as the requirement that all prescribed burning be completed using the Districts' Burn Permitting requirements.

Implementation of Alternative III results in emissions of criteria pollutants (other than PM) from prescribed fire, heavy equipment use and the potential emissions from a wildfire that are all less than significant, because all are far below the emission thresholds for these criteria pollutants. For PM10, emissions from implementing Alternative IIIs prescribed fire activities are expected to be around 1.4 % of total annual prescribed fire PM10 emissions and only around 0.008% of heavy equipment PM emissions within the NCUAQMD area. As a result, PM10 emissions are expected to create a less than significant effect to air quality as a result of the limited number of tons produced annually as well as the requirement that all prescribed burning be completed using the Districts' Burn Permitting requirements.

3.3.9 Similar Impacts to Air Quality Described Elsewhere

Production of CO2 is described further in the Greenhouse Gas Analysis chapter 3.6. Also, wildfire impacts are described in chapter 3.17.

3.3.10 Mitigation Measures for Air Quality for the Proposed Program

Because the impact of implementing the Program or the Alternatives is less than significant, no mitigation measures are specified.

3.3.11 Literature Cited

Humboldt County, 2002. Humboldt 2025 General Plan Update - Natural Resources and Hazards Report. Prepared by Dyett & Bhatia for Humboldt County. September.

Humboldt County, 2007. Recirculation Draft 3 Master Environmental Impact Report for the Samoa Town Master Plan (SCH #2003052054). Prepared by Planwest Partners for Humboldt County. September.

Radke, Lawrence F.; Lyons, Jamie H.; Hobbs, Peter V.; Hegg, Dean A.; Sandberg, David V.; Ward, Darold E. 1990. Airborne monitoring and smoke characterization of prescribed fires on forest lands in western Washington and Oregon. Gen. Tech. Rep. PNW-GTR-251. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station

Sugihara, Neil. G., Jan W. van Wagtendonk, Kevin E. Shaffer, Joann Fites-Kaufman, Andres E. Thode. 2006. Fire in California's Ecosystems. University of California Press, Berkeley.

USDI BLM, 2005. Draft Programmatic Environmental Impact Report Vegetation Treatment on BLM lands in17 western states. Nevada State Office, Reno Nevada.

3.4 Impacts of Program/Alternative Implementation on Aquatics Resources Including Fish and Amphibians

This section describes the impacts to aquatic biological resources due to implementing either the Proposed Program or any of the alternatives.

3.4.1 Environmental Setting - Aquatic Resources

The watershed assessment area (WAA) for assessing the direct impacts from implementing the Program's practices on Aquatic resources is the Program area itself.

The environmental setting for aquatic resources for the Program area has been previously discussed in chapter 2.0.6, which quotes extensively from the detailed description of these resources from NCWAP and the 2009 MRC Integrated Coastal Watershed Management Plan for the Mattole Basin. As such, these descriptions are not repeated below. As noted in chapter 2.0.6, a detailed description of the history and status of fish resources in the Mattole is found at pages 115-133 of the NCWAP report. Figures 3-1 and 3-2 below from NCWAP show the historic range of salmonids and location of amphibian surveys is reproduced below from NCWAP.

NCWAP summarizes the condition of the Aquatic resources in the Program area and the Mattole basin as follows:

Pool Quantity and Quality

> *"Primary pools provide escape cover from high velocity flows, hiding areas from predators, and ambush sites for taking prey. Pools are also important juvenile rearing areas. Generally, a stream reach should have 30 – 55% of its length in primary pools to be suitable for salmonids. The percent of primary pools by length in the Mattole Basin is generally below target values for salmonids, and appears to be less suitable in lower order streams than in higher order streams."*

Spawning Gravel Quality

> *"Salmonids cannot successfully reproduce when forced to spawn in streambeds with excessive silt, clays, and other fine sediment. Cobble embeddedness is the percentage of an average sized cobble piece at a pool tail out that is embedded in fine substrate. Category 1 is 0-25% embedded, category 2 is 26-50% embedded, category 3 is 51-75% embedded, and category 4 is 76-100% embedded. Cobble embeddedness categories 3 and 4 are not within the fully supported range for successful use by salmonids. More than one half of the surveyed stream lengths within the Mattole Basin have cobble embeddedness in excess of 50% in categories 3 and 4, which does not meet spawning gravel target values for salmonids. "*

Figure 3-1
Historic Range of Coho (NCWAP, 2002)

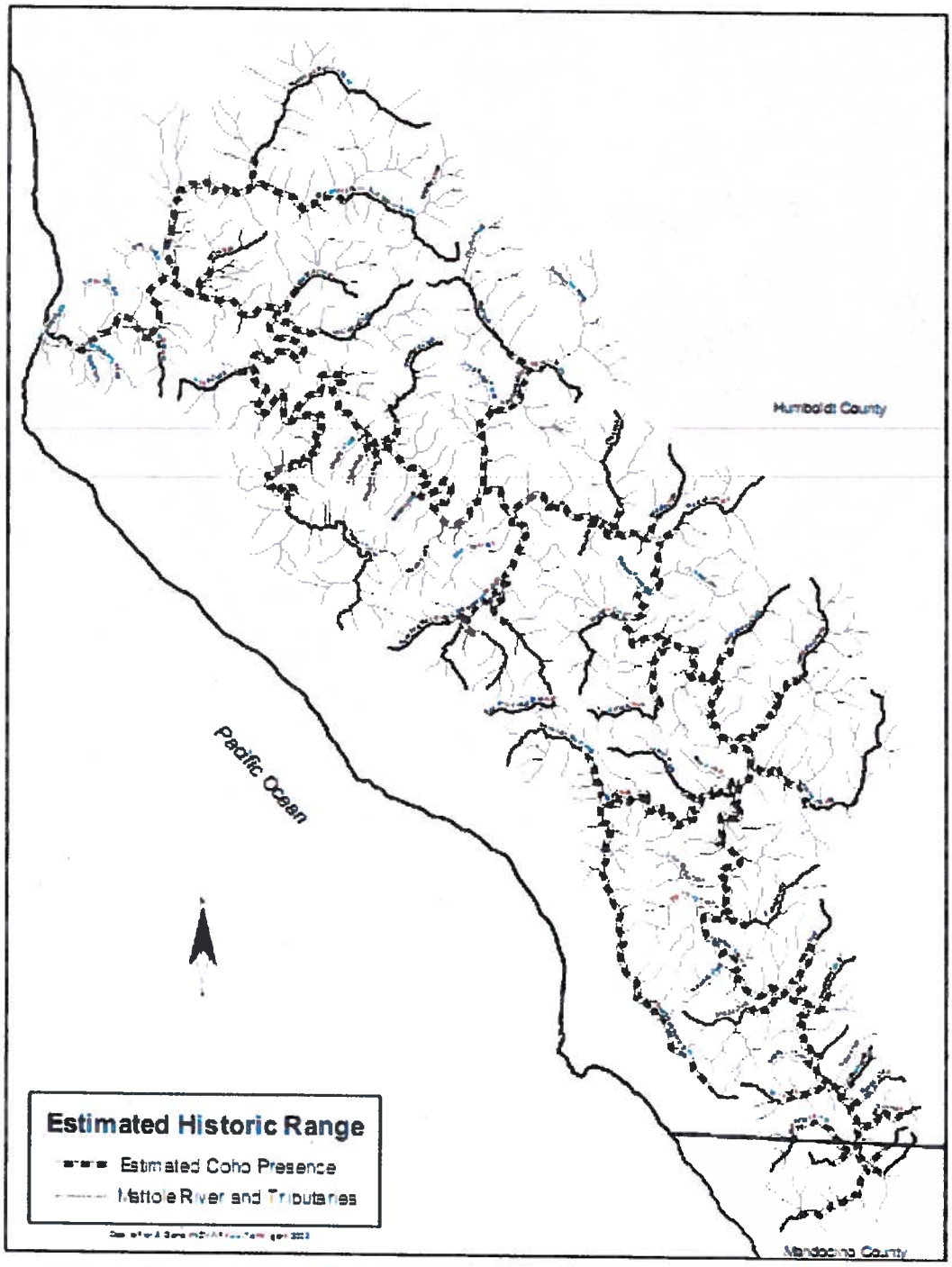


Figure 3- Mattole Basin estimated historic coho distribution

Figure 3-2
Historic Range of Chinook (NCWAP, 2002)

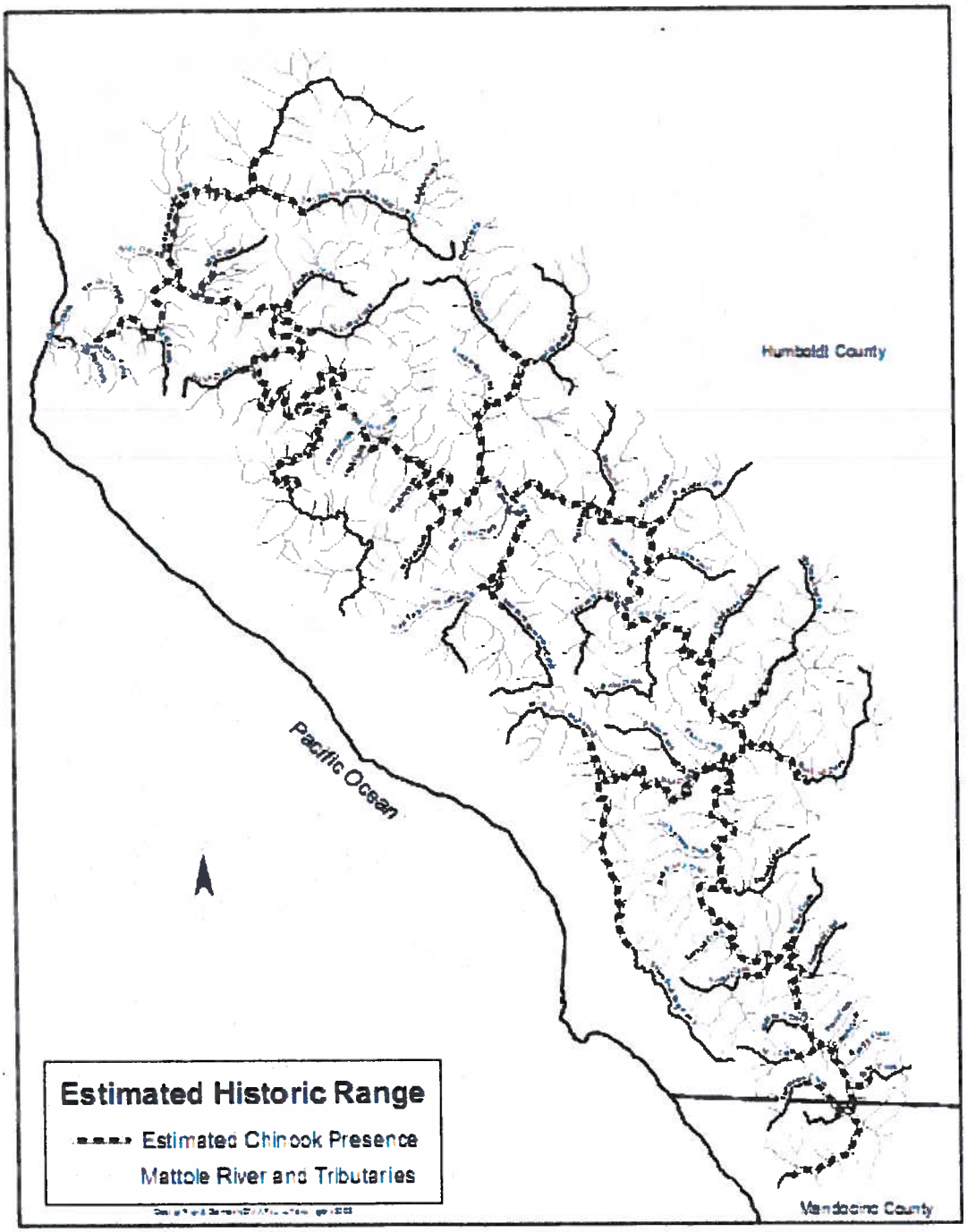


Figure 38 Mattole Basin estimated historic Chinook distribution

Figure 3-3
Historic Range of Steelhead (NCWAP, 2002)

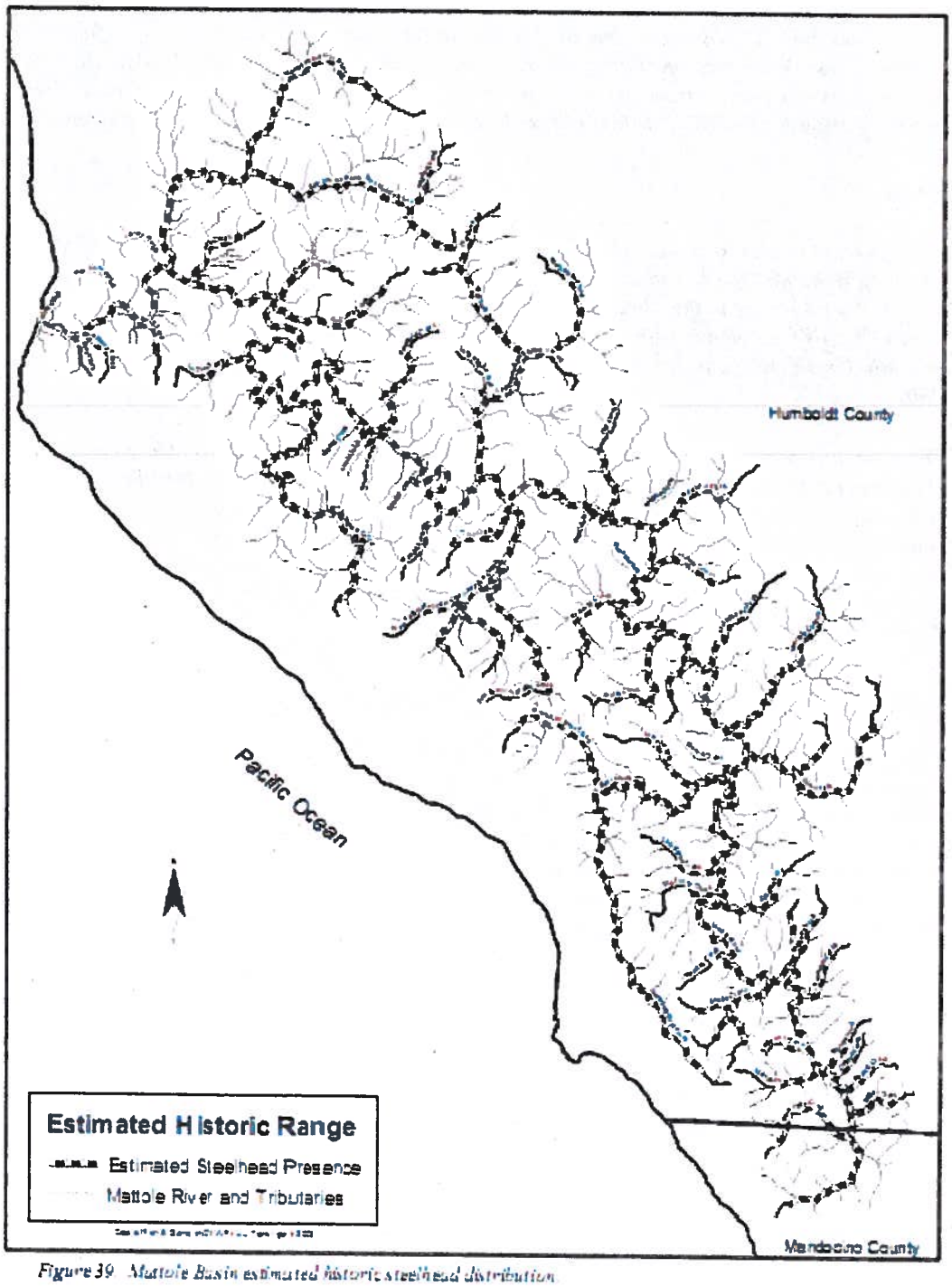


Figure 39 Mattole Basin estimated historic steelhead distribution

Shade Canopy

"Near-stream forest density and composition contribute to microclimate conditions that help regulate air temperature, which is an important factor in determining stream water temperature. Stream water temperature can be an important limiting factor of salmonids. Generally, canopy density less than 50% by survey length is below target values and greater than 85% fully meets target values. More than one half of the surveyed stream lengths within the Mattole Basin have canopy densities greater than 50% and almost one third of the surveyed lengths have canopy densities greater than 80%. This is above the canopy density target values for salmonids."

Fish Passage

"The percent of estimated historic coho salmon habitat that is currently blocked by all artificial barriers in the Mattole Basin varies from 10.2-11.2%. More salmonid habitat is blocked by total fish passage barriers in the Mattole Basin than by partial and temporary barriers. The CDFG North Coast Watershed Improvement Program funded an improvement of Clear Creek in 2001 and Mill Creek (RM 5.5), Ravasoni Creek (East Anderson Creek), and Mill Creek (RM 2.8) in 2002.

Dry channel recorded in CDFG stream inventories in the Mattole Basin has the potential to disconnect tributaries from the mainstem Mattole River and disrupt the ability of juvenile salmonids to forage and escape predation. This condition is most common in streams in the Mattole headwaters in the Southern Subbasin, and in the Eastern Subbasin. Juvenile salmonids seek refuge from high winter flows, flood events, and cold temperatures in the winter. Intermittent side pools, back channels, and other areas of relatively still water that become flooded by high flows provide valuable winter refugia."

Large Woody Debris

"Large woody debris shapes channel morphology, helps a stream retain organic matter, and provides essential cover for salmonids. There are currently no target values established for the % occurrence of LWD. The percent occurrence of LWD in a stream as calculated by CDFG in the Mattole Basin represents a measure of the amount of woody debris that was found in the wetted width of a stream channel during stream surveys that can be used by fish for cover as compared to other types of fish cover present. The average percent occurrence of LWD for the Mattole Basin is only 6.6%, as the dominant shelter type recorded in most stream reaches was boulders. This average percent occurrence of LWD is lower than that found in surveys in the Gualala River (average = 11.3 ± 13.6) and Redwood Creek (average = 8.9± 9.5) Basins, two basins for which CDFG has good records.

Although instream habitat conditions for salmonids varied a great deal across the 304 square mile Mattole Basin, several generalities can be made. Canopy density was generally greater than 50% across the basin. Additionally, 0.9 miles of surveyed stream (less than 1% of surveyed stream channel) were dry and less than 5% of estimated historic coho habitat was inaccessible due to artificial passage barriers. However, across the Mattole Basin the percent of primary pools by survey length and cobble embeddedness values were both below target values found in CDFGs California Salmonid Stream Habitat Restoration Manual and calculated by the EMDS system. In two other North Coast California watersheds currently being assessed by the NCWAP, Redwood Creek near Orick and the Gualala River, have a higher percent occurrence of

large woody debris than the Mattole Basin."

Refugia

"The NCWAP interdisciplinary team identified and characterized refugia habitat in the Mattole Basin by using expert professional judgment and criteria developed for north coast watersheds. The criteria included measures of watershed and stream ecosystem processes, the presence and status of fishery resources, forestry and other land uses, land ownership, potential risk from sediment delivery, water quality, and other factors that may affect refugia productivity. The team also used results from information processed by NCWAP's EMDS at the stream reach and planning watershed/subbasin scales. The most complete data available in the Mattole Basin were for tributaries surveyed by CDFG. However, many of these tributaries were still lacking data for some factors considered by the NCWAP team. Salmonid habitat conditions in the Mattole Basin are generally best in the Southern and Western subbasins, mixed in the Eastern subbasin, and worst in the Estuary and Northern subbasins".

Rare and Endangered Species

Three species of anadromous fish are listed as threatened within the Program area and within the Mattole basin. Detailed descriptions of the habitat needs for each of the three species is found in NCWAP and summarized here:

- Oncorhynchus kisutch - Coho salmon SONCC ESU – Fed and State listed as threatened.
  Coho salmon adults enter the Mattole River from mid- November through mid-January and arrive at the upper spawning reaches two to four weeks later, depending on water levels. Spawning commences shortly after arriving at the spawning sites provided that water conditions, including flow and temperature are satisfactory. Coho salmon utilize a variety of freshwater habitats and tolerances and requirements change with season. They occur in all Program subbasins.
- Oncorhynchus tshawytscha – CA coastal Chinook salmon - Fed and State listed as threatened
  Mattole River Chinook salmon are fall-run, migrating into the river as adults from October through early January and spawning from November to January. Shortly after fry emerge from redds, the gravel incubation nests built by spawning females, they begin to move downstream and arrive at the estuary throughout the spring. In California, most Chinook smolts enter the ocean during their first seven months of life. Chinook salmon generally mature at 3 to 4 years of age. Key habitat is pools 1-3 m deep with bedrock bottoms and cover in the form of underwater rocky ledges or large rocks. The pools usually have bubble curtains and shade provided throughout the day. Stream temperatures must be below 27 degrees C. Suitable spawning areas are gravel beds with an optimum mixture of gravel and cobble of mean diameter 1-4 cm with less than 25% under 6.4 mm in diameter. They occur in all Program subbasins.

Figure 3-4 NCWAP Map of Salmonid Refugia

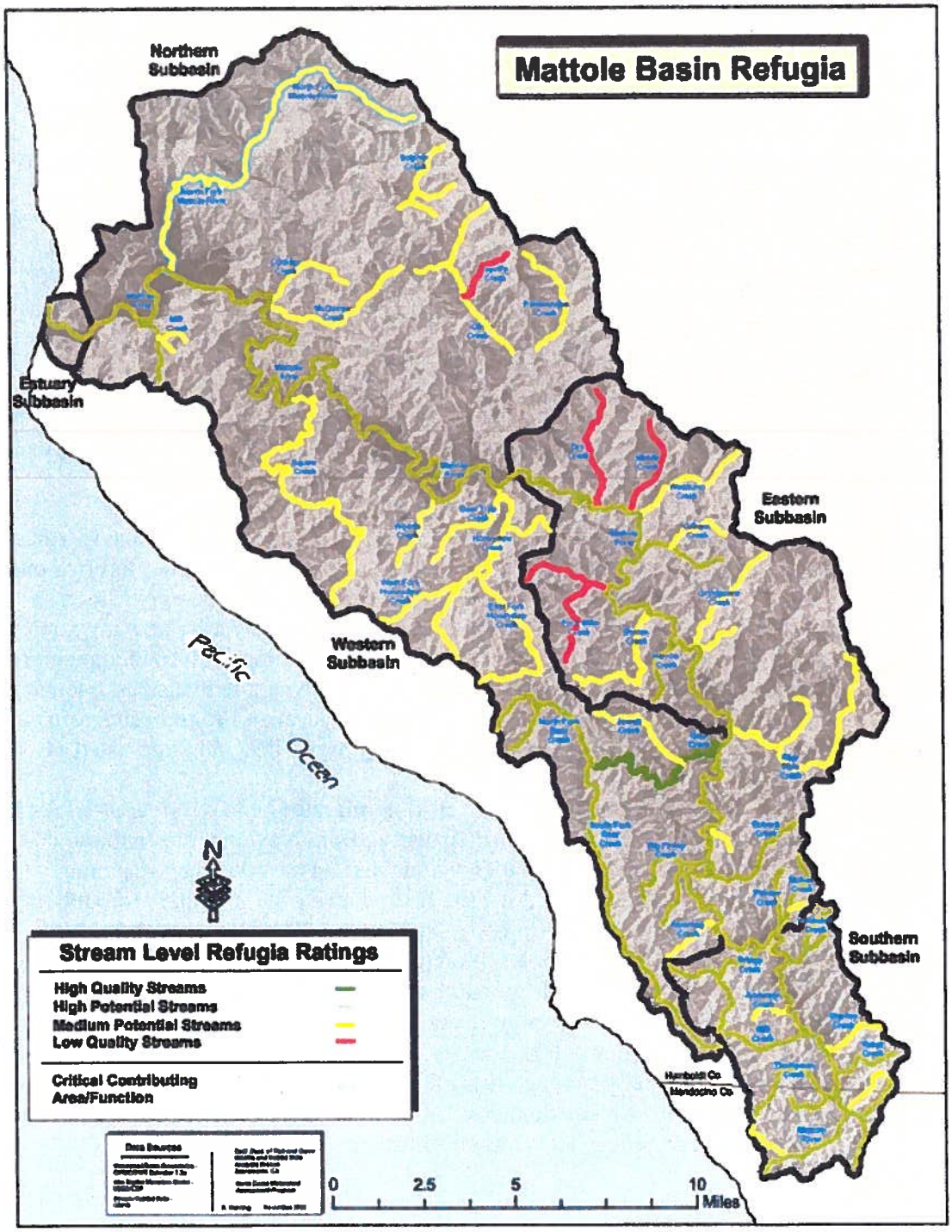


Figure 5-4 Refugia categories for Mattole Basin surveyed tributaries

- Oncorhynchus mykiss – Northern California steelhead - Fed and State listed as threatened.

  Steelhead trout are an anadromous strain of rainbow trout that migrate to sea and later return to inland rivers as adults to spawn. In contrast to all Pacific salmon, not all steelhead die after spawning. In the Mattole River, upstream migration occurs from November through March with the peak run occurring in January-February. Like other salmonids, steelhead prefer to spawn in clean, loose gravel and swift, shallow water. Gravel particle sizes selected by steelhead vary from about 0.25-3.0 inches in diameter, somewhat smaller than those selected by Chinook salmon. Migrating fish require deep holding pools with cool clear and well-oxygenated water. They occur in all Program subbasins.

Amphibians

A detailed description of amphibian status and history in the Mattole is found at pages 134-135 of NCWAP, a portion of which is excerpted below. Figure 3-5 below shows the locations of various species were found or where surveys have taken place.

> *"Welsh et al. (2002) conducted a study to determine the linkages between landscape processes and torrent salamanders and tailed frogs in the Mattole Basin. They surveyed 49 stream reaches for amphibians from 1994-1996.*
>
> *Torrent salamanders were found in eleven stream reaches and tailed frogs were found in15 stream reaches.*
>
> *No torrent salamanders were found in Northern Subbasin surveyed stream reaches, while tailed frogs were found in four reaches. Neither species of amphibian was found in surveyed stream reaches in the Eastern Subbasin. The Southern Subbasin had torrent salamanders in three surveyed stream reaches and tailed frogs in three additional surveyed stream reaches. The Western Subbasin also had occurrences of both torrent salamanders and tailed frogs. Five surveyed stream reaches contained both species of amphibian, two reaches only contained torrent salamanders, and two reaches only contained tailed frogs. When the occurrence of torrent salamanders and tailed frogs in stream reaches was examined in terms of the seral stage of the stream canopy, torrent salamanders and tailed frogs were abundant in late seral forests, less common in second growth forest habitats, and not found in mixed forest/grassland ecosystems in the Mattole Basin. "*

Amphibian Species of Special Concern

Six amphibian species of special concern are potentially located within the Program area and might be affected by Program practices. The habitats for these species are described below:

- Ascaphus truei – western tailed frog – State species of special concern, not Fed listed.

  Found in riparian areas where there are clear cold swift flowing streams; sometimes found near water in damp forests or in more open areas in cold wet weather. Key habitat components include streams with plunge pools and rock

substrates. Five occurrences in the Program area found from 2009 CNDDB list as well as the occurrences noted above from the NCWAP report.

- Emys marmorata – Northwestern pond turtle – DFG species of special concern and candidate for federal listing

  Pond turtles require basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. Turtles slip from basking sites to underwater retreats at the approach of humans or potential predators. Individuals normally associate with permanent ponds, lakes, streams, irrigation ditches or permanent pools along intermittent streams. Associated with permanent or nearly permanent water in a wide variety of habitats. Not found in CNDDB search, possible in Program area.
- Rana aurora aurora – northern red legged frog - State species of special concern, not Fed listed.

  Found in riparian areas and permanent bodies of relatively quiet water such as ponds, pools along streams, springs and marshes. Not currently known within the Program area according to 2009 CNDDB list.
- Plethodon elongates – Del Norte Salamander –DFG species of special concern

  This species is a common yearlong resident in open-to-dense, sapling-to-mature stages of valley-foothill riparian, montane hardwood-conifer, Douglas fir and redwood habitats. Found at elevations from near sea level to about 1100 m (3610 ft. Feeds on a variety of invertebrates including springtails, beetles, annelid worms, spiders, flies and millipedes. Found primarily within stabilized talus, beneath rotting logs, and under slabs of bark in damp, but not wet, situations. Rock rubble with considerable fine soil seems to be preferred. Not in CNDDB search, stabilized talus slopes likely in Program area.
- Rana boylii – foothill yellow legged frog - State species of special concern, not Fed listed.

  Prefers watercourses with bedload materials composed primarily of sand and gravels while larger rocks are sought out for cover. Rarely found far from permanent water. Three occurrences in the Program area were found from the 2009 CNDDB list.
- Rhyacotriton variegates – southern torrent salamander - State species of special concern, not Fed listed.

  Found in Northern California coastal forests in preferred habitat of cold well-shaded permanent streams and spring seepages. Not noted in CNDDB, but documented in NCWAP (see above) in the far western portion of the North_1 subbasin, the West_1, West_2 and the South_1 subbasin.

Figure 3-5
Location of Amphibian Surveys in Mattole (NCWAP, 2002)

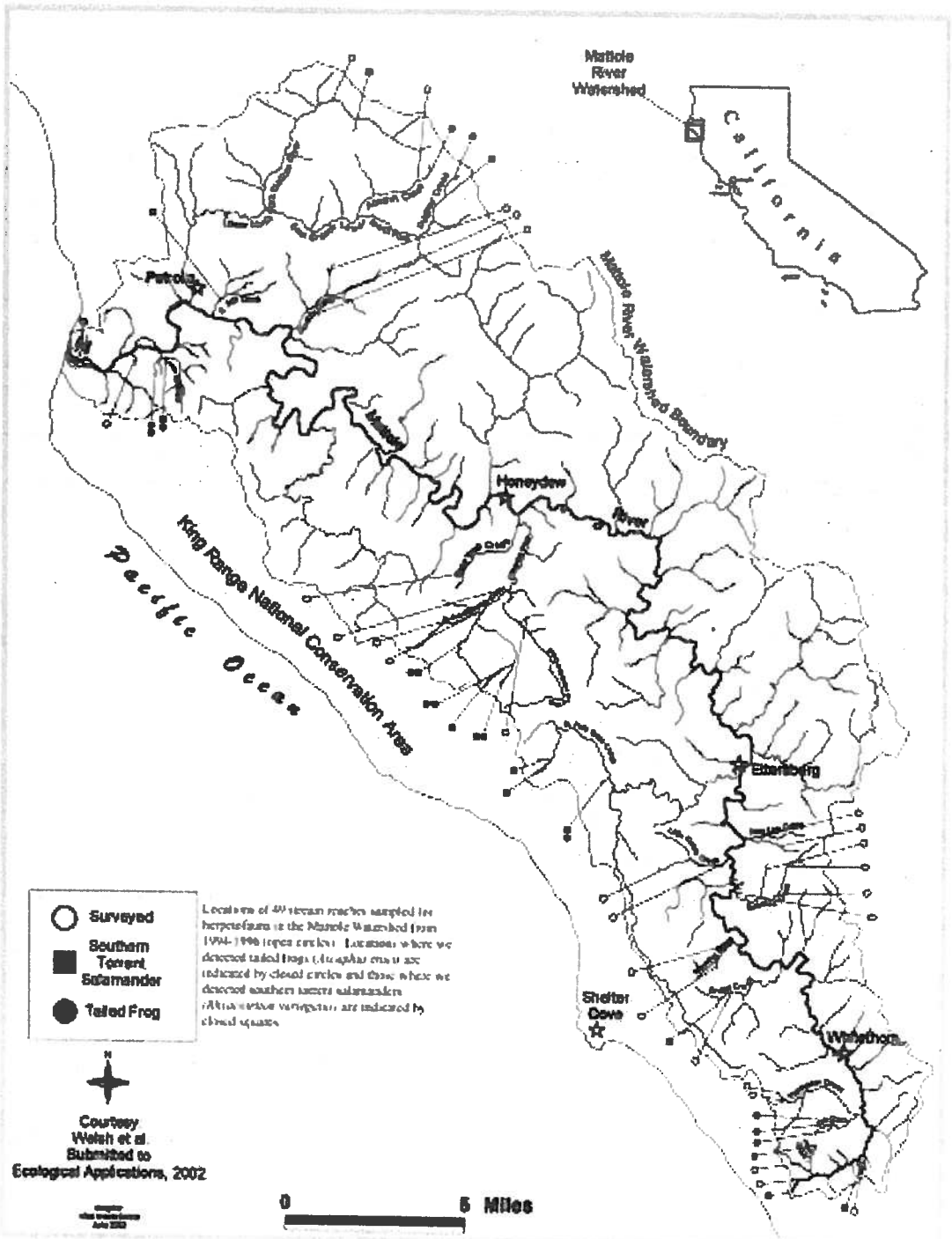


Figure 45. Amphibian survey (Welsh et al. 2002)

3.4.2 Regulatory Setting-Aquatic Resources

The Program area is located within a *Watershed with Listed Anadromous Salmonids* per FPR 895.1. As such, the Program is designed to comply with the FPR's at 916.9.

The primary laws and regulations that relate to the Program's operations on fisheries, aquatic resources and amphibians are those contained in the California Forest Practices Act and the Forest Practice Rules. The FPR's contain multiple sections with explicit language related to fish, aquatic species and amphibians and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to soils and soil stabilization. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE. The FPR Appendix Technical Rule Addendum # 2 contains nine places where RPFs must describe the cumulative impacts of timber operations on fish. Sections 913.1 and 913.6 both describe on-site mitigation measures that must be addressed in the choice of regeneration method when fish are present or nearby. Section 914.8 Discusses fish in relation to tractor watercourse crossings while 915.3 discusses protection of natural resources (fish) during site preparation. Much of 916, Watercourse and Lake Protection is devoted to protecting fish and aquatic/riparian species including the mention of fish 38 times in 916 alone. Fish are mentioned extensively at 923.3 watercourse crossings, and at 923.9 roads and landings in watershed with listed anadromous salmonids. Fish are also mentioned in the California Forest Practice Act at 4512, findings, particularly at 4562.7, protection of streams. Riparian-associated species, including amphibians are mentioned at least four times in 916, watercourse protection. The FPR definition of riparian-associated species "means those plant, invertebrate, amphibian, reptile, fish or terrestrial wildlife species that require utilization of riparian zones during any life history stage.

In addition to the regulatory requirements described above, as well as the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2 – Program description. As a result, Program participants would be further regulated by the Program's restrictions including:

- Uneven-aged management only, including limitations on canopy cover and measures for wildlife protection
- Snags must be left everywhere and down woody material must be recruited in Class I and II watercourses beyond the FPR requirements
- No old-growth trees (sprouted prior to 1850) would be allowed to be cut
- Existing late seral stands have to be managed to increase late seral conditions
- Road construction is limited
- Existing roads must be upgraded beyond the requirements in the FPR's
- Further limitations on harvest in Class I,II and III WLPZ's beyond those in the FPR's
- Limitations on harvest beyond the FPR's on highly erodible soils
- Limitations on harvest beyond the FPR's when operating on or near unstable slopes
- Limitations on skidding on slopes > 50% beyond those in the FPR's
- Limitations skidding and log hauling during the winter period beyond those in the FPR's

3.4.3 Significance Criteria-Aquatic Resources

Based on the CEQA Guidelines, the Program and Alternatives would have a significant biological impact to aquatic resources if they would:

a) Have an adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service;
b) Have an adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service;
c) Interfere with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites;
d) Conflict with any City or County adopted General Plan policies or ordinances protecting biological resources, such as water quality regulations applicable to a particular stream system;
e) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan;
f) Cause a reduction in the quality of water by an increase in sediment, temperature, bacteria, or chemical contamination;
g) Modify existing vegetation so as to reduce future critical habitat development, including retention of woody species that will eventually comprise habitat elements;
h) Adversely or positively affect the input of large wood components into a stream system;
i) Reduce the quantity of water available to species of concern, by water withdrawal for project-related fire or dust control purposes;
j) Cause a decrease in the quantity or quality of botanical or animal food necessary to maintain a healthy and diverse biological component of a water body.

3.4.4 Determination Threshold-Aquatic Resources

The following thresholds were used to determine whether a substantial adverse effect to aquatic biological resources would result from implementation of vegetation treatments under the Program or any of the alternatives:

The Proposed Program (or alternative) would be considered to have a significant negative effect on aquatic biological resources if it:

a) Violates any state or federal wildlife protection law or
b) Contributes directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native species or subspecies at the state level.

3.4.5 Data and Assumptions-Aquatic Resources

NCWAP (Downie et al. 2002), MRRP (2009) and MRRP (2010) contain the most recent and relevant descriptions of fisheries populations, trends and habitat conditions for the Mattole and are not repeated here. Welsh (2005) provides the most recent and relevant description of herpetofauna distribution in the Mattole watershed. For a detailed review of the relationship of habitat parameters to aquatic species needs see CAL FIRE (2007).

In general, salmonid populations have dramatically declined across the Mattole due in large part to the combination of aggressive timber harvest in the 1950-1970 time period and the flood event of 1964. The massive influx of sediment during that time period reduced habitat complexity, pool abundance and depth, spawning gravel quality and riparian forest composition. The result was that most of the mainstem Mattole (downstream of River Mile 52) and lower gradient reaches of most tributaries offer poor salmonid habitat due to elevated water temperatures, excessive fine sediment and lack of suitable pool rearing habitat or winter velocity refugia. There were no long-term records of herpetofauna abundance, so it was not clear how the sediment influx affected these species.

High summer water temperatures in particular seem to exert a strong influence on aquatic species distributions. The most temperature-sensitive salmonid, coho, was almost exclusively found in the coolest water temperature areas of the upper headwaters (South subbasin) and a few cool water tributaries further downstream, while the more thermally tolerant steelhead and Chinook salmon were more widespread. A similar pattern appears to be influencing herpetofauna distributions with the most temperature-sensitive species (black, coastal giant and torrent salamanders and tailed frogs) being found higher in the stream network where late seral forest conditions tended to occur and water temperatures were lowest (Welsh 2005). In contrast, less temperature-sensitive amphibians such as foothill yellow legged frog, rough skinned newt and all of the reptiles were more commonly found in streams with higher water temperatures.

According the NCWAP report the most limiting habitat conditions for each subbasin were as follows;

- Northern subbasin -high water temperatures
- Southern subbasin - low summer water flows/dry reaches
- Eastern subbasin – excess sediment delivery to the watercourse
- Western subbasin- instream habitat, lack of complexity

3.4.5 Direct Impacts Common From Implementing the Program/Alternatives-Aquatic Resources

Overall Impacts to Aquatic Habitat and Species

The proposed Program and the Alternatives were determined to be unlikely to adversely impact water temperature, turbidity, sediment yield, peak flows or chemical contamination (see Section 3.16). Therefore impacts to aquatic species due to changes in water quality or quantity are unlikely to occur.

The topics of Large Woody Debris (LWD) recruitment, fish passage and in-stream sediment conditions were not addressed in the water quality section and are relevant to the potential for timber harvest to effect aquatic habitat.

LWD Recruitment

According to the NCWAP report, LWD levels and habitat features associated with LWD were generally below target levels across the Mattole watershed. This is likely because extensive timber harvest removed most trees (LWD sources) prior to the 1964 flood, and the widespread landsliding across the basin during the flood delivered only sediment to the channel rather than a mix of LWD and sediment. The Program and all of the Alternatives are much more protective of LWD source areas than the pre-FPR harvest activities which led to the current set of conditions in the Mattole.

LWD source areas vary in their distance from the channel based on the recruitment process in question. See the following discussion from CAL FIRE (2007):

> *The relative level of potential large wood recruitment can be estimated based on buffer width and prescriptions for leave trees within the buffer. Buffer width determines the area from which potential source trees can contribute large wood, and prescriptions determine how much of this potential material remains after timber harvesting (Murphy 1995). Full recruitment of large wood by toppling, windthrow, or stream undercutting will generally occur if no-harvest riparian buffers equivalent to one site-potential tree height are retained (FEMAT 1993). However, McDade et al. (1990) estimated that for mature conifer forests in Oregon, 50 percent of debris originates within 33 feet of the stream, 85 percent within 75 feet, and 100 percent within 154 feet. They also showed that 90 percent of large wood in mature forests originated within 89 feet of the stream channel. These values are substantially less than one site-potential tree height and indicate that most large wood is recruited within a short distance of the stream channel.*
>
> *Additional studies support the contention that most large wood is recruited from within 20 m (66 ft) to 40m (130 ft) of the channel bank. For example, Benda et al. (2002) reported that in the absence of landsliding, wood recruitment in both old-growth and second growth Humboldt County study sites originated from within 20 to 40 m of the stream. The four main input mechanisms for their second-growth forest sites in the Van Duzen River watershed included bank erosion, mortality, landsliding, and anthropogenic*

(or logging related), and averaged 18%, 21%, 13%, and 50%, respectively. On average in second growth forests, recruitment of wood from mortality was approximately equal to the recruitment attributable to bank erosion or landsliding, but wood storage was dominated by logging related debris. Conifer trees accounted for approximately 50% of recruited wood by volume. The field sites that had significant recruitment from bank erosion had approximately 90% of wood originating from within 10 m (~33 ft) of the bank. The theoretical prediction curve from mortality alone predicts 90% of wood originating from about 15 m (~50 ft). For those sites that had significant recruitment from streamside landsliding, source distances were greater than that predicted by the theoretical prediction curve from mortality. Landsliding caused recruitment distances to extend to over 60 m (~200 ft). Landslide recruitment tends to be highest in small channels. Mortality was found to be much more important in second-growth forests compared to old-growth forests.

According to the previous discussion, most LWD is recruited from within 50-150' of the channel bank, except in small, steep sided channels were landsliding is the dominant recruitment mechanism and source distances may exceed 200'. The TMDL for the Mattole indicated that mass wasting was a dominant source of sediment, so it may be reasonable to assume that much of the LWD recruited to the Mattole would also be from mass wasting. Bank erosion tends to be the dominant LWD input mechanism on low gradient channels where erosion of former floodplains and terraces recruits wood from these areas (Benda et al. 2002). Most low gradient streams with significant floodplains are Class I streams and have no-cut buffers and CMZs under the ASP rules.

Within the Program, the dominant near-stream LWD source areas on Class I and II streams are protected with no-cut and high retention buffers. High and very high landslide risk areas are also protected with no-cut and high retention buffers. Finally outside of all of the high probability LWD source areas, no opening >1 acre is allowed without retention, thereby making it nearly impossible for a landslide to occur that did not contain live trees as well as sediment. Furthermore, the goal of the Program is to create conifer-dominated stands of larger trees over time, thereby increasing the size and quality of LWD recruited from lands managed under the Program. Within the Program, half of the largest diameter conifer trees must be left after each harvest, thus protecting the supply of future large woody debris, (see Section 2.1 for a detailed description of silvicultural prescriptions included in the Program).

Alternative II has broader no-cut buffers on all stream classes than the Program and prohibits harvest on very high landslide hazard areas. These measures offer an improvement to protection of high probability LWD recruitment areas. However, this additional source area protection is offset because even-aged harvesting is allowed outside of these protected areas, thereby increasing the odds that a landslide could occur on a site that did not contain forest cover.

Alternative III is similar to Alternative I in terms of riparian buffer protections, both being less protective than the Program or Alternative II. Other than riparian buffer widths, Alternative III is similar to the Program in terms of landslide protections and general forest conditions.

Alternative I is the least protective of LWD source areas, having narrower no-cut buffers on

streams, no specific harvest restrictions on landslide prone areas and allowing the use of even-aged harvesting which can remove all trees from LWD source areas.

Barriers to Fish Passage

Creation of or failure to remove existing management-related fish passage barriers is prohibited for the Program and Alternatives.

In-Stream Sediment Conditions

Aquatic habitat conditions in the Mattole have been degraded by excess sediment delivery, much of it delivered during the 1964 flood event. Since 1964, the quantity of sediment delivered to the stream channel via landsliding, which is the dominant sediment delivery mechanism in the Mattole, has declined dramatically (NCRWQCB 2002). As sediment supplies from hillslopes declined, water and gravity carried much of the delivered sediment down the channel network. The result was a 42% decrease in the length of channel reaches with negative mapped channel characteristics[1] between 1984 and 2002 (Downie et al. 2002). Essentially, stream channels in the Mattole watershed are recovering from the top down. Smaller and higher gradient channels have largely recovered from the excessive sediment loading experienced post-1964. However, the sediment is still accumulating in low-gradient tributaries and the mainstem of the Mattole where sediment transport rates have not been sufficient to move the excess sediment out to the ocean. Regardless of current land management practices, a complete recovery to pre-1964 channel conditions in the low gradient tributaries and the mainstem Mattole will take decades to centuries.

As determined in the Water Quality/Quantity section (3.16), neither the Program or Alternatives will have significant effect on sediment delivery rates to the watercourse or peak flows, which are the primary mechanisms by which management could affect sediment transport rates. Therefore the Program and Alternatives will not have a significant effect on in-stream sediment transport rates.

Salmonids

Habitat conditions for salmonids in the Mattole are not optimal, primarily due to excess sediment loading in the stream channel and elevated water temperatures (NCRWQCB 2002). The California Board of Forestry and Fire Protection (BOF) recently adopted regulations to address the situation of poor aquatic habitat common to salmonid bearing streams across forest land in California, known as the Anadromous Salmonid Protection Rules (FPR 916.9, 936.9, and 956.9). In a formal review of the environmental and economic impacts of adopting these rules, the BOF (2009) made the following findings (among others):

[1] Negative mapped channel characteristics (NMCC) was a term developed by aerial photo interpreters in the NCWAP Mattole process to refer to channel reaches that appeared to be overly wide due to sediment aggradation and/or had unstable riparian vegetation due high sediment loads (NCWAP 2002).

- *The Board finds that the adopted regulations are based on the consideration of an extensive review and evaluation of applicable scientific literature. The adopted rules are found to be based upon the science literature review and testimony from scientists and technical experts in the fields of watershed processes, riparian functions, and fisheries biology.*

- *The Board finds that the adopted regulations are based on recommendations by the Department of Fish and Game, the California Department of Forestry and Fire Protection, the State Water Quality Control Board and Regional Boards, and numerous individuals.*

- *The adopted regulations are found by the Board to be consistent with goals established in the California Fish and Game Commission, Board of Forestry and Fire Protection, Joint Policy Statement on Pacific Salmon and Anadromous Trout.*

- *The Board finds that the adopted regulations will maintain and improve aquatic habitat and contribute to restoration of listed anadromous salmonids. This finding is based on the expected impacts on the beneficial uses of water, including cold freshwater habitat, spawning, migration and rare and endangered species...*

All subbasins within the Mattole watershed are subject to the ASP rules, which have been determined to be protective of salmonid habitat. The Program and Alternatives II and III include additional regulations to further protect salmonid habitat and are therefore even more likely to "maintain and improve aquatic habitat and contribute to restoration of listed anadromous salmonids."

The Mattole Coho Recovery Strategy (MRRP 2010) contains a ranked listing of mainstem and tributary reaches of highest priority for protection and restoration. Most of the high priority habitat occurs in the South subbasin, while very little occurs in the North_1 and North_2 subbasins. That document identifies the two most salient limiting factors for coho recovery as the lack of refugia from wintertime high flows, and low summertime flows, including the dewatering of stream reaches in the headwaters area that otherwise provides the best and most consistently used habitat for coho juveniles.

Factors that increase channel complexity tend to increase velocity refugia during high winter flows. The input of large wood to streams, discussed above, is a factor that provides refugia from high flows. Additionally, minimizing management related sediment delivery to stream channels leads toward channel conditions with increased channel complexity and velocity refugia, as does flood prone area protection (reducing impacts to overflow channels).

Regarding summer lowflows, according to the MRRP (2010) report:

> *Analyses suggests that climate change and a longer dry season is the main driving cause of the low flow problem, with human use, high evapotranspiration rates and a loss of groundwater storage exacerbating the problem (Klein 2007, McKee 2004).*

The high evapotranspiration rates referenced in the MRRP (2010) report are primarily related to young, fast growing forests. There is a well established literature base that reports on experimental forest manipulations to alter water yield, and in particular summer low flows (Bosch and Hewlett 1982). In general, if less than 20% of the forested area of a watershed is clearcut there is little or no measureable effect on water yield or summer low flows. As the percentage of forest removal increases up to 100%, water yield and summer low flows increase. However, as vegetation or young plantations become re-established water yield and summer low flows decrease, as is occurring in the Mattole. Since harvest levels will not even approach 20% clearcutting of any watershed under the Program or any Alternative there is not likely to be any measureable effect on summer low flows or annual water yields.

Amphibians

Amphibian species typically make use of small, headwater stream reaches known as Class II and Class III streams in California. Amphibians are known to be sensitive to changes stream water temperatures and riparian microclimates.

Welsh et al. (2005) conducted perhaps the only Mattole watershed wide survey of herpetofauna during the summers of 1994-1996. Sampling was conducted in late seral, second growth and grassland vegetation types on both perennial and intermittent streams. Welsh concluded that late seral and grassland vegetation types contained unique species assemblages, while second growth forests contained species assemblages that were intermediate between the two. In general, species that preferred cooler water and air temperatures were found predominantly in late seral stands, whereas warm temperature tolerant species were found predominantly in grassland and to a lesser extent in second growth forest ecosystems. The mixed grassland associated species assemblage included rough skinned newt, foothill yellow legged frog and the Pacific tree frog while the late-seral forest-associated assemblage included coastal giant salamander, black salamander, southern torrent salamander and the tailed frog. Amphibian species richness was higher in late seral forests compared to second-growth forests, while reptile richness and evenness was significantly greater in mixed grassland compared to the forest vegetation types.

The Program and Alternatives II and III prohibit harvest of old-growth trees; therefore impacts to late-seral stands, which contained unique cold water adapted amphibian species assemblages are unlikely. Alternative I does not prohibit harvest of old growth trees and is therefore more likely to impact this unique species assemblage. Neither the Program nor Alternatives will affect mixed grassland areas, as there is no timber to harvest in this vegetation type.

Welsh et al (2005) did not attempt to draw any conclusions regarding the impacts of various silvicultural methods within second growth stands in the Mattole. However, there are many studies of the impacts of partial and complete harvest of second growth forests on amphibians and riparian microclimates that have been conducted elsewhere.

Anderson et al (2007) looked at the impacts of thinning 30-80 year old Douglas-fir stands with variable width riparian buffers. He found that,

> *Thinning resulted in subtle changes in microclimate as mean air temperature maxima were 1-4°C higher than in unthinned stands. With buffers 15 m or greater width, daily maximum air temperature above stream center was less than 1°C greater, and daily minimum relative humidity was less than 5% lower than for unthinned stands. In contrast, air temperatures were significantly warmer within patch openings (+6 to +9 °C), and within buffers adjacent to patch openings (+3°C) than within unthinned stands.*

The following review of impacts to amphibians due to forest thinning was included in Rundio and Olsen (2007):

> *Salamander abundance was reduced in the first 1 to 5 years after thinning in most previous experimental studies across a range of thinning intensities and forest types in North America (Harpole and Haas 1999, Grialou et al. 2000, Knapp et al. 2003, Morneault et al. 2004), and observational studies also have found that salamander abundance was lower in thinned stands compared with unthinned stands (Naughton et al. 2000, Brooks 2001). However, several studies have shown either no difference or higher abundance in thinned stands, as well as variable responses among species (Suzuki 2000, Bartman et al. 2001, MacCracken 2005, Karraker and Welsh 2006).*

Habitat elements that appeared to ameliorate short-term impacts to amphibians due to forest thinning include presence of coarse woody debris and/or boulders on the forest floor (Rundio and Olsen 2007, Kluber et al. 2008).

Aubry (2000) studied amphibian abundance and diversity in second growth forests of different ages from <5 years old to 70 years old. He found that diversity and abundance were highest in the oldest stands and suggested that maintaining a higher proportion of older stands on the landscape and extending rotation ages would benefit amphibian populations.

In order to maintain gene flow throughout a region, some authors have argued that amphibians need to retain the ability to disperse over ridgelines, as well as along riparian zones (Olson and Burnett 2009). Clear-cuts with their dramatic microclimatic differences have been identified as a potential barrier to migration for amphibians prone to desiccation; however Olson and Burnett (2009) indicated that linkages between subbasins could be composed of managed forests that retained forest cover.

In summary, it appears that increased canopy removal is related to increased change in microclimatic conditions, i.e. warmer and drier. A subset of cool-temperature-adapted amphibians are very sensitive to warmer, drier climatic conditions and therefore are more often found in older stands with more canopy cover. Thinning of forest stands has less of an effect on amphibians than clearcutting and both had variable responses observed in studies. Riparian buffers are helpful for protecting amphibians, but linkages across watershed divides are also important.

The Program clearly provides the best combination of prescriptions to maintain amphibian populations relative to the other Alternatives. First, even-aged harvesting is prohibited, which is an improvement over Alternative I and II in regards to buffering microclimate impacts. Also, by

eliminating even-aged harvesting, forested linkages between subbasins will be maintained at all times. By requiring uneven-aged harvesting and retention of half of the largest trees after each entry, stands managed under the Program will continue to become bigger and older over time, rather than oscillating between zero and 50-70 years of age indefinitely as occurs in even-aged managed stands. Old growth trees, which are a component of habitat types preferred by some amphibians, are prohibited from harvest within the Program and Alternatives II and III. Within the Program the riparian buffer widths and protective measures on class I, II and III streams exceed those for Alternatives 1 and 3. Alternative II includes wider no-cut buffers than the Program, but also permits even-aged harvests, which offsets this benefit to some extent.

The South_1 subbasin contains the highest quality habitat for salmonids and the coolest water temperature values within the Mattole watershed. The North_1 and North_2 subbasins appear to have the poorest salmonid habitat conditions, highest water temperatures and least recovered in-stream conditions from sediment loading. The values for the average annual rate of harvest and percent canopy cover removed (see Water Quality section) were projected to be the lowest for the South_1 subbasin under the Program and highest for the North_1 and North_2 subbasins. Thus the Program is least intensive in the subbasin with highest quality salmonid habitat and most intensive in the subbasins with the poorest salmonid habitat.

3.4.6 Indirect Impacts of Implementing the Program/Alternatives - Aquatic Resources

No indirect impacts due to implementing the Program or the Alternatives were expected for aquatic species.

3.4.7 Determination of Significance - Aquatic Resources

Table 3-11 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-11
Summary Of Impacts[1/]
To Fish and Aquatic Resources
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Adverse Impact; LS = Less than Significant Adverse Impact

The Program is expected to create a less than significant adverse impact to Fish and Aquatic Resources because in general, habitat conditions are improved rather than degraded over the 50 year analytical time-frame. Relative to the Status Quo (Alternative I), the Program has larger no-cut stream buffers, greater canopy retention in the remainder of the buffers and greater protection

of LWD source areas. The Program also has a cap on the rate of harvest at 1.5% of the watershed area, which is more protective than the Status Quo. For amphibians in particular, which are sensitive to the extreme changes in microclimate caused by clear-cuts, the Program is superior to Alternatives I and II which allow this practice. In addition the ASP rules, which apply to the Program, have been found to be protective of salmonids and their habitat (BOF 2009).

Alternative I (Status Quo) is expected to create a less than significant adverse impact to Fish and Aquatic Resources because harvest rates are expected to remain fairly low in the Mattole due to the ownership pattern and because the ASP rules, which apply to Alternative 1, have been found to be protective of salmonids and their habitat (BOF 2009). However, the availability of clearcut silviculture as an option in this Alternative may result in greater microclimate variation, which could affect amphibians, compared to the Program or Alternative III.

Alternative II is expected to create a less than significant adverse impact to Fish and Aquatic Resources because harvest rates are expected to remain fairly low in the Mattole due to the ownership pattern and because the ASP rules, which apply to Alternative II, have been found to be protective of salmonids and their habitat (BOF 2009). The no-cut stream buffer widths in Alternative II are much wider than the other Alternatives which should be beneficial for riparian microclimate, LWD recruitment and sediment filtration functions- all important element for aquatic habitat. However, the availability of clearcut silviculture as an option in this Alternative may result in greater microclimate variation, which could affect amphibians, compared to the Program or Alternative III.

Alternative III is expected to create a less than significant adverse impact to Fish and Aquatic Resources because harvest rates are expected to remain fairly low in the Mattole due to the ownership pattern and because the ASP rules, which apply to Alternative III, have been found to be protective of salmonids and their habitat (BOF 2009). This Alternative would maintain amphibian habitat better than Alternative I and II through elimination of group openings and clearcuts, but would not be as good as the Program which has more protective stream buffer requirements.

3.4.8 Similar Impacts Described Elsewhere- Aquatic Resources

The impacts to water quality described in Chapter 3.16 are similar to the impacts described in this Aquatic Resources section, 3.4.

3.4.9 Mitigation Measures for the Proposed Program- Aquatic Resources

No impacts to Aquatic Resources will arise from implementing the Program so no mitigations are required.

3.4.10 Literature Cited- Aquatic Resources

Anderson, P., D.J. Larson and S. Chan. 2007. Riparian Buffer and Density Management Influences on Microclimate of Young Headwater Forests of Western Oregon. Forest Science 53(2):254-269

Aubry, K. 2000. Amphibians in managed, second growth Douglas-fir forests. Journal of Wildlife Management 64(4):1041-1052

Bosch, J.M. and J.D. Hewlett. 1982. A review of catchment experiments to determine the effects of vegetation changes on water yield and evapotranspiration. Journal of Hydrology, 55: 3-23

CAL FIRE. 2007. Recirculated Draft Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan Alternative G. Prepared by the California Department of Forestry and Fire Protection, Sacramento, CA.

Board of Forestry and Fire Protection (BOF). 2009. Final Statement of Reasons. Anadromous Salmonid Protection Rules 2009. [Adopted by BOF on October 7, 2009] Title 14 of the California Code of Regulations (14 CCR): Sacramento, California.

NCWAP, 2002. Downie, Scott T., C.W. Davenport, E. Dudik, F. Yee, and J. Clements (multi-disciplinary team leads). 2002. Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program, p. 441 plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

Kluber, M.R., D. Olson and K.J. Puettmann. 2008. Amphibian distributions in riparian and upslope areas and their habitat associations on managed forest landscapes in the Oregon Coast Range. Forest Ecology and Management 256 (2008) 529-535.

Mattole River and Range Partnership (MRRP). 2009. Mattole Integrated Coastal Watershed Management Plan Foresight 2020. Petrolia, California.

Mattole River and Range Partnership. 2010. Draft Mattole Coho Recovery Strategy. Petrolia, California.

Olson, D.H. and K.M. Burnett. 2009. Design and management of linkage areas across headwater drainages to conserve biodiversity in forest ecosystems. Forest Ecology and Management. 258S:S117-S126

Rundio, D. and D. Olson. 2007. Influence of Headwater Site Conditions and Riparian Buffers on Terrestrial Salamander Response to Forest Thinning. Forest Science 53(2)320-330

Welsh, H., G.R. Hodgson and A.J. Lind. 2005. Ecogeography of the herpetofauna of a northern California watershed: linking species patterns to landscape processes.

3.5 Impacts of Program/Alternative Implementation on Cultural, Archaeological and Historic Resources

This section summarizes the impacts to prehistoric, historic, and ethnographic resources from implementing either the Proposed Program or any of the alternatives. ***Generally, in this section these resources will collectively be referred to as "cultural resources", except where a distinction needs to be drawn for analysis purposes.***

3.5.1 Introduction to Cultural, Archaeological and Historical Resources

The State of California has a legally mandated responsibility to protect and manage the archaeological and historical resources of the state. In the context of forestry practices this responsibility is delegated to CAL FIRE. The CAL FIRE Forest Practice Program is one of the largest in CAL FIRE Resource Management, and its Archaeology Program plays an important role in the delivery of this program (Foster, 2006). CAL FIRE in this context functions as the lead agency under CEQA for review and approval of Timber Harvesting Plans (including PTHPs), and the Archaeological Program is designed to assist landowners and RPFs in meeting state regulations for protection of these often fragile and unique resources.

THPs and PTHPs must include a current archaeological records check and Native American consultation. A field archaeological survey is usually also required.

The archaeological records check (which is paid for by the plan proponent) is conducted by the RPF through one of the twelve state Information Centers. The report generated by the Information Center contains documentation of known cultural resources, including archeological sites, within or adjacent to the area of operation, and an evaluation of the potential for the presence of additional resources that could be affected by the proposed operation.

If the records check indicates the potential for undiscovered resources within the PTHP area, a field reconnaissance will be required. This can be conducted by a professional archaeologist or one of CAL FIRE's Certified Archaeological Surveyors, with oversight and review by a professional archaeologist. The Certified Archaeological Surveyors must attend and pass a CAL FIRE training course that includes identification and management of cultural resources, including research methods, artifact recognition, survey techniques, site recording, and site protection methods (Foster 2006). Mitigation measures must be developed to protect any significant resources located during the field reconnaissance. Archaeological surveys supporting THPs are reported in a Confidential Archaeological Addendum (CAA).

In addition to the records check and potential field reconnaissance, the RPF of record must consult with Native Americans whose resources are potentially affected by the project. A list of tribes or individuals that must be consulted (by location of the project) is maintained by CAL FIRE and available on the CAL FIRE website. Results of the consultation are contained within the Confidential Archaeological Addendum of the PTHP.

Because there is no way of knowing in advance upon which properties PTHPs tiered to this document may be filed, the PTEIR contains no programmatic option for streamlining the CAL FIRE evaluation and mitigation process for cultural resources.

The following discussion of the prehistoric, ethnographic, and historic background provides a context for identifying the variety of artifacts and features that may be affected by the Program or Alternatives for the Mattole Forest Futures Project, which include

- Prehistoric Native American archaeological sites predating sustained Euro-American settlement in 1850.
- Historic districts as defined in Public Resources Code Section 5020.1(h), "a definable unified geographic entity that possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development."
- Historic archaeological sites typically dating from the period 1850-1960 (50 years of age is the general threshold for recognition of historic period resources).
- Historic period architectural features older than 50 years, such as building and structures
- Traditional cultural places important to contemporary Native Americans who have heritage ties to the land.

3.5.2 Environmental Setting for for Cultural, Archaeological and Historical Resources

The Mattole River watershed has been occupied since around 4000 BP (Bramlette and Fredrickson 1979) by at least two distinct Tribal groups: the Mattole and an unnamed Sinkyone tribal group inhabiting the middle and upper Mattole River. The Sinkyone tribe consisted of several distinct units, probably closely associated and speaking nearly identical languages. (Rohde 2010). Exact territorial boundaries of these Tribes may have changed over time, and the published record thus far is not clear in delineating all of these boundaries. The historic period in the Mattole Valley occurred in phases: early pioneering efforts and conflict with Native Americans, agriculture, ranching, and logging. The Mattole watershed has been logged for fir and redwood lumber, tan-oak bark, and split-wood products including rails, fence-posts, grape-stakes, and shingles (Eastman and Praetzellis 1995). This section will provide information about these periods and what cultural, archaeological, and historic resource site-types are expected to be encountered in the Mattole River Valley.

Prehistoric Archaeological Background

Prior to European-American contact, the Mattole River basin was occupied by the Mattole and an unnamed group of people related to the Sinkyone. Other Sinkyone-related groups may have also claimed parts of the drainage. The Mattole and Sinkyone are Athabascan speaking people. Goddard (1907), Merriam (1923), and Kroeber (1925) are the primary ethnographers who provided information about the Native residents of the area. Baumhoff (1958) synthesized the work of Goddard and Merriam regarding the ethnographic locations and specific affiliations of Sinkyone villages.

A definitive cultural chronology for the Mattole Valley has not been developed. Chronologies have been developed by Hildebrandt and Hayes (1983, 1984) in the Six Rivers National Forest, east of the Mattole; and by Levulett (1985) in the King Range, which forms the western edge of the Mattole watershed. The coastal chronology begins much later in time, with the King Range Early Period (2500 – 1500 B.P.). This period coincides with Hildebrandt and Hayes' Upper Archaic Period (2500 – 1100 B.P.). The interior of the Mattole Valley was inhabited earlier than the coast, with earliest carbon dates of 4000 B.P. (Bramlette and Fredrickson 1979). According to these dates, a cultural chronology for the Mattole Valley would fall somewhere between these two previously defined chronologies.

Archaeological sites dating to the Middle Archaic Period are found throughout the central North Coast Ranges in moderate density. Initial occupations occurred predominantly during spring and summer, as evidenced by seasonal faunal remains, and were focused on food procurement and processing. Terrestrial resources, specifically elk and deer, were preferred over marine resources (Levulett 1985, Whitaker 2005).

The artifact assemblage associated with the Middle Archaic is characterized by the Mendocino Pattern: relatively large Trinity side- and corner-notched projectile points, medium-to-large shouldered lanceolate points, leaf-shaped points, McKee unifaces, and bowl mortars and pestles. Obsidian is present, although chert predominates the flaked stone assemblage. Bone tools (including fishing equipment) are present in coastal sites. The Upper Archaic Period is distinguished by the development of non-utilitarian features and artifacts (including shell beads and pendants) that begin to appear in substantial numbers.

Hildebrand and Hayes' Late or Emergent Period (1100 B.P. to contact) somewhat coincides with Levulett's King Range Late Period (700 B.P. to contact). This is when the Athabascan settlement of the North Coastal ranges began, according to Whistler (1979) and linguistic evidence by Elmendorf (1980). The Late Period brought changes in the diversity and abundance of artifact forms and the gradual development of extensive middens. A blending of adaptive traits referred to as the Tuluwat/Augustine Pattern, employed by people during these periods, includes a variety of small barbed and notched stone arrow points, stone net-weights, and hopper mortar slabs and pestles (Levulett and Hildebrandt 1987).

The presence of human burials indicates that certain locations on the coast were occupied residentially, at least sporadically, although the interior riverine and ridge-top ecosystems seem to have been favored during the Late Period. As time went on, the importance of coastal sites increased, as indicated by the gradual appearance and development of midden soils and abundant lithic tools and debris, including obsidian blades and beds of obsidian pressure-flakes recorded in association with burials (Levulett 1985; Levulett and Hildebrandt 1987). An industry of manufacturing specialized items such as mauls and maul-handles, elk-antler wedges, gorge fish-hooks, grooved abrading stones, composite-toggling harpoons, Tuluwat projectile points, elk-antler spoons and combs, and beads and similar decorative items made from shell and bone expands during the Late Period.

Late Period artifacts common in the Mattole watershed include chert and obsidian bifaces and small Tuluwat barbed projectile points. Groundstone artifacts include hopper mortar slabs and pestles; hammerstones, and core-tools.

Generalized categories of resources associated with pre-contact populations that could be encountered in the Mattole watershed include:

- Permanent occupation sites, typically located on terraces at stream confluences and permanent water sources and characterized by midden soil and moderate-to-dense artifact scatters including flakestone and groundstone artifacts;
- Temporary occupation sites which contain the same sorts of artifacts as village sites, in lower densities and with less-developed middens;
- Quarry sites, located at chert outcrops, characterized by dense scatters of primary flakes and flaked stone debitage;
- Lithic workshops and associated flake scatters;
- Milling stations, located on mixed oak/grassland, characterized by groundstone including slab or hopper mortars and/or pestles;
- Shell middens at coastal sites;
- Resource gathering and hunting areas marked by culturally important plant and animal species;
- Cemeteries, sometimes marked by fences or stones, and
- Isolated artifacts, sometimes marking resource gathering and hunting areas.

Tribal History

Ethnographers of the southern Athabascans note that they followed a seasonal round; spending winters in their primary villages in the major river valleys and going in summer into the hills to hunt and gather seasonal plant foods. Spring and fall brought them to the major streams for the salmon runs. Elsasser (1978) notes that fish were the primary food resource for the Sinkyone and their neighbors, the Mattole. Charlie, a Sinkene informant for Goddard, provided a partial list of villages on the Mattole River and the coast. Joe Duncan, a Mattole, provided a list of villages for both the Mattole tribe and the Sinkyone-related tribal group just upriver from the Mattoles.

The Mattole occupied the lower Mattole River. Their northern neighbors were the Nekanni of the Bear River drainage. The Lolangkok Sinkiyone bound the Mattoles on the east. South of the Mattole were one or more Sinkyone-related tribal groups (Rohde 2010). The Mattole territory was bounded on the north at Cape Mendocino (not Davis Creek as previously reported), Cape Ridge and the divide between Bear River and the Mattole River to South Rainbow Peak. The southern boundary was at Johnny Jack Ridge, Cooskie Mountain, Shenanigan Ridge, and Evarts Ridge; and the eastern boundary was at Rainbow Ridge (Rohde 2010).

Due to the climate and topography of this region, it is believed that the Mattole predominately inhabited inland settlements. For the majority of the year, the Mattole lived along streams, retreating to the cool hillsides and forests during the summer months. The traditional housing structures consisted of circular ground plans, conically shaped or with hip roofs and a single

round pole. In addition, the wealthy lived in rectangular ground plan houses constructed as double lean-tos with side walls. The homes were covered with bark or slabs from fir or redwood trees, and had swinging or lifting doors made out of bark, mats, or boughs. Two or more families typically occupied each house, with a single fire pit in the center (Kroeber 1970).

According to one source, the Sinkyone once numbered above 3000, inhabiting 615 square miles of the Main Stem and South Fork Eel River and the upper Mattole River watershed (Bramlette and Fredrickson 1979). They were comprised of several distinct bands, including the Shelter Cove Sinkyone (Tahng-i ka-ah), the Lolangkok Sinkyone, and the Sinkene, on the Salmon Creek drainage of South Fork Eel (Rohde 2010). Merriam's informant, Sally Bell, indicated that there was a Briceland tribe, the To-cho-be ke-ah (Merriam 1998:(30)422, 497).

Baumhoff estimated that the Lolangkok Sinkyone numbered approximately 2000 (1958). According to Kroeber (1970), the Lolangkok spent the warmer dry season hunting and gathering at a variety of places in the hills. At the onset of the rainy season, when the rivers began to rise, the Lolangkok moved into their primary villages in the river valleys to fish.

The arrival of European Americans in the 1850s brought great change to the Mattole valley, decimating the Native populations and displacing most of the survivors. Some Native people resided within European-American households, and some wandered back from the rancherias (Roscoe 1984). The Allotment period, beginning with the Dawes Act of 1887, gave some local Native people homesteads in areas of the Mattole Valley. Some of these properties are still held by their descendants.

Historic Background

The arrival of European Americans (Historic Era) began with the arrival of pioneering families and the period of conflict between European-Americans and Native Americans (Eastman and Praetzellis 1995). Ranching in the Mattole Valley occurred in two phases, revolving first around cattle and then sheep. The logging period was likewise marked by distinct phases of activity: logging to produce lumber for export, the split-wood product industry (split rails and posts, shingles, and grape-stakes), and the procurement of tan-oak bark (Eastman and Praetzellis 1995). Agriculture in the Mattole valley included production of potatoes and fruit including apples. Historic era resources commonly encountered in the Mattole Valley include:

- Buildings and structures representing occupation locations;
- Foundations of cement, wood, or stone;
- Cemeteries, possibly featuring wooden or metal fencing and/or grave-markers;
- Linear resources such as historic road segments, railroad grades, and fence lines;
- Features associated with ranching such as fencing, gates, water-troughs, corrals, and buildings;
- Living historical features such as orchards, gardens and ornamental plants;
- Surface-grading, log bridges and road grades;
- Logging equipment such as heavy equipment, hand tools, wire-rope, and chokers;
- Temporary logging camps containing wood-stoves, residential garbage, and lumber-scatters;

- Split-redwood product scatters consisting of deposits or piles of split-redwood scraps, including fenceposts, grape-stakes, rails, and shingles;
- Trash-deposits, including bottle and can scatters, and garbage dumping areas;

Pioneers, Removal of the Natives, and Ranching

The first excursions into the Mattole Valley by European-Americans were by members of the Hudson Bay Fur Company's John Work expedition in 1832-1833 (Maloney 1944). Other early fur-trapping parties included Michel La Frambois and Ewing Young in the 1830s. The1849 gold rush brought European-Americans in greater numbers, and by 1859, they occupied much of the rich bottom lands of the Mattole Valley (Roscoe 1983). The Aboriginal inhabitants were pushed farther and farther, and murder and depredations started to occur on both sides. In 1861 residents requested military regiments to protect the citizens from Natives, and often the Natives needed protection from the armed bands of volunteer militia now roaming the hills. The outbreak of the Civil War brought the Federal troops back east, and a rise in the number of local militias rose. By 1865, the Native inhabitants of the Mattole had nearly all been killed or forcibly removed to reservations (Roscoe 1983).

Beef and dairy cattle, popular in the American west during the 1850s, were imported from the Central Valley. Horses were another popular range animal raised by early Mattole ranchers (Eastman and Praetzellis 1995). By the 1860s sheep had become the preferred stock, as the Civil War created demand for wool. The 1867 Wool Tariff helped bring about a boom in sheep ranching. By 1876, California had become the nation's leader in wool production, and Humboldt County's wool commanded the highest price on the California market. In the 1880s, wool prices began to decline, and sheep began disappearing from the landscape. By the beginning of the 20th century, cattle had once again become the dominant stock animal in the Mattole Valley. A sudden increase in lamb prices during the 1920s economic boom brought sheep back to the landscape, and several ranching innovations started on Mattole ranches. The Clark Chute, developed by Mattole rancher T.K. Clark, eliminated the need for ranch-hands to rope and wrestle calves in order to castrate, de-horn, and vaccinate them (Eastman and Praetzellis 1995).

Logging: Redwood, Tan-bark oak, and Fir

Early efforts at logging in the Mattole Valley were focused on the towering old-growth redwood trees that carpeted the upper regions of the watershed. Redwood was valued for its beautiful color and resistance to rot and insect damage, and Humboldt redwood became famous. Mills sprang up throughout the north coast, and much of the lumber from Humboldt County was shipped to San Francisco. Railroads were instrumental in transporting the logs to mills, and the lumber to port. The main shipping port in Humboldt County was at Eureka, on Humboldt Bay. The geographic isolation of the Mattole Valley previously had prevented the intrusion of railroads from the mill-towns of Humboldt Bay and the Eel River. The pre-synthetic tanning industry triggered an interest in a species previously overlooked, but plentiful on the Mattole: tan-bark oak, which was not harvested for timber but was stripped of its bark for use in tanning. In 1908, Calvin Stewart formed the Mattole Lumber Company and built a mill at Petrolia, and Walter Selvage built a 2000-foot wharf from Sea Lion Rock to a point two miles north of the

mouth of the Mattole River. A narrow-gauge railroad was constructed from the wharf to Petrolia. By 1918, most of the Mattole's tan-bark oak had been stripped, and market demand for tan-bark had decreased, forcing the closure of the Petrolia mill (Carranco and Sorensen 1977).

The post-World War II housing boom, occurring along with the first mass-production of chainsaws and bulldozers, brought a boom in logging Douglas fir, a long-neglected source of construction material. Many roads and skid trails were constructed during the late 1940s and 1950s. Large-scale commercial logging of Douglas fir continued to occur in the 1960s. An extended community of loggers populated the Whitethorn Valley, on the upper Mattole, in the 1950s in an area that became known as Gopherville. This valley today is littered with the remains of houses and lumber- and refuse-scatters associated with Gopherville.

Agriculture

Early crops in the Mattole included hay, potatoes, strawberries, nuts, apples, and other orchard crops, but none achieved commercial success until the early 20th century. In 1894 Albert Etter bought the area around what was to become Ettersburg and began planting and experimenting with vegetables. By the 1920s, several of Etter's strawberry varieties were being commercially grown in Oregon and overseas. His success in breeding apple varieties led to the development, in Mattole Valley orchards, of the Etters Gold, Waltana, and Pink Lady, among others. Etter's orchards still dot the landscape in the upper Mattole Valley.

3.5.3 Regulatory Setting for Cultural, Archaeological and Historical Resources

The management of archaeological and historical resources for the Program and Alternatives are designed to comply with requirements of CEQA (as amended), the State CEQA Guidelines, the Public Resources Code (Section 5020 et. seq.), the California State Register Bill (CCR Title 14), and Executive Order W-26-92, and to conform to established CAL FIRE procedures (Foster 1992).

The primary laws and regulations that relate to the Program's operations on archaeological and historic resources are those contained in the California Forest Practice Rules. The FPR's contain multiple sections with explicit language related to archaeological and cultural resources and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to archaeological, historic and cultural resources. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE.

The primary FPR rule regulating impacts to archaeological and cultural resources is found at 14 CCR 929 through 929.7. 929.1 requires notification to Native Americans and the preparation of a Confidential Archaeological Addendum (CAA). FPR section 929.2 indicates how the RPF shall describe in a separate CAA or Letter, measures to be taken to mitigate or avoid substantial adverse change to any significance site. 895.1 Definitions indicates that a specific location that may contain artifacts, or objects and where evidence demonstrates a high probability that the specific location or site, meets defined criteria would be considered as a significant archaeological or historical site. 929.3 regulates practices when a significant archaeological site

is found post review. 929.4 describes the training that an RPF must have to make determinations of significance. 929.5 describes the methods to record a site, while 929.6 describes the protection measures required during timber operations. Finally, 929.7 describes the determination of significance when dealing with a possible significant archaeological site. Portions of 14 CCR 4850 and 4852 (California Registry of Historic Places) provide additional regulation to Program activities that might affect historic resources, including requirements to protect historic resources that are listed on the California Register of Historic Places as well as on any local registries.

The Program's practices with respect to archaeology are the same as those described in the 2011 FPR's.

3.5.4 Significance Criteria for Cultural, Archaeological and Historical Resources

The CEQA Environmental Checklist specifies that the Program and Alternatives would have a significant adverse effect to prehistoric, historic, and paleontological resources if any of them would:

a) Cause an adverse change in the significance of a historical resource, as defined in Section 15064.5 of the CEQA Guidelines (Bass et al 1999);
b) Cause an adverse change in the significance of an archaeological resource, pursuant to Section 15064.5 of the CEQA Guidelines;
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
d) Disturb any human remains, including those interred outside of formal cemeteries.

In addition to prehistoric and historic archaeological sites, cultural resources also include those used for traditional cultural practices, or "ethnographic" resources. The term "traditional" refers to those beliefs, customs, and practices of a living community of people that have been passed down through generations, usually orally, or through practice. The term "cultural" refers to those attributes that are important to support the traditions, practices, lifeways, arts, crafts, or social institutions of a community, Indian Tribe, or other local ethnic group. The traditional cultural significance of a historic resource, then, is derived from the role the site plays in a community's historically rooted beliefs, customs, and practices (BLM 2004). Examples of traditional sites possessing such significance include:

- Locations which are associated with the traditional beliefs of local Native American communities about their origin or cultural history, or the nature of the world;
- Locations where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; or
- Locations where Native Americans have traditionally carried-out economic, artistic, or other cultural practices important in maintaining their historical identity (e.g., gathering sites for basketry materials or medicinal herbs).

State law and regulation requires that any proponent of a timber harvest permit must follow a defined methodology to determine the potential to affect cultural resources, including measures to avoid or mitigate adverse impacts to these resources (Foster 1992, 2003) (CAL FIRE 1996).

The significance of an historical resource is materially impaired when a project demolishes or materially alters in an adverse manner the physical characteristics of a historical resource so that it would no longer be included in the California Register of Historic Places or a local register of historical resources (Bass et al 1999). The criteria for listing include resources that are:

(1) Associated with events that have made a significant contribution to the broad patterns of California's history or cultural heritage;
(2) Associated with the lives of persons important in our past;
(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
(4) Has yielded, or has the potential to yield, information important in prehistory or history.

An adverse change to an ethnographic resource is one that would lessen the ability of Native Americans to access traditional sites, or to utilize such sites or the resources therein for their traditional purposes.

- A "substantial adverse change" in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired.

3.5.5 Determination Threshold for Impacts to Cultural, Archaeological and Historical Resources

The Program and Alternatives would have a significant effect on cultural resources if treatments ultimately result in:

- A substantial adverse change in the characteristic(s) contained in that resource which qualify it as being significant;
- An adverse change to locations associated with the traditional beliefs of Native Americans, including areas used or assumed to be used for ceremonial activities; or
- An adverse change to locations and or resources used by Native Americans to carry out or support economic, artistic, or other cultural practices.

3.5.6 Data and Assumptions for Cultural, Archaeological and Historical Resources

The goal of the Program is to institute light-touch timber harvest practices across 15,038 acres of private forestlands in the Mattole basin over the next 50 years. Because the Program utilizes timber management practices that maintain a timbered stand on site indefinitely and from which timber is removed periodically, many of these 15,038 "footprint" acres are predicted to be re-

entered for harvest during the 50-year analysis period. The total area of operation, including re-entry harvests, under implementation of the Program is 41,718. Cultural resources are fixed in place and activities that disturb the ground surface are the primary cause of damage to prehistoric and historic resources. Ethnographic resources, which may include vistas and condition of the landscape, may also be affected by disturbance and/or removal of vegetation in and around sites utilized for ethnographic purposes.

3.5.7 Direct Effects on Cultural, Archaeological and Historical Resources From Implementing the Program/Alternatives

Impacts Common to All Alternatives

The stated goal of the Mattole PTEIR is to support the project goal of growing larger trees. Restricting opportunities to "high grade" or remove the better trees in a given stand are intended outcomes. Desirable silvicultural prescriptions under the Mattole PTEIR would intentionally be considered "light touch". While this is probably true from a silvicultural view, logging by its very nature can include approved activities that have the potential to rearrange soil surface. Felling trees, skidding logs, constructing and maintaining logging infrastructure such as haul roads, skid roads, landings, yarder settings, unarguably have the potential to cause impacts that, if left unevaluated, would be common to the alternatives and prescriptions.

The potential logging area for the Mattole PTEIR-approved activities encompasses many acres of land that have not previously been systematically surveyed for cultural, archaeological, and historic resources. The Mattole PTEIR cultural, archaeological, and historic resources site landscape is largely a geographic patchwork of surveys conducted by RPFs and archaeologists for timber harvest projects, County-approved projects and various state and federal government undertakings.

During the initiation of a PTHP it would be possible to model the locations of cultural, archaeological, and historic resource sites while planning individual actions and tribal scoping for a specific project. However, the spatial scale and 50-year life span of the Mattole PTEIR makes landscape-level site location predictions neither feasible nor desirable.

Proposed Program activities could take place on about 15,038 acres of private forestlands in the Mattole Basin over the 50-year analysis period. All of the forests that the project is designed to treat have been logged to one extent or another, some many times. One of the project goals is to encourage long-term, sustainable timber management on as many acres as feasible and appropriate. Stands brought under sustainable management as envisioned in the PTEIR are expected to produce timber in approximately 15-20 year re-entry cycles, with increasing volumes over time as stands are managed for larger, more mature trees.

Common to the proposed alternative of "light touch" activities on the landscape are a set of silvicultural prescriptions. The silvicultural prescriptions described below are the only stand treatments allowed under the Mattole PTEIR (if this project is chosen by the decision maker). These prescriptions represent the intent of the Mattole Restoration Council to encourage "light

touch" treatments now and into the future, as developing stands mature and are brought under commercial management.

Each of the alternatives could result in impacts common to cultural, archaeological, and historic resource sites and could result in an impact to the environment. The types of impacts from the Mattole PTHPs that would result in effects defined in the previous sections include any of the general activities that by their nature and as they are particular to logging, would be harmful to a cultural, archaeological, and historic resource sites. It is recognized here that each of the alternatives has the potential, when applied to a particular Mattole PTHP that was not evaluated for cultural resources, to include activities that could cause harm to cultural, archaeological, and historic resource values.

The types of Program-related impacts to sites that would commonly diminish site significance could include the possibility for destruction, demolition, isolation, relocation, and impairment. This would entail an extent of damage such that those criteria that would otherwise render the site important no longer exist nor are they interpretable. A site has been impacted when its integrity has been compromised. When material harm has occurred or potentially when nonmaterial cultural values have been harmed, there is an effect. The severity of the impact is dependent on how a particular cultural, archaeological, historic resource site's importance was defined. Evidence to support a site's meeting significance criteria helps to define the level of significance of the impacts.

The differences between a practice's effects on sites would be a matter of whether they could be avoided or not. To avoid or mitigate against the potential to adversely affect important sites, the Mattole PTEIR-approved activities would require the RPF to ensure conformance with Article 14 CCR § 929 Preferred protection and mitigation would apply through project-specific avoidance, of cultural, archaeological, and historic resources during approved Mattole PTHPs.

Measures in the FPR's and Program Description Applied to Avoid Impacts to Cultural Resources

Timber harvest activities implemented under the Program or any of the alternatives that could cause damage to cultural, archaeological, and historic resource sites would intentionally be avoided. Where project elements have been identified as having the potential to have a significant effect to cultural, archaeological, and historic resources, the plan submitter shall include protection measures in their project-level CAA that meet the intent of PRC Division 13, § 21083.2(b). In the broadest terms the prescriptive protections include:

1) Plan the activity in a way that avoids the site.
2) Deed the site into permanent conservation easement.
3) Cap or cover the site with soil prior to the activity.
4) Include the site in some form of no-harvest reserve that could, for example, also include wildlife or plant habit, serve as park space, and or green-space.

The appropriate application of mitigations to protect cultural, archaeological, historic resources site would ultimately be determined through the iterative Coast Forest District review process between an RPF and CAL FIRE's Archaeological Program. Mitigation outcomes that avoid damaging effects to cultural, archaeological, and historic sites are the preferred and proposed outcomes.

Impacts from Implementation of the Program

As described in Chapter 2, implementation of the Program would entail application of one or more "light touch" silvicultural prescriptions within the area of effect of the Program. Impacts from each of these prescriptions to cultural resources are described below.

- Commercial Thinning Prescription

The commercial thinning prescription has the potential to impact cultural, archaeological and historic resources. Removal of trees from a young-growth stand, with location-dependent yarding methods, log transport infrastructure, road building and or repair, as well as post-harvest stocking, as activities singly and as a whole have the potential to affect, or do material harm to the values that comprise significant cultural, archaeological and historic resources. This prescription would be evaluated during the CAA development for its potential to affect sites, as it requires a fair degree of impact to the ground surface to gain the benefit of the prescription. Despite its potential for effects, commercial thinning can be done in the vicinity or on a cultural, archaeological, historic resource without causing material impairment. Typical CAL FIRE-approved protection measures that would avoid impacts to cultural, archaeological, and historic resources with this prescription could include but are not limited to directional falling of trees, yarding methods suited to site avoidance, and the use of capping or covering locations with material that does not contain contamination. Use of existing infrastructure, roads, landings, and skid trails is preferred.

Identification of cultural, archaeological and or historical resources prior to implementation of a commercial thinning and related activities is expected pursuant to PTHP compliance with Article 14 CCR § 929. Assessment of site significance would be dependent upon whether effects could be adequately avoided by redirecting the proposed harvest activity. The more likely a site is to being harmed, the greater the requirement for a detailed site significance evaluation commensurate to proposed impacts. Mitigations and protections would be developed and implemented dependent on the particulars of an individual PTHP tiered to the PTEIR. Evidence of this would be in a CAA that has been vetted through the existing Coast Forest District review process.

- Individual Tree Selection Prescription

Individual tree selection affords opportunity to undertake the prescription and avoid potential for significant impacts to cultural, archaeological and historic resources. This prescription requires retention of a balance of trees' size classes and affords more discretion with regards to the particular trees harvested on the forester's part. This method provides opportunities for directional felling and affords greater opportunity for site protection measures by avoidance. Individual tree selection tends to not require substantial infrastructural support such as road or landing construction and can be undertaken with care. Individual tree selection may also be used for example, to support localized conservation objectives, such as soil stabilization, and possibly site protection.

Identification of cultural archaeological and or historical resources prior to implementation of an individual tree selection treatment and related activities is expected pursuant to compliance with Article 14 CCR § 929. Assessment of site significance would be dependent upon whether effects could be adequately avoided by redirecting the proposed harvest activity in some way or felling a tree and milling it in place, or leaving the log for other purposes were the tree not merchantable. The more likely a site is to being harmed, the greater the need for a detailed site significance evaluation commensurate to proposed impacts. Per Article 14 CCR § 929, mitigations and protections would be developed and implemented through the CAA review process.

- Group Selection Prescription

On a whole the group selection prescription has the appearance for potentially more substantial adverse change to occur to cultural, archaeological, and historic resources than commercial thinning or individual tree selection. It would create larger openings in a stand than would the previously described prescriptions and therefore logically creates potential for more ground surface disruption. The group selection prescription would be most likely to concentrate impacts in confined areas and could require more transportation infrastructure compared to the other prescriptions discussed above.

Identification of cultural, archaeological and or historical resources prior to implementation of group selection prescription and related activities is a prerequisite to protection of cultural resources. Assessment of site significance would be dependent upon whether effects could be adequately avoided by redirecting the proposed harvest activity. The more likely a site is to being harmed, the greater the need for a detailed site significance evaluation commensurate to proposed impacts. As with the other prescriptions, mitigations and protections measures for cultural, archaeological, and historic resources sites would be concordant with Article 14 CCR § 929.

- The All-Aged Prescription

The all-aged prescription's potential for substantial adverse to change to cultural, archaeological, and historic resources is dependent on the scale of a particular entry into a stand requiring rehabilitation to Group A species. As with individual tree selection there are opportunities to avoid significant impacts to cultural, archaeological, and historic resources. Individual trees identified for harvest can be directionally felled and yarded toward existing infrastructure and sites can be avoided. Trees that if felled and logged would cause harm to a cultural, archaeological, and historic resources site might also be left unharvested, or if circumstances warranted, be felled and left in place.

Like the other prescriptions, the removal of an all-age group clearly has some potential for substantial adverse change to occur to cultural, archaeological, and historic resources. The scale of an all-age operation, taking into account the harvest, and infrastructural needs, could potentially result in greater ground surface area disturbance than the individual tree or even the commercial thinning of small trees. This assumes that the

types of trees being harvested were to be felled, yarded and transported. Were the logs felled and processed in place, this prescription would seem to have a lesser potential to result in adverse effects.

Because this prescription is specific to the Mattole PTEIR it is designed to address specific on-the-ground challenges to forest management faced by landowners in the Mattole watershed. Accordingly, in those instances where a Mattole PTHP intersects with a cultural, archaeological, and historic site, the RPF and CAL FIRE Archaeological Program would work to achieve the project goals and protect an identified site. There are many forested acres in the Mattole dominated by hardwoods where commercial harvest is not economically viable and landowners are not interested in or cannot afford to use intensive rehabilitation prescriptions. This set of circumstances may provide opportunities to use the felled Class B species for cultural, archaeological, and historic resources site protection purposes as well as accomplish other Mattole PTEIR objectives. Through either on site mastication, chipping, and pilling, Class B species may find value as capping and covering materials.

Prior to the approval by CAL FIRE of any Mattole PTHP all-aged prescription entry, the identification of archaeological and or historical resources is a requisite to protection of cultural resources. Assessment of an identified site's significance would be dependent upon whether effects could be adequately avoided by redirecting the proposed harvest activity or using Class B logs, chips, and slash for site protection, for example. The more likely a site is to be harmed, the greater the need for a detailed site significance evaluation commensurate to proposed impacts.

Impacts from Alternative I: No Project - Continue Status Quo

Under the No Project alternative, the Mattole PTEIR/PTHP process would not be used to implement commercial timber harvest in the Mattole. Individual landowners could continue to file Timber Harvest Plans (THPs), NTMPs and exemptions to the Forest Practice Rules to harvest timber. Based on past timber harvest plans implemented in the basin, projection of harvest levels under the status quo is 14,715 "footprint" and 24,051 total harvest entry acres (including re-entry harvests on the same acres) during the 50-year analysis period.

Under implementation of the Program (or any of the other alternatives, as required under the FPR's), and in accordance with Article 14 Archaeological and Historical Resources Protection, an RPF would follow the direction specified. The RPF would ultimately be required to prepare a Confidential Archaeological Addendum (CAA), and submit the CAA for review by CAL FIRE's archaeological program located in Santa Rosa. This would continue to be done on a plan-by-plan basis. Preparation of the CAA and its review require substantive and material documentation satisfying each part of Article 14 CCR § 929. A CAL FIRE archaeologist and possibly a CAL FIRE forester would conduct a preharvest inspection (PHI). In most cases this practice is undertaken to assess whether the identification effort for sites by an RPF was sufficient and whether identified sites were afforded sufficient protection from timber operations. Impacts would be assessed on a plan-by-plan basis, with the preferred outcome usually resulting in some form of site avoidance mitigation strategy.

Alternative II: Broader Buffers While Allowing Even-Aged Management

Alternative II attempts to increase protection of wildlife and water quality by widening no-harvest buffers along watercourses and prohibiting harvest on areas delineated as "Very High" landslide hazard. Under Alternative II, no-harvest buffers are 150' wide on Class I streams, 100' wide on Class II streams and 50' wide on Class III streams (both sides of stream, slope distance). Harvest under Alternative II is projected to occur on 15,400 "footprint" acres of NIPF land and 28,157 acres (including re-entry harvest acres) during the 50-year analysis period.

In contrast to restricting the potential harvestable acreage, Alternative II would allow the full suite of FPR silvicultural prescriptions to be applied on the remaining manageable landbase. Under this PTEIR alternative, clearcuts and variable retention harvests would be limited to 10 acres in size, and shelterwood and seed tree harvests would be limited to 40 acres, with no size restriction on the other FPR prescriptions. The flexibility to apply the full range of FPR prescriptions is designed to allow landowners to harvest a larger volume of timber from fewer acres compared to the PTEIR-specific prescriptions, helping offset the negative economics of the increased no-cut stream buffers.

Under Alternative II, just as under the Proposed Program, the timberland owner would file a programmatic timber harvest plan (PTHP) rather than a timber harvest plan (THP). Compliance with Article 14 CCR § 929 would be satisfied by the RPF. Prior to finalizing the Mattole PTEIR checklist, the RPF would ensure that a CAA has been approved through the CAL FIRE Archaeological Program review process.

In accordance with Article 14 CCR § 929 and its subparts, Archaeological and Historical Resources Protection, an RPF would follow the direction specified. The RPF would be required to prepare a Confidential Archaeological Addendum (CAA), and submit the CAA for review by the CAL FIRE's archaeological program located in Santa Rosa. This would continue to be done on a plan-by-plan basis. Preparation of the CAA and its review require substantive and material documentation satisfying each part of Article 14 CCR § 929. A CAL FIRE archaeologist and potentially a CAL FIRE forester would conduct a preharvest inspection to validate the CAA's content. In most cases this practice is undertaken to assess whether the identification effort for sites by an RPF was sufficient and whether identified sites were afforded sufficient protection from timber operations. Impacts would be assessed on a plan-by-plan basis, with the preferred outcome usually resulting in some form of site avoidance mitigation strategy.

Alternative III: Fire and Fuels Management

Alternative III would implement much the same practices as the Program, but would also require reduction of fire hazard in areas where significant values are at risk from wildfire. Alternative III applies fuels reduction treatments to 19,889 acres of NIPF and 7,000 acres of industrial land, over the 50-year analysis period. Under this alternative, all operations-related slash would have to be either piled and burned, lopped to 18" from the ground surface, removed, or chipped so that flame lengths in a subsequent fire would not exceed 2 feet in height.

Alternative III also requires that at least 60% canopy cover be retained in all harvested areas, to provide shade sufficient to retard the growth of flammable understory vegetation and buildup of fire ladders. For this reason, no group selection openings are allowed under Alternative III, whereas the other Program-specific prescriptions (All-aged (without the group selection option), single tree selection and commercial thinning would be allowed. However, unlike the Proposed Program and Alternative II, Alternative III would allow limited timber harvest within portions of riparian buffers with the goal of reducing fuel loading and fire hazard across a larger portion of the Program acreage. The only prescription allowed in riparian buffers would be thinning from below with requirements that the treatment result in an increase in the quadratic mean diameter (QMD) of the trees in the treated stand (within the buffer). In addition, no tree 20" DBH or larger could be harvested from a riparian zone.

Under Alternative III the timberland owner would file a programmatic timber harvest plan (PTHP) rather than a timber harvest plan (THP). Compliance with Article 14 CCR § 929 would be satisfied by the RPF. Prior to finalizing the Mattole PTEIR checklist the RPF would ensure that a CAA has been approved through the CAL FIRE Archaeological Program review process.

In accordance with Article 14 CCR § 929 and its subparts, Archaeological and Historical Resources Protection, an RPF would follow the direction specified. The RPF would be required to prepare a Confidential Archaeological Addendum (CAA), and submit the CAA for review by CAL FIRE's archaeological program located in Santa Rosa. This would continue to be done on a plan-by-plan basis. Preparation of the CAA and its review require substantive and material documentation satisfying each part of Article 14 CCR § 929. A CAL FIRE archaeologist and potentially a CAL FIRE forester would conduct a preharvest inspection to validate the CAA's content. In most cases this practice is undertaken to assess whether the identification effort for sites by an RPF was sufficient and whether identified sites were afforded sufficient protection from timber operations. Impacts would be assessed on a plan-by-plan basis, with the preferred outcome usually resulting in some form of site avoidance mitigation strategy.

3.5.8 Indirect Effects on Cultural, Archaeological and Historical Resources of Implementing the Program/Alternatives

Off-Site Project Impacts

Indirect effects of implementing the Program or the alternatives could potentially occur if off-site operations of the project were to impact a cultural site outside of the Program area. For instance, effects might occur if project equipment were parked on an adjacent area that had not been evaluated as part of the project, or if an access road ran through an unknown site. These impacts are considered transitory and unlikely; nevertheless, indirect impacts can be addressed by requiring the project proponent to assess the potential for sites to exist on off-site areas that might be used for parking, crew campsites, transportation, etc.

Effects from Reduction of Wildfire Intensity

Wildfire can have detrimental effects to cultural resources. Generally, the more intense the fire the more potential there is to degrade cultural resources. Due to reduction in fire hazard from

vegetation manipulation, the Proposed Program would have a negligibly beneficial to strongly beneficial effect on wildfire intensity across every treatment type and location, and would cause no exacerbation of wildfire intensity related to the Program. The Proposed Program can therefore be expected to have a beneficial effect to cultural resources to the degree that wildfire intensity is decreased, thereby helping protect the integrity of the resources.

3.5.9 Determination of Significance for Cultural, Archaeological and Historical Resources

Table 3-12 summarizes the potential environmental effects associated with implementation of the Program or Alternatives.

Table 3-12
Summary Of Effects[1/]
To Archaeological and Historic Resources
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The Program is expected to create a less than significant adverse effect to prehistoric, historic, or ethnographic resources due to the regulations contained in the FPR's and the professional oversight for every individual project by CAL FIRE professional archaeologists.

Alternative I is expected to create a less than significant adverse effect to prehistoric, historic, or ethnographic resources due to the regulations contained in the FPR's and the professional oversight for every individual project by CAL FIRE professional archaeologists.

Alternative II is expected to create a less than significant adverse effect to prehistoric, historic, or ethnographic resources due to the regulations contained in the FPR's and the professional oversight for every individual project by CAL FIRE professional archaeologists.

Alternative III is expected to create a less than significant adverse effect to prehistoric, historic, or ethnographic resources due to the regulations contained in the FPR's and the professional oversight for every individual project by CAL FIRE professional archaeologists.

3.5.10 Similar Effects on Cultural, Archaeological and Historical Resources Described Elsewhere

Effects to cultural resources have little if any similarity to effects on other resources as described in this document.

3.5.11 Mitigation Measures for Cultural, Archaeological and Historical Resources for the Proposed Program

No impacts on prehistoric, historic, or ethnographic resources are expected from implementing the Program, so no mitigations are required.

3.5.12 Literature Cited for Cultural Archaeological and Historical Resources:

Bass, Ronald E., Albert I. Herson and Kenneth M. Bogdan. 1999. CEQA Deskbook, Second Edition. Solano Press Books. Rohnert Park, CA.

Baumhoff, Martin A. 1958. California Athabascan Groups. Anthropological Records. Berkeley and Los Angeles University Press.

Bramlette, Allan G. and David A. Fredrickson. 1979 An Archaeological Study of CA-HUM-405, at the Mattole River Bridge, Humboldt County, California. Cultural Resources Facility, Anthropological Studies Center, Sonoma State University, Rohnert Park, California.

CAL FIRE. 1996. Memorandum of agreement no. 2: (agreement regarding historical resources records check procedures)

Carranco, Lynwood and Henry L. Sorenson. 1988. Steam in the Redwoods. Caxton Printers Ltx.

Eastman, Bright and Adrian Praetzellis. 1995. Task Order No. 2 to Cooperative Agreement Between the BLM, Ukiah District and Sonoma State University Academic Foundation, Inc. Agreement No. CA-B950-A3-0024, Documentation and Evaluation of Historical Resources within the King Range National Conservation Area. Rohnert Park, California: Anthropological Studies Center, Sonoma State University, Rohnert Park, California.

Elmendorf, William. 1980. Models of linguistic prehistory in California. Paper presented at the 79th annual meeting of the American Anthropological Association, Washington, D.C.

Elsasser, Albert. 1978 Mattole, Nongatl, Sinkyone, Lassik, and Wailaki. Handbook of North American Indians: California (volume 8). Washington, Smithsonian Institution

Foster, Daniel G. 2006. CAL FIRE website, archaeological program page, http://www.indiana.edu

Foster, D. G. 1992. The environmental review process mandated by CEQA: a summary of the requirements for evaluating impacts to archeological resources. (CAL FIRE Archeological Reports Number 7.) California Department of Forestry and Fire Protection, Archeology Office. Sacramento, CA.

Foster, Daniel G. 2003, updated 2006. Archaeological Review Procedures for CAL FIRE Projects. California Department of Forestry and Fire Protection. Sacramento.

Fredrickson, David A. 1979. Appendix I: Recent Archaeological Studies by Sonoma State College in Coastal Northern California. In Bickel, A Study of Cultural Resources in Redwood National Park. Report on file, Redwood National Park, Arcata, California.

Goddard, Pliny Earle. 1907 Lassik -Handbook of American Indians. Bureau of American Ethnology – Bulletin 30.

Hildebrandt, William R. and John F. Hayes. 1983. Archaeological Investigations on Pilot Ridge, Six Rivers National Forest. Anthropological Studies Center, Sonoma State University and Center for Anthropological Research, San Jose State University. Copies of the report are on file at Six Rivers National Forest, Eureka, CA.

Hildebrandt, William R. and John F. Hayes. 1984. Archaeological Investigations on South Fork Mountain, Six Rivers and Shasta-Trinity National Forests. Anthropological Studies Center, Sonoma State University, Rohnert Park, California, and Center for Anthropological Research, San Jose State University, San Jose, California. Submitted to U.S. Department of Agriculture, Forest Service, Six Rivers National Forest, Eureka, California, Contract No. 53-9A47-3-27

Kroeber, A. L. 1976 [1925]. Handbook of the Indians of California. New York: Dover Publications, Inc.

Levulett, Valerie. 1985 The Prehistory of Southwestern Humboldt County: A Study of Coastal Archaeological Sites in the King Range National Conservation Area. Ph.D. Dissertation, Department of Anthropology, University of California, Davis.

Levulett, Valerie and William Hildebrandt with contributions by Amy Gilreath, Richard Hughes, Thomas Origer, Eric Ritter, and Randall Skelton. King Range Archaeological Project: Results of the 1984 Field Season, Excavations at CA-HUM-307, Hum-276, Hum-270, and Hum-175. Anthropological Studies Center, Sonoma State University.

Maloney, Alice B. 1943. Fur Brigade to Bonaventura (Part 2). California Historical Society Quarterly 22 (4 323-348.

Merriam, C. Hart. 1923. California Journal, Vol I. Photocopy on file at the Cultural Resources Facility, Center for Indian Community Development, Humboldt State University, Arcata.

Rohde, Jerry. 2010. Personal communication. Reference is to an unpublished document.

Roscoe, James. 1983. An Ethnohistory of the Mattole, Master's Thesis. Sonoma State University.

Roscoe, Katie. 1984. King Range Coastal Management Plan. Report on file, Bureau of Land Management, Ukiah District Office, Ukiah, California.

USDI National Park Service. National Park Service. 2005. Final EIS for a Fire Management Plan. Santa Monica Mountains National Recreation Area

3.6 Impacts of Program/Alternative Implementation on Greenhouse Gases

This section summarizes the impacts of implementing the Proposed Program and Alternatives on climate change and greenhouse gas (GHG) emissions.

3.6.1 Environmental Setting – Greenhouse Gases

The assessment area for assessing the direct impacts from implementing the Program's practices on greenhouse gas emissions is the 15,038-acre Program footprint area itself.

There is international scientific agreement that human-caused increases in GHG's have and will continue to contribute to global warming, although there is much uncertainty concerning the magnitude and rate of the warming. The scientific community agrees that the Earth's climate is becoming warmer, and that human activity is playing a role in climate change. Unlike other environmental impacts, climate change is a global phenomenon in that all GHG emissions generated around the globe contribute to it.

Some gases in the atmosphere affect the Earth's heat balance by absorbing infrared radiation. These gases can prevent the escape of heat in much the same way as glass in a greenhouse, and is most commonly called the "greenhouse effect." On Earth, the GHG's believed to be most responsible for global warming are water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N20), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Enhancement of the greenhouse effect can occur when these gases exceed natural concentrations in the atmosphere. Of these gases, CO2 and CH4 are emitted in the greatest quantities from human activities. Emissions of CO2 are largely by-products of fossil fuel combustion, whereas CH4 results from off gassing associated with agricultural practices and landfills (COE 2008).

In California, some of the potential impacts of global warming may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, more drought years, changes in disease vectors, and changes in biodiversity (California Natural Resources Agency, 2009). The CARB estimated that in 2008, California produced 477 million metric tonnes (a metric tonne is 2,204 pounds, or 1.102 U.S. tons) of CO2- equivalent GHG emissions, and that transportation was the source of 25% of these emissions followed by electricity generation at 8% and industrial sources at 19%. Forestry is a net sink of GHG's, such that in 2008 total GHG emissions from forests in California were –3.98 million tonnes (CARB, 2010). Wildfires in the state are thought to generate an average of around 0.19 million tonnes of GHG's per year.

Carbon sequestration is achieved through a repeating cycle of planting and growing trees that remove CO2 from the atmosphere and store carbon in tree fiber. Forestlands in general are a carbon sink where CO2 is captured and fixed by a process of photosynthesis, which removes carbon from the atmosphere and sequesters such carbon in wood fiber. Managed forests make a significant contribution to the sequestration of carbon and mitigation of GHG (IPCC, 2007). When a tree is harvested, most of the carbon-containing tree fibers become lumber that is sequestered in buildings while a new rotation of trees is planted and grown. In Northern California, up to 68% of the wood volume in a harvested tree is turned into long-term wood

products such as boards (CAR, 2010). Branches and tops left in the forest either slowly release CO2 as they decay, or quickly give up CO2 if they are burned using prescribed fire. Although this decay releases CO2, it also supplements soil and duff layers where carbon is stored through consumption of leafy material by soil biota. Some of the material removed from the site that is not turned into boards is turned into engineered wood products such as pressboard and flake board that may last for many years. That portion of timber removed from the woods that is utilized for power production (e.g., sawdust and shavings) offsets power that would be produced through the burning of fossil fuels.

Since 1990 (the State of California benchmark for achieving GHG reductions), the forest products industry has seen a significant reduction in harvest levels and in the number of operating sawmills. Timber harvest peaked in 1988 at 4,670 MMBF of timber and declined to 804 MMBF in 2009. During the same time frame, timber growth continued to exceed harvest and tree mortality. Net annual growth (gross growth minus mortality and harvest) for the period 2001-2005 was approximately 200 MMBF/year. Total number of sawmills has declined from 117 sawmills in 1990 to 39 sawmills in 2007.

According to the CARB, (CARB 2008) "*Current net forest sector emissions are approximately -5 MMTCO2E (2002-2004 average). This net number is negative because the gross emission rate from disturbances such as fires, harvesting, land conversion, and decomposition of wood and other forest products is less than the gross atmospheric uptake and sequestration of carbon from forest growth. Forests also provide multiple ecological benefits (for example, habitat, structure, and nutrient cycling), as well as a suite of other human benefits or services on which we depend (for example, water storage, soil stability, air and water quality, wood products, and recreation).*"

3.6.2 Regulatory Setting – Greenhouse Gases

In 2005, in recognition of California's vulnerability to the impacts of climate change, Governor Schwarzenegger issued Executive Order S-3-05, which set forth a series of target dates by which statewide GHG emissions would be progressively reduced, as follows:

- By 2010, reduce GHG's to 2000 levels
- By 2020, reduce GHG's to 1990 levels; and
- By 2050, reduce GHG's to 80% below 1990 levels.

In 2006, California passed the California Global Warming Solutions Act of 2006 (Assembly Bill 32; California Health and Safety Code, Division 25.5, §38500, et seq., or AB 32), which requires CARB to design and implement emission limits, regulations, and other measures such that feasible and cost-effective statewide GHG emissions are reduced to 1990 levels by 2020 (representing an approximately 25% reduction in emissions; COE 2008).

In January of 2010, the office of Attorney General released a set of 60 mitigation measures that local agencies and project proponents can take to mitigate the impacts of climate change from their projects and polices. These mitigation measures cover a broad set of possible measures including two that particularly apply to forestry:

- Preserve forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas and other open space that provide carbon sequestration benefits
- Protect existing trees and encourage the planting of new trees. Adopt a tree protection and replacement ordinance.

The 2020 target reductions are currently estimated to be 174 million metric tons/year of CO2 equivalents. In total, the 44 recommended early actions have the potential to reduce GHG emissions by at least 42 million metric tons/year by 2020, representing about 25% of the estimated reductions needed by 2020. CARB staff is working on 1990 and 2020 GHG emission inventories in order to refine the projected reductions needed by 2020 and identify the additional reduction measures required to meeting the 202 target

On March 18, 2010, the final CEQA Guidelines for GHG emissions analysis in CEQA documents went into effect as a result of rulemaking required under SB97. These significance criteria and determination thresholds for GHG emissions are described below.

In December, 2010 ARB adopted regulations for a cap and trade program under AB 32. These incorporate protocols for measuring carbon benefits from forest management, avoided conversion and reforestation projects for use as carbon offsets. Thus, current regulations recognize the potential GHG benefits of forest management activities and their value in mitigating climate change.

3.6.3 Significance Criteria – Greenhouse Gases

Based on Appendix G of the CEQA Guidelines, GHG impact would be considered significant if the Program and Alternatives would:

a) Generate greenhouse gas emissions, either directly or indirectly that conflict with the State goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth in AB 32, California Global Warming Solutions Act of 2006.
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

3.6.4 Determination Threshold – Greenhouse Gases

Determination thresholds have not been established by State agencies for GHG emissions; for the time being, the only guidance comes from air quality management districts. The Program area overlaps the jurisdiction of two such agencies. The North Coast Unified Air Quality Management District (NCUAQMD) has not set a threshold for CO2. For the Mendocino County portion of the Program area, the Mendocino County District Air Pollution Control Officer issued new CEQA guidance (http://www.co.mendocino.ca.us/aqmd/pdf_files/MCAQMD_CEQA.pdf) for the District on June 3, 2010, which requested that planning agencies and consultants use the Bay Area AQMD CEQA CO2 thresholds adopted on May 28, 2010 to evaluate new projects. The Bay Area Air Quality Management District (BAAQMD) sets a threshold of significance at 6.6 metric tonnes of carbon dioxide equivalent per "service population"/year (the service population

is the sum total of all residents plus outside employees within the district). Because a portion of the Program area is in Mendocino County, and because the NCUAQMD does not have criteria, the threshold of determination used by Mendocino is established for the entire Program area. As a result, the threshold of determination is whether the Program emits an annual total of approximately 13,200 tons of CO2 equivalent per year based on an estimated population of 2,000 people in the Mattole. Translated to the Program footprint, the threshold of determination would be whether the Program's practices resulted in the emission of approximately 1,050 tonnes of CO2 per year.

3.6.5 Data and Assumptions – Greenhouse Gases

Current Projections Without Management

Using USFS FIA data from the 15 FIA plots in the Mattole and the USFS FVS program and CARBREPT keyword, the Mattole's forestlands are projected to sequester an average of 1.4 metric tonnes of elemental carbon per acre per year over the next 100 years without management. The average annual amount of CO2 (CO2 = 3.67*tonnes of elemental carbon) removed from the air each year across the 15,038 acres of Program footprint within the Mattole is estimated at over 77,000 metric tonnes of CO2 per year. It is worth noting that this is a high rate of sequestration compared to wildlands statewide. The CARB estimates that in 2008, forests statewide sequestered carbon at a rate of 0.16 metric tonnes per acre of CO2 equivalent per year. This includes forests of varying productivity such as oak woodlands, forests in Southern California, forests at high elevation, eastside pine forests, etc.

There are no estimates for the amount of CO2 that might be generated by people, business, vehicles, etc. from the Mattole, by way of comparison to the magnitude of carbon release and sequestration from the Program footprint. However, estimates from the 2008 CARB GHG emissions inventory indicate that each person in California generates around 13.25 tonnes of CO2 equivalent per year. Thus, in the Mattole basin, all man-made sources of GHG emissions might be around 26,500 tonnes/year. This does not, however, account for GHG's given off by logging and trucking associated with the Program.

Analysis of Program and Alternatives: Method

The Program's silvicultural selections, timing choices for harvest, acreage harvested by strata, etc., are described in general in chapters 2.1 and 3.1 and in detail in the Timberland Resources chapter, 3.19. Modeling of the harvest included using the FVS Yardloss keyword to tell FVS the percent of cut stems to leave, percent of left stems that would fall down, and percent of branchwood left from removed stems. For the Program and Alternatives I (the No Project alternative) and II, it was assumed that all cut hardwoods were left in the woods. For Alternative III, it was assumed that all cut hardwoods were removed from the site and that only 10-20% of the branches were left, reflecting the lop-and-scatter slash treatment. For the Program selection prescription, 30% of branches were left, while for the All-aged prescription only 10% of branches were left, which reflects the high level of hardwood slash treatment expected. In all Alternatives including the Program, it was assumed that all group cuts were pile-burned to

facilitate replanting. For Alternatives 1 and 2, it was assumed that there would be very little slash treatment in the even-aged harvest areas.

For this analysis, the USFS FVS program along with the Mattole-specific plot data was used to generate inventory, growth, yield, harvest and total stand (all standing above ground and all below ground) elemental carbon stocks for 50 years given the assumptions about the acres harvested by prescription by strata. The USFS FVS program is certified for carbon accounting by the California Climate Action Reserve for forest management projects. The FVS program reports total carbon stored in trees at 5 year intervals , accounting for sequestration through growth, carbon removed during harvest, and changes in down wood carbon and below-ground carbon (e.g. carbon in roots, including roots that decay after trees are cut).

The CARB EMF2007 CO2 emission rates for on-road truck haul and the CARB OFFROAD2007 CO2 emission rates off road use of chainsaws, tractors, loaders, etc were used along with estimates of daily production in terms of MBF skidded, loaded and hauled per day. These amounts were previously calculated in chapter 3.3 for the Air Quality Analysis. The CO2 daily emission rates are shown below in Table 3-13:

Table 3-13
CO2 Emission Rates

Equipment Type	Tons/Day of CO2	Source of Data
Log Trucks	0.33	CARB EMF2007
Log Trucks	0.36	CAL FIRE GHG calculator
Chainsaws	0.12	CARB OFFROAD2007
Bulldozers	1.56	CARB OFFROAD2007
Excavators	1.81	CARB OFFROAD2007
Rubber Tired Loaders	1.96	CARB OFFROAD2007

Production rates by piece of equipment and the total conifer and hardwood volume cut within each watershed in each five-year period was used to calculate the total number of days of logging and hauling. Production rates for the Program assumed that chainsaws cut 8 MBF/day, tractors skidded 25 MBF/day of conifers, loaders loaded 40 MBF/day of conifers and the average log truck load was 4.6 MBF/truck. Production rates were doubled in sub-basins North1 and North 2 to account for higher-production loggers operating on industrial timberland.

Production rates in Alternative 1 were increased to 40 MBF/day for tractor skidding and 60 MBF/day for loading to reflect higher volumes per acre being harvested. While production rates in Alternative 1 are higher, resulting in a shorter number of days of operation per MBF cut, the much larger volume being removed overall often times resulted in more days of operation in a particular watershed in any particular five-year period compared to the Program.

Production rates in Alternative 2 were set to be the same as Alternative 1, while production rates in Alternative 3 were set equal to the rates used in calculating the Program's CO2 emissions.

The CAL FIRE GHG calculator was not used because, while it can apparently accept varying acreages being harvested over time, the complexity of the modeling was such that a different acreage harvested, and total volume harvested would have had to be input each five-year period, for each of the 32 strata/prescription/subbasin combinations resulting in 320 entries into the GHG calculator. Instead, because FVS accounts for carbon, the accounting matrix used to track all the forest stand variables including acres harvested by strata by subbasin was queried to produce the total elemental stand carbon on the footprint in each subbasin at each five-year period.

3.6.6 Direct Impacts Common From Implementing the Program/Alternatives – Greenhouse Gases

Table 3-14 shows total stand elemental carbon stocks for each alternative at the beginning of each five-year period after accounting for harvest and slash treatment based on the silvicultural and accounting matrix assumptions stated above. Note that the initial stocks of carbon are different for each alternative, because the footprint of each alternative is slightly different.

Table 3-14
Metric Tonnes/Acre of Total Stand Carbon Stocks by Alternative Through Time

Period	Alternatives			
	Program	Alt 1	Alt 2	Alt 3
	Metric Tonnes/Acre of Total Stand Carbon Stocks			
2010-15	95	90	91	99
2015-20	99	98	97	101
2020-25	106	102	100	105
2025-30	108	103	100	107
2030-35	107	105	101	103
2035-40	105	100	96	100
2040-45	105	97	92	102
2045-50	99	86	81	96
2050-55	102	83	79	99
2055-60	101	73	72	97
2060-65	99	71	70	93

Table 3-15 shows the stock trends from the Program in detail for one of the silvicultural prescriptions applied to one of the most prevalent strata in the Program area. Carbon projections from FVS for the DF4 High-conifer stratum, harvested using the PTEIR selection prescription, are shown below for the total stand carbon at each period along with carbon growth and carbon removals.

Table 3-15
On-site Carbon Stocks Through Time
DF4 High-Conifer
PTEIR Selection Prescription
(all figures in Metric tonnes of Carbon/Acre)

Period	Total Carbon on-site at beginning of period	Increase of carbon stocks due to growth net of decay	Carbon removed through harvest
2010-15	93.5	21.6	30.1
2015-20	85.0	13.2	0.0
2020-25	98.2	15.1	0.0
2025-30	113.3	15.4	32.9
2030-35	95.7	7.9	0.0
2035-40	103.6	9.7	0.0
2040-45	113.3	10.8	29.8
2045-50	94.2	5.1	0.0
2050-55	99.3	6.8	0.0
2055-60	106.2	8.3	24.1
2060-65	90.3		

Table 3-16, below shows the average on-site carbon stocks in the DF4 Low-conifer stratum using the All-aged prescription. The PTEIR All-aged prescription applies selection to approximately 60% of the footprint throughout the 50-year projection period and group selection to 20% of the footprint area for the next 20 years and another 20% during the period of 20-40 years into the future. Hence, the PTEIR all-aged prescription looks substantially different than the PTEIR selection prescription in terms of carbon stocks. This stratum was chosen to demonstrate that even for a stratum poorly stocked with conifers, the on-site carbon storage will increase during the 50-year planning horizon of the project, even without accounting for carbon stocks stored in wood products and landfills.

Table 3-16
On-Site Carbon Stocks Through Time
DF4 Low-Conifer Stratum
All-Aged Prescription

Period	Total C (Metric tonnes/acre)
2010-15	105
2015-20	120
2020-25	88
2025-30	88
2030-35	90
2035-40	94
2040-45	89
2045-50	94
2050-55	103
2055-60	117
2060-65	116

Chapter 3.19, Timberland Resource section shows that the Program prescriptions reach MSP, usually by 50 years into the future, but in some cases, for vegetative types with very low initial conifer stocking, MSP isn't reached until 60-90 years into the future. The example in trend in carbon stocking for the two vegetative types below shows, together with the results from chapter 3.19, that the Program prescriptions lead eventually to increasing carbon stocks over time even when accounting for harvest.

As a result of application of all of the prescriptions across the Program footprint or the alternatives footprint, the total change in carbon stocks for the Program and the Alternatives, from one five-year period to the next, is tracked below for a 50-year projection period in Table 3-17. Table 3-17 below shows the net amount of additional carbon that is either sequestered (+) or emitted as a result of forest management by time period for the Program and the other alternatives. Emissions result from timber harvest and slash treatments.

Table 3-17
Balance Of Carbon Sequestration and Emission For Program And Alternatives

Period	Change in Elemental Carbon Stored On-Site Or In Wood Products by Alternative (Metric Tonnes)			
	Program	Alt 1	Alt 2	Alt 3
2010-15	62,343	18,288	16,843	8,231
2015-20	103,604	10,913	5,996	4,567
2020-25	37,480	1,862	889	-8,449
2025-30	-24,240	5,388	2,835	-4,780
2030-35	-24,634	-12,682	-13,501	2,370
2035-40	301	-5,968	-10,046	-11,301
2040-45	-85,511	-29,231	-29,820	6,798
2045-50	43,574	-5,656	-4,657	-4,299
2050-55	-14,972	-25,458	-17,796	-8,152
2055-60	-35,662	-5,849	-5,436	5,653
Total change in elemental carbon stored on-site in forests over 50 years	112,917	-42,543	-49,257	-2,562
Annual average increase in on-site elemental C	2,258	-851	-985	-51
Annual average of C projected to be stored in products per CAR protocol1	2,812	3,711	4,814	1,643
Annual average C from vehicle emissions over 50 years	-938	-774	-902	-604
Annual C equivalent of CH4 from vehicle emissions (CH4 tonnes* 25)	-91	-91	-106	-59
Net annual average C sequestration (+) or emission (-) over 50 years	4,041	1,995	2,821	929
Net Average Annual additional CO2e sequestered or emitted over 50 years	14,832	7,320	10,353	3,409

1/ Wood in long-lasting products partially offsets the carbon lost from the forest when harvest is undertaken.

Program GHG's

Table 3-15 shows that over a 50-year projection period, on-site elemental carbon stocks range up and down starting at about 95 metric tons/acre for all carbon pools in 2010, then going up to as much as 108 metric tons of elemental carbon /acre in 2025 then decreasing to as low as 99 tons/acre after harvest at various times and ending at 99 metric tons/acre at the end of the projection period. Total elemental carbon includes carbon from the above ground live pool, below ground live and dead carbon pools (carbon in roots), carbon in duff, carbon in dead and down material, and carbon in standing dead material. Average annual net change in the amount of elemental carbon sequestered on the Program footprint is estimated at about 2,258 metric tons/year, taking into account growth, decay, and removals due to harvesting but excluding both the emissions from harvesting activities as well the carbon stored in wood products.

Carbon is also stored in wood products. For this analysis, the CARB Forestry Protocol v3.2 appendix C, Carbon in Wood Products process was used to calculate the amount of carbon stored in wood products. For this analysis it was assumed that the annual harvest volume of conifers in the Program or Alternatives can be converted to carbon using 6 tons/MBF, a specific gravity of 0.429 to convert green tons to dry tons, a regional average mill efficiency ratio of 0.675 to convert round logs into lumber, a ratio of 0.5 tons/ton of dry wood to convert dry weight to carbon and a factor of 0.9072 to convert short tons of carbon to metric tonnes of carbon. During the 50-year projection period, the Program produces around 446,000 MBF of conifer logs (see chapter 3.19 for production volume) which is equivalent to around 1.12 million metric tonnes of carbon stocks that are cut down in the Program and turned into logs. Of that tonnage of logs, only about 40% (source: Appendix C of v3.2 of CARB Forest Protocol Pacific Coast – California Mill Efficiencies) of each log is turned into durable lumber (or is residue or durable lumber that goes to landfills) As a result, in the Program, average annual elemental carbon that remains stored in boards is estimated at about 2,812 metric tons/year.

Average annual total tons of elemental carbon sequestered is the sum of
• the 2,258 metric tons of elemental carbon sequestered annually and stored in the forest (after accounting for harvest, slash treatment, etc.), **plus**
• the 2,812 metric tons/year of elemental carbon stored in boards, **minus**
• the carbon and methane emitted by log trucks, bulldozers, etc. in bringing logs to sawmills which is estimated at 938 metric tonnes/year of carbon and 91 metric tons of carbon equivalent methane (CH4).

The result of the annual sequestration by forests, plus the annual addition amount stored in durable wood products minus the emissions from harvesting equipment is estimated at 4,041 tonnes of additional carbon "sequestered" and/or stored per year which is equivalent to about 14,832 additional tonnes of CO2 being stored per year

In addition to the amount stored in trees, soil, wood products, etc., implementation of the Program will result in minimal impacts to carbon stored in the duff layer and the soil. Because the harvesting conducted under the Program minimizes duff and soil disturbance and not much of the Program area is likely to be broadcast burned, the carbon stored in the duff is mostly intact following harvest. In addition, research by Page-Dumroese et al., 2005 shows that the absolute mass of below ground carbon shows little change over time.

Recent research by Wiedinmyer and Hurteau, 2010 shows that treating stands with prescribed fire can reduce the amount of greenhouse gases emitted by wildfires burning in treated areas compared to not treating such stands. Their work shows that CO2 emissions are 15-25% less from wildfires burning treated stands than untreated stands. However, research by Mitchell, Harmon and O'Connell, 2009, shows that while various mechanical and prescribed fire treatments can reduce wildfire severity, reducing the amount of carbon emitted by a wildfire burning through a treated area requires the removal of a much greater amount of carbon in green trees to have a positive effect on emissions. Most wildfires only burn needles, twigs and small limbs, rarely large limbs and almost never entire boles of trees. However, treatments remove boles of trees where the greatest portion of carbon per acre is stored. Approximately 65-80% of the aboveground carbon is stored in the merchantable portion of the bole of trees. On a tree by

tree basis, wildfires might emit 20-35% of the aboveground carbon stored, while treatments, such as the Program can remove 65-80% of the above ground carbon at the tree level. Since only about 10% of Program treatment area is expected to include prescribed fire, the impacts to GHG's from treating the Program area with prescribed fire are expected to be minimal.

Implementation of the Program results in about 3.64 metric tons of CH4 being given off per year from vehicle exhaust associated with the operation of heavy equipment and log hauling. CH4 is 25 times more potent as a GHG than CO2, such that the amount of CH4 being given off is equivalent to about 91 tons of CO2.

Alternative 1 (Status Quo) GHG's

Based solely on looking at on-site carbon stores in the forest only (e.g. not accounting for carbon stored in wood products), the Status Quo (Alternative 1) actually emits rather than sequesters carbon over the 50-year projection period. This results from a combination of 30% of acres being treated with even-aged harvest, and the remainder being treated with repeated heavy selection. Even-aged management results in long periods where live carbon stocks are extremely low, which is somewhat offset by both the quantity of slash generated and the duration of the slash decay. Regular selection harvests only have to leave 75 ft^2 under the FPRs, which causes carbon stocks to be substantially depleted initially (all strata begin with 225 to 350 ft^2) and then maintained at a low level through successive harvesting. Basal area retention requirements are much higher in the Program. However, while forest carbon declines over time under Alternative 1, the large volume of wood products produced under this alternative which are stored in durable products results in Alternative I storing more carbon than is emitted over the 50 year projection period. Over the 50-year projection period, Alternative 1 results in an average annual decline in on-site carbon stocks of about -851 tonnes of carbon from forest management, the storage of around 3,711 tonnes in durable wood products annually, and the emission by heavy equipment required to remove the logs to sawmills of around -774 metric tonnes of carbon from CO2 emissions and –91 tonnes of C equivalent in CH4 emissions. As a result, Alternative 1 sequesters and/or stores around 1,995 metric tonnes of additional carbon per year or the equivalent of around 7,320 metric tonnes of CO2.

The Status Quo emits about 3.66 tons of CH4 per year, which is equivalent to about 91 metric tons of CO2 per year.

Alternative II

Alternative II is similar to Alternative I in that forest management processes result in annual emissions of carbon as a result of the heavy selection management allowed under the forest practice rules. However, these emissions are offset by the amount of durable wood products produced during the 50 year projection period such that the combination of emissions from management, storage of carbon in durable wood products and the annual emissions from heavy equipment required to remove the timber results in annual additional carbon storage of about 2,821 tonnes of carbon or about 10,532 tonnes of CO2 per year.

This alternative emits about 4.26 metric tons of CH4 per year which is the equivalent of about 106 tonnes of carbon per year from vehicles.

Alternative III

Alternative III's uneven-aged harvests operate similar to the Program, however, substantial amounts of carbon are "removed" in this Alternative compared to the Program in order to meet the goal to reduce flame lengths to approximately 2' in a moderate fire weather wildfire. As a result, this Alternative results in forest management emitting carbon on an annual basis equal to about -51 tons of elemental carbon per year.

Alternative III treats on average only slightly fewer acres than Alternative II but product sequestration is quite a bit lower than in Alternative II because of the uneven-aged harvest which reduces the amount of product produced per acre. The forest management used in this Alternative, the carbon stored in durable products, and the emissions from heavy equipment results in annual sequestration of about 929 metric tons of elemental carbon per year, which is about 3,409 additional metric tons of CO2 equivalent being sequestered each year.

Compared to the other alternatives and to the Program, this Alternative does have some potential to affect the amount of elemental carbon in duff and litter due to the fuel treatment practices in this Alternative. However the acreage being treated is so small that the result is not likely to be significant.

This alternative emits about 2.34 metric tons of CH4 per year which is the equivalent of about 59 tonnes of carbon per year.

3.6.7 Indirect Impacts of Implementing the Program/Alternatives – Greenhouse Gases

Indirect impacts of the Program and Alternatives are associated with the amount of GHG's given off during wildfires, which is treated as an air quality impact and described in the air quality chapter.

3.6.8 Determination of Significance – Greenhouse Gases

Table 3-18 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-18
Summary Of Impacts on Greenhouse Gas Emissions 1/ From Implementing The Proposed Program Or Alternatives Across the Entire Program Footprint

	Program	Alt 1	Alt 2	Alt 3
	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The Program is expected to create a less than significant adverse effect on GHG emissions as it

results in net annual sequestration and storage of around 14,832 tonnes of CO2 per year on the Program footprint compared to the threshold of emitting around 1,050 tonnes of CO2.

Alternative I is expected to create a less than significant adverse effect on GHG emissions as it results in net annual sequestration and storage of around 7,320 tonnes of CO2 per year on the Program footprint compared to the threshold of emitting around 1,050 tonnes of CO2.

Alternative II is expected to create a less than significant adverse effect on GHG emissions as it results in net annual sequestration and storage of around 10,353 tonnes of CO2 per year on the Program footprint compared to the threshold of emitting around 1,050 tonnes of CO2.

Alternative III is expected to create a less than significant adverse effect on GHG emissions as it results in net annual sequestration and storage of around 3,409 tonnes of CO2 per year on the Program footprint compared to the threshold of emitting around 1,050 tonnes of CO2.

3.6.9 Similar Impacts Described Elsewhere – Greenhouse Gases

Similar impacts are described in the Air Quality chapter.

3.6.10 Mitigation Measures for the Proposed Program – Greenhouse Gases

Because the impacts associated with implementation of the Program are less that significant (and modestly beneficial), no mitigation is required.

3.6.11 Literature Cited – Greenhouse Gases

California Air Resources Board (CARB), 2008. . Climate Change Scoping Plan Appendices. Volume 1. Supporting Documents and Measurement Detail. A Framework for Change. December 2008. California Air Resources Board. Pg 165.

California Air Resources Board, 2010. California Greenhouse Gas Inventory for 2008. http://www.arb.ca.gov/cc/inventory/data/tables/net_co2_flux_00-08_2010-05-12.pdf

California Natural Resources Agency, 2009. Executive Summary. 2009 California Climate Adaptation Strategy. A Report to the Governor of the State of California in Response to Executive Order S-12-2008.

Climate Action Reserve, 2010. Forest Project Protocol, version 3.2.

City of Eureka (COE), 2008. Draft Environmental Impact Report for the Marina Center Mixed Use Development Project (SCH #2006042024). Prepared by ESA for the COE. November, 2008.

Mitchell, Stephen, Mark E. Harmon and Kari O'Connell, 2009. Forest Fuel Reduction Alters Fire Severity And Long-Term Carbon Storage In Three Pacific Northwest Ecosystems. Ecological Applications. 19(3), 2009.

Page-Dumroese, Deborah; Jurgensen, Martin; Abbott, Ann; Rice, Tom; Tirocke, Joanne; Farley, Sue; DeHart, Sharon 2006. Monitoring Changes in Soil Quality from Post-fire Logging in the Inland Northwest. In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management-How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 605-614.

United Nations Intergovernmental Panel on Climate Change (IPCC). 2007. Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter9.pdf.

Wiedinmyer, Christine and Matthew D. Hurteau, 2010. Prescribed Fire as a Means of Reducing Forest Carbon Emissions in the Western United States. Environmental Science and Technology. 44(6).

3.7 Impacts of Program/Alternative Implementation on Geology and Soils

This section summarizes the impacts to soils and to geology due to implementing either the Proposed Program or any of the alternatives. The analysis is based on the CEQA environmental checklist criteria contained in Appendix G of the CEQA Guidelines.

3.7.1 Environmental Setting – Geology and Soils

The assessment area for assessing the direct impacts from implementing the Program's practices on geology and soils is the Program area itself.

Geology

Compared to many areas of California, the Mattole watershed has extensive and detailed geologic mapping. Both the King Range Resource Management Plan (BLM, 2004) and the NCWAP report have extensive and detailed descriptions of the geology of the Mattole Basin, and hence the Program Area. The NCWAP report in particular has a detailed description of the Mattole's geology, terrain types, faulting, seismicity and landslide potential. Very detailed maps of the terrain types and landslide features in Appendix A accompany this detailed description to the NCWAP report. Excerpts from the NCWAP report on geology are excerpted below. Figure 3-6 shows the terrain types in the Mattole while Figure 3-9 shows the landslide potential in the Mattole. Figure 3-10 shows a more detailed map of the Rattlesnake Creek watershed in the North_2 subbasin as an example of the degree of detail to the geologic mapping in the area.

> *"The Mattole Basin is situated in a geologically complex and tectonically active area, with some of the highest rates of crustal deformation, surface uplift, and seismic activity in North America.*
>
> *The bedrock map units have been consolidated into three groups, herein referred to as hard, moderate, and soft geomorphic terrains. Specifically, the bedrock map units have been grouped into geomorphic terrains as follows:*
>
> - *Soft Terrain – Geologic subunits identified as having the greatest landslide density*
> - *Moderate Terrain – Geologic subunits identified as having intermediate landslide density, along with small units of different lithology, which collectively underlie less than 1% of the study area.*
> - *Hard Terrain – Geologic subunits identified as having the lowest landslide density.*
>
> *These terrains show a strong correlation with mapped landslide occurrence and type, and provide a simplified division of the watershed based on geology and landform that is useful in the analysis of other spatial data.*
>
> *The Relative Landslide Potential for the Mattole Basin was defined and illustrated in five categories, from 1 (lowest) to 5 (greatest landslide potential). The results of the landslide potential evaluation [were] dominated by potential categories 3 through 5. This is considered reasonable in this geologically active watershed. Overall, approximately 52% of the Mattole Basin has high to very high landslide potential."*
>
> *"The unconsolidated Quaternary deposits mapped overlying the bedrock are grouped together as a fourth geomorphic terrain, which underlies approximately 7% of the study area." (App. A, p. 25)*

Figure 3-6

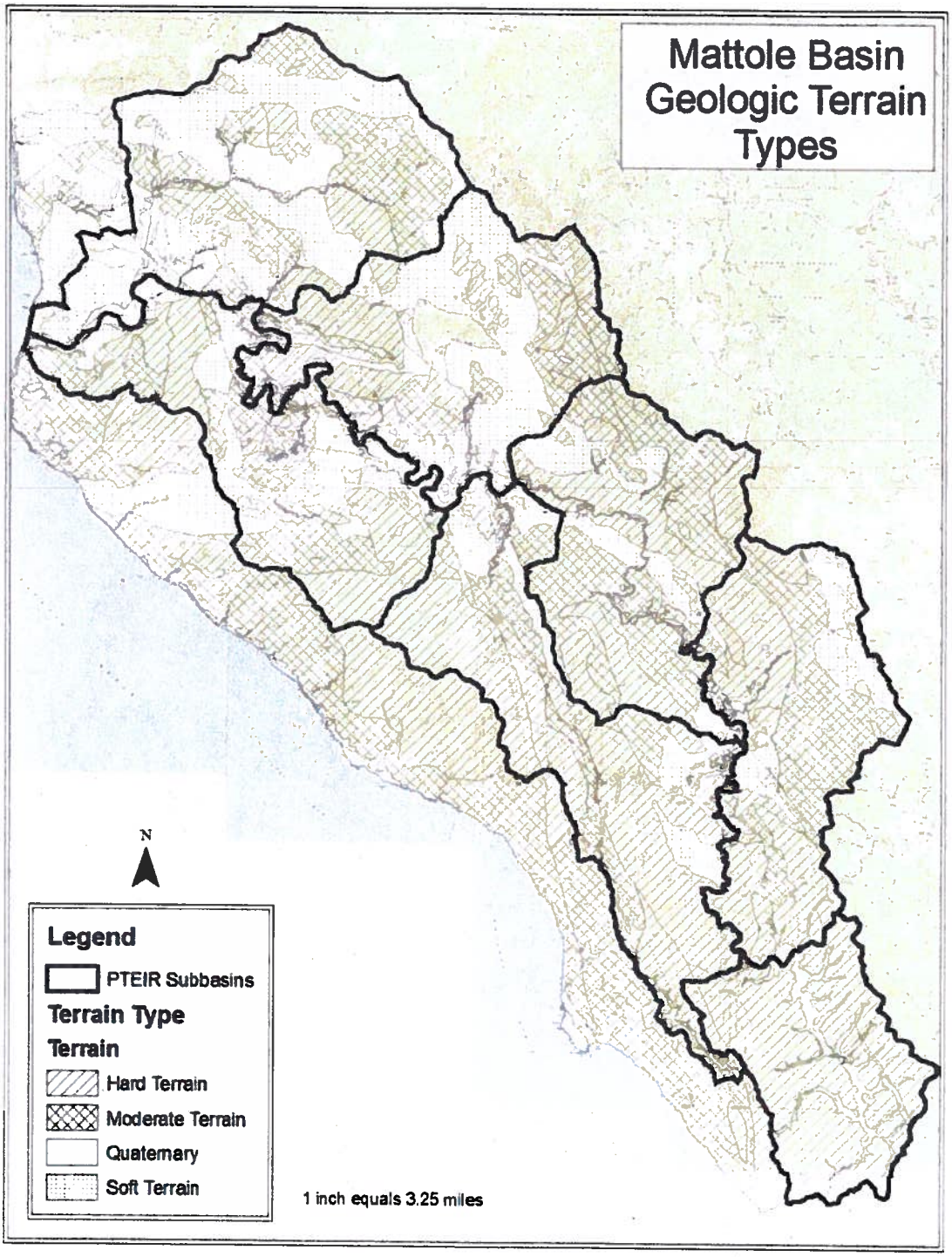

Mattole Basin
Geologic Terrain
Types
N
Legend
PTEIR Subbasins
Terrain Type
Terrain
Hard Terrain
Moderate Terrain
Quaternary
Soft Terrain
1 inch equals 3.25 miles

Figure 3 7

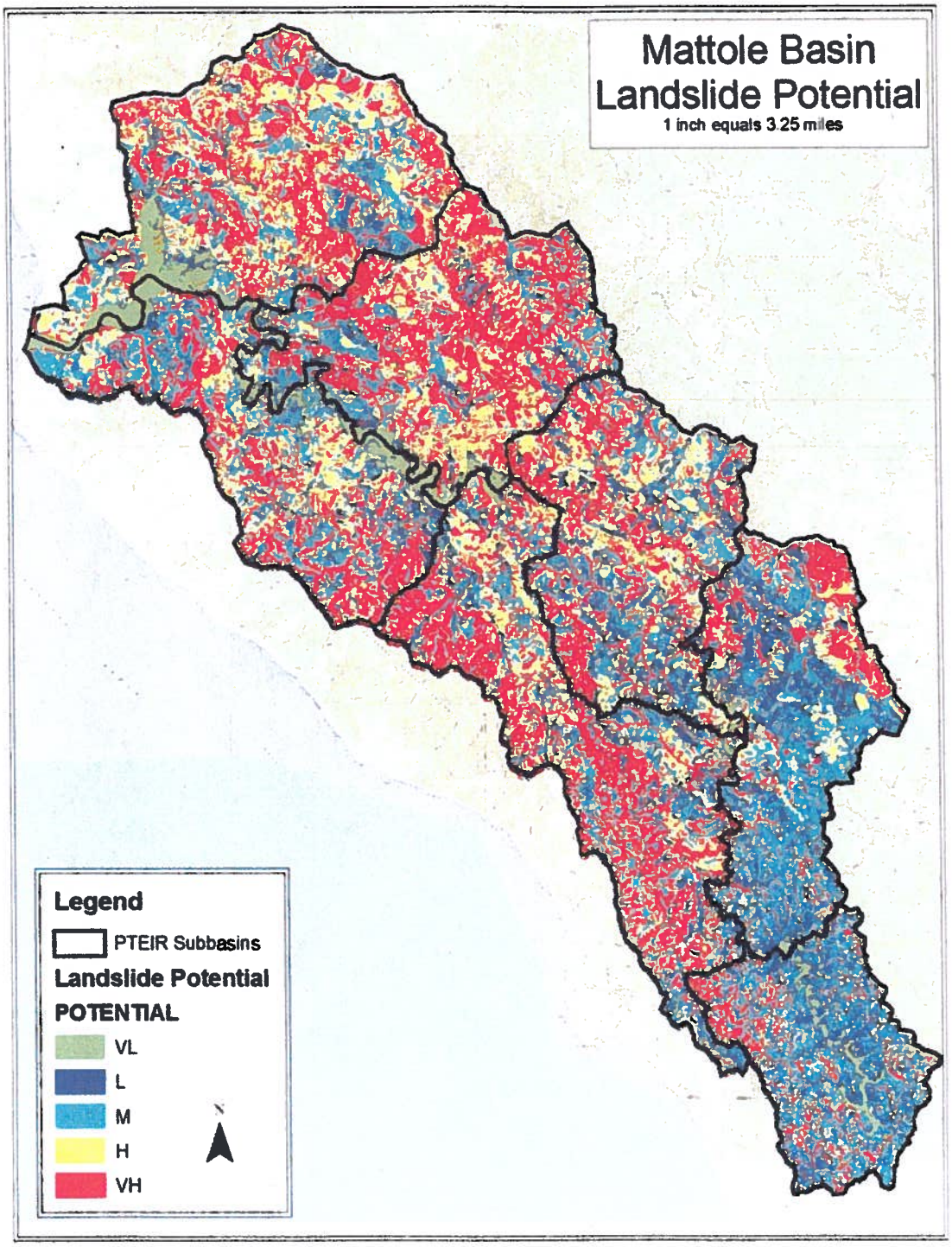
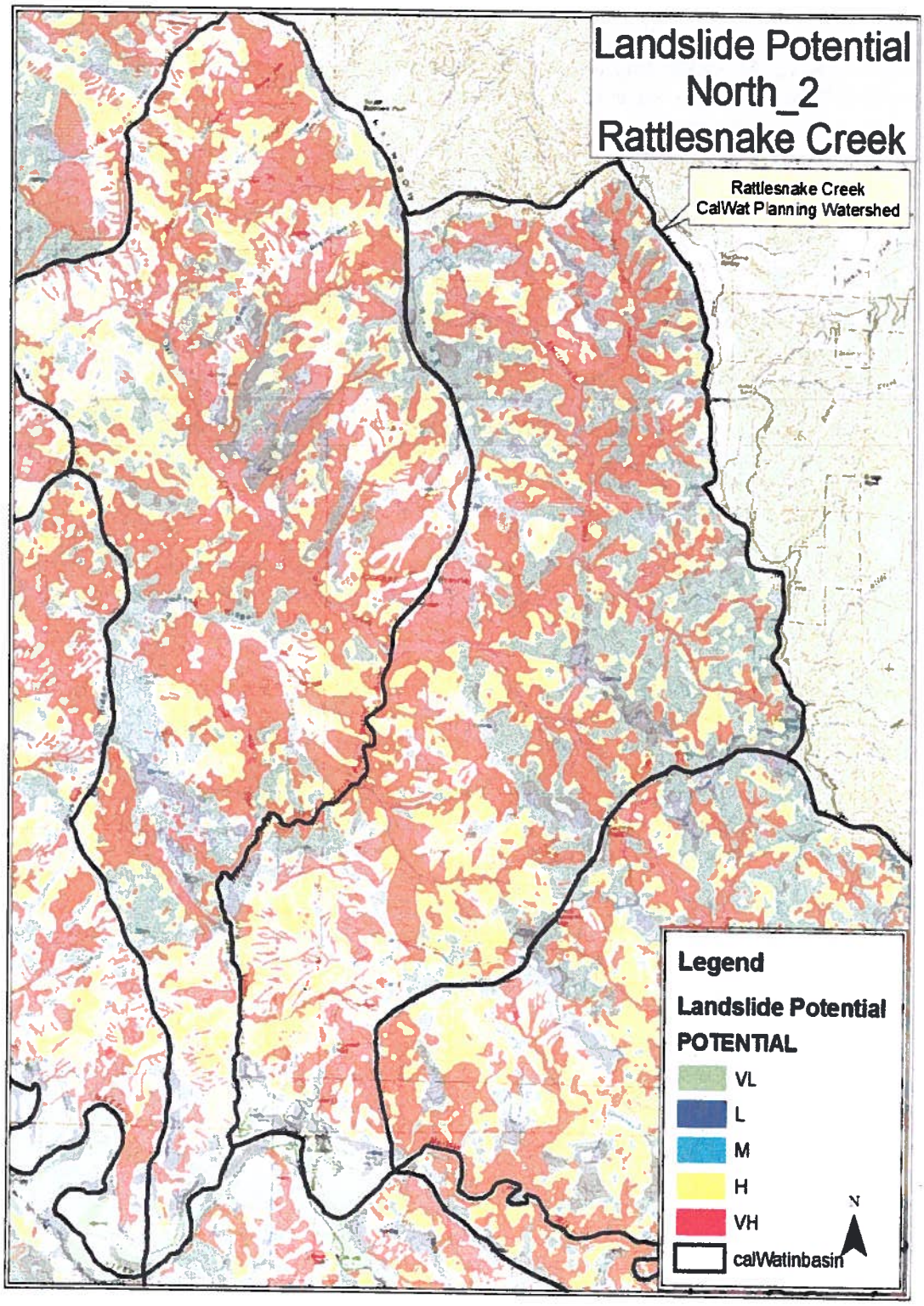

Mattole Basin
Landslide Potential
1 inch equals 3.25 miles
Legend
PTEIR Subbasins
Landslide Potential
POTENTIAL
VL
L
M
H
VH
N

Figure 3-8


Landslide Potential
North_2
Rattlesnake Creek
Rattlesnake Creek
CalWat Planning Watershed
Legend
Landslide Potential
POTENTIAL
VL
L
M
H
VH
calWatinbasin
N

Given the amount of work that has been done in the basin on the relationship between mass wasting and human-caused factors, no additional literature review was completed for this analysis. Instead, excerpts from the major documents that have been published on these relationships are excerpted below.

The Mattole River Mass Wasting Assessment (Simpson, 2006) describes in detail the relationship between timber harvest and hydrologic processes.

> *"Recent literature relating timber harvesting to soil mechanics and hydrologic processes stems from the work of Gray (1970), who proposed a reduction in effective soil cohesion from diminished root reinforcement (due to root die-off) and increased soil moisture (due to the loss of evapotranspiration) as harvest-related impacts that result in decreases in slope stability. The hydrologic impacts of timber harvesting have been documented by Jones (2000), in an analysis of paired watershed studies performed between the early 1960s and late 1990s. Keppeler and others (1994) documented changes in groundwater levels after logging in the Caspar Creek watershed. Iverson and Major (1987) document seasonal and storm influences on shallow and deep groundwater levels. Ziemer (1981) proposed a model of root strength depletion and recovery after harvest that is used to derive estimates of the duration of harvest impacts. The mechanics of root reinforcement are summarized by O'Loughlin and Ziemer (1982). Abe and Ziemer (1991) provided experimental data on shear reinforcement by root systems. Detailed analyses of root cohesion, stand structure, and landsliding are provided in Krogstad (1995), Schmidt and others (2001), and Roering and others (2003)."*

The TMDL assessment completed by the North Coast Regional Water Quality Control Board in 2002 (NCRWQCB, 2002) also describes the relationship between timber harvest and hydrologic processes and is excerpted below:

> *"A confounding factor in sediment production is the effect of vegetation on slope stability. Very steep slopes in terrains similar to those in the Mattole watershed would not have been able to form unless the slopes were stabilized by the protection of dense forest (Sidle, 1985). The forest stabilizes the slope in four major ways: a) a dense tangle of roots within the soil and penetrating down into fractured, weathered bedrock tends to hold the soil in place and stabilize the slope; b) the large amount of water transpired by the vegetation keeps the water table lower than it would be without this water use; c) the trees break the impact of falling rain so that surface erosion is minimized, and d) duff on the ground absorbs water and prevents surface flow and attendant erosion. Thus the forest itself may have a significant effect in shaping the landscape. Undoubtedly, the removal of forest canopy, e.g., timber harvest and conversion to rangeland, in areas of high erosion potential has had a dramatic effect on sediment production within the watershed. Further compounding sediment production has been the increased road construction both for timber harvest activities and for rural homes. "*

> *"Timber harvest is another human activity that affects erosion and slope stability. The quality of management planning and implementation strongly influences sediment production from forest-harvesting activity (Meehan, 1991; Cafferata and Spittler, 1998). Timber harvest activities such as clearcutting and construction of landings and skid trails can increase erosion and sedimentation (Meehan, 1991; Lewis, 1998). These activities increase exposure of bare surfaces to rainfall and runoff, modify surface water flow pathways, and therefore increase the potential for surface erosion. In addition, they create steepened slopes in both cuts and fills. Removal of vegetation associated with logging has been shown to increase peak stream flow and reduce lag*

between high precipitation events and high stream flow events (Ziemer, 1998), which can lead to bank erosion downstream. Vegetation removal and soil compaction associated with timber harvest can reduce the factor of safety on hillslopes and increase susceptibility to mass wasting by elevating pore pressures and decreasing root strengths (Keppler and Brown, 1998; Abe and Ziemer, 1991)."

"Road construction, maintenance, and operation are a major source of erosion and sedimentation on most managed forest and ranch lands (Weaver and Hagans, 1994). The construction of roads increases the potential for surface erosion and slope instability by increasing the area of bare soil exposed to rainfall and runoff, obstructing stream channels, over-steepening hillslopes, and altering surface and subsurface flow pathways. Road ditches concentrate storm runoff and increase its erosive power to form rills and gullies, the pathways of sediment delivery to streams."

"Culverted stream crossings often fail during storm events causing massive fill wash-outs and stream diversions. Stream crossing failures occur when the hydraulic capacity of the culvert is exceeded because of either obstruction of the inlet or inadequate hydraulic capacity. Stream crossing fill material is often washed into watercourses when water is impounded behind the road fill prism until it floods over and erodes the road fill, or the fill becomes saturated and fails catastrophically (Furniss et al., 1998). In some instances, stream crossing failures divert streams out of their channels and down the roadway, which often leads to gullies, landslides and other stream crossing failures (Furniss et al., 1998; Weaver, et al., 1995). In addition, road fill prisms can act as hydraulic barriers to subsurface flow, which acts to increase pore pressure locally, reducing material strength, and often causing landsliding."

"The practice of cutting up-slope banks and side-casting soil during road grading also increases the likelihood of landsliding by eliminating cover and disturbing native soils. Cutbanks related to road construction often fail and deliver sediment and other debris to watercourses. Cutbank failures can also plug inside ditches causing erosion of the road surface. In addition, roads built on steep or unstable slopes may exacerbate soil mass movements, by increasing slope weight and decreasing slope support, as well as by altering groundwater pressures (Meehan, 1991)."

Several studies in the basin have found that timber harvest practices have improved since large scale logging in the 1950s and '60s and that most of the landslides occurring today are due to legacy logging roads (NCWAP, 2002).

In addition, timber harvesting practices have greatly improved over those of the post-war era, due to increased knowledge of forest ecosystem functions, changing public values, advances in road building and yarding techniques, and regulation changes such as mandated streamside buffers that limit equipment operations and removal of timber. For example, Cafferata and Spittler (1998) found that almost all of the more recent landslides occurring in an area logged in the early 1970s were related to the legacy logging roads. In contrast, in a neighboring watershed logged in the late 1980s to early 1990s, landslides to date have occurred with about equal frequency in the logged areas as in unlogged areas. Existing road location and densities primarily reflects construction related to timber harvest access since 1940. (NCWAP, 2002)

Simpson (2006) noted that: *"Virtually all of the "legacy" slides are associated with now-abandoned roads, originally constructed and used for timber harvest access in the 1950s and 60s."* In addition, the BLM noted in their KRNCA plan (BLM, 2004) that: *"The highest*

potential for adverse impacts to fisheries is represented by the opening and use of old logging roads and construction of new temporary roads."

The TMDL assessment (NCRWQCB, 2002) notes that rural residential roads can potentially be a problem, and that the approximately 2,800 miles of abandoned roads are still contributing sediment to the system. The vast majority of these rural residential roads were originally constructed for timber harvest purposes.

> *"Perhaps of equal concern today has been the construction of more rural residential roads, which have intensified road networks and road densities in the watershed. There are approximately, 3,310 miles of active and abandoned roads in the Mattole basin (Perala et al., 1993). The county maintains about 100 miles of road, and about 25 miles are maintained by the BLM. About 385 miles of active roads are maintained at various levels, leaving 2,800 miles of abandoned roads, which are neither managed nor maintained. These old roads still contribute "legacy" sediment to the system. Roads contribute sediment not only through surface runoff, but also through road-construction-related failures such as cut and fill failures, gullies, and landslides.*

Finally, Simpson (2006) noted that management impacts on large and very large slides are less likely to be caused by management "*...because their basal shear surfaces are typically too deep to be affected by changes in root reinforcement, shallow grading, or minor hydrologic changes". NCWAP characterizes the predominant geologic units in North_1 and North_2 as Franciscan coastal terrane with minor amounts of Yager and Wildcat groups. The two North subbasins have the highest proportion of soft terrain which also has the highest incidence of large earth flows, rock slides, and gully and stream bank erosion. The North subbasins have the highest proportion of soft terrain at 43%, compared to the basin as a whole which only has 25% soft terrain.*

NCWAP, 2002 describes the geology and landslide potential within the Mattole as follows:

- The East_1 and East_2 subbasins are underlain by Franciscan central belt and Yager terranes and have much less soft terrain and a greater proportion of hard terrane types where typical mass wasting events are from debris and rock slides, with a lesser amount from earthflows. The East subbasins have the highest proportion of moderate terrain at 42% while only 28% of the Mattole has moderate terrain.

- The South_1 subbasin is composed almost entirely of Franciscan Coastal terrane and the predominant typical mass wasting events are debris slides and scattered deep-seated rock slides. The South_1 subbasin is comprised of 86% hard terrane with the rest being recently formed colluvium.

- The West_1 and West_2 subbasins are comprised of Franciscan Coastal terrane and King Range terrane. The western subbasins are a mix of terrain types with 50% of these two subbasins in hard terrain, 24% in moderate terrain and 19% in soft terrain.

- Based on landslide potential as mapped by CGS in NCWAP, 26% of the basin is mapped as very high landslide potential, and 23% is mapped as high potential for a landslide. The

combination of very low, low and moderate landslide potential comprises the balance of the basin at 51%.

- For a more detailed description of the geology and landslide potential see NCWAP at pages 101-109, and the basin-by-basin description of the geology between pages 166-351. NCWAP Appendix A contains six large-scale maps of the basin, three describing mapped landslides and an additional three describing landslide potential.

Soils

Compared to the detailed geologic work in the basin and Program area, there is a lack of recent published soils data for the Mattole although the USDA NRCS has been mapping soils in the region over the last several years in anticipation of updating Humboldt County's soils information.

NCWAP characterizes the soil types in the North subbasins as thick clayey soils, which are comprised, of weak and broken argillite and mélange. In the Eastern subbasins, the soils are intact sandstones and argillites with weak rock and clayey soils. In the Southern subbasins soils are relatively strong and intact sandstone and argillite producing thin sandy soils. In the Western subbasins, soils are more broken sandstones and argillites, which produce thin sandy soils.

Based on a request to the NRCS for data specific to the Mattole, preliminary (and subject to change) tabular (but not spatial) soils data specific solely to the Mattole was obtained from from recent NRCS soil mapping. Unfortunately, not all of the Mattole was mapped for soils, portions of the BLM King Range and some properties where access was denied. Along with the tabular estimates of acres of soils by subbasin, the NRCS also provided descriptive soil information for each named soil that included the percent sand, silt and clay by soil horizon location, depth of each horizon, moist bulk density, and calculated "K" erosion factors, These data show that the following soils could be found within each subbasin. Table 3-19 shows the distribution of the mapped soils in each subbasin for the most prevalent soil types described. Table 3-20 shows some characteristics of the soils mapped in the Mattole.

- East_1 is comprised of 24.3% Canoecreek-Sproulish-Redwohly complex soils which are very gravelly loams, 22.3% Crazycoyote Sproulish-Canoecreek complex soils with very gravelly loam to loam soils and a host of minor soil types whose soil textures run from gravelly silt and loam to clays and clay loams.

- East_2 is quite a bit different with 16.9% of the subbasin in Canoecreek, Sproulish-Redwohly complex soils that are very gravelly loams, but only a small amount of Crazycoyote-Sproulish-Canoecreek complex soils at 9%. Over 32.9% of the East_2 subbasin is composed of Sproulish-Canoecreek-Redwohly complex soils whose textures are gravelly silts.

Table 3-19
Soil Distribution By Subbasin From Recent NRCS Soil Mapping

Map Unit #	Soil Name	East_1	East_2	North_1	North_2	South_1	West_1	West_2	Total
575	Canoecreek, Sproulish-Redwohly 30-50% slopes,	29%	18%	10%	31%	15%	12%	37%	15%
5505	Crazycoyote Sproulish Canoecreek, 30-50% slopes	26%	10%	15%	6%		10%	24%	9%
574	Sproulish-Canoecreek-Redwohly complex dry 30-50% slopes	6%	35%	7%	10%	1%	5%	6%	8%
5506	Crazycoyote Sproulish Canoecreek, 50-75% slopes	10%	3%	22%	15%		8%	2%	8%
567	Crazycoyote-Sproulish_Caperidge 15-50% slopes	12%	3%	2%	6%		5%	11%	4%
649	Windynip-Wirefency-Devilshole complex 30-50% slopes	2%	0%	8%	8%		2%	3%	3%
569	Crazycoyote-Windynip-Caperridge 30-50% slopes	5%	0%	2%	10%		3%	6%	3%
663	Yorknorth-Windynip complex, 15-50% slopes	3%	1%	8%	3%		7%	1%	3%
579	Sproulish-Gibsoncreek-Redwohly complex 50-70% slopes		2%			29%			2%
646	Wirefence-Windynip-Devilshole 5-30%	4%	1%	2%	3%		2%	5%	2%
576	Gibsoncreek-Sproulish-Redwohly complex 30-50% slopes		0%			24%		1%	2%
506	Caperidge-Taylorspeak-Northbear complex 50-70% slopes			1%			16%		2%
100		2%	0%	3%	1%		5%	1%	1%
505	Northbear-Caperidge-Taylorspeak complex 30-50% slopes			2%			11%		1%
578	Sproulish-Telegraph-Redwohly complex 30-50% slopes		2%			14%			1%
	Subtotal	100%	74%	81%	94%	84%	86%	95%	63%
	Total Mapped	67%	90%	87%	85%	91%	59%	38%	72%

- North_1 and North_2 are also quite different both from each other and from the other subbasins. What sets these two basins apart from the others is the proportion of Crazycoyote-Sproulish-Canoecreek complex soils on 50-70% slopes, which are classified as gravelly silt loam to gravelly loams at 19.0% and 12.6% of each subbasin, respectively. No other basin has as high a proportion of these soils as the North_1 and North_2 subbasins. The main difference between these two subbasins is that the North_2 subbasin does not have nearly as much Crazycoyote-Sproulish-Canoecreek soils as the North_1 subbasin. These two subbasins also contain soils with loam to silty clay loam to clay textures reflecting the deep-seated earthflow terrain in these two subbasins. No other subbasins have these soils.

- The South_1 subbasin has soils that are substantially different from the other subbasins. The South_1 subbasin has 14.6% Canoecreek-Sproulish-Redwohly very gravelly loam soils, 24.2% Gibsoncreek-Sproulish-Redwohly complex loams and 29.1% Sproulish-Gibsoncreek-Redwohly complex soils on 50-70% slopes with textures in the range of loam to gravelly loam.

Table 3-20
Soil Characteristics

Map Unit #	Soil Name	Characteristics			CAL FIRE Technical Rule Addendum 2 Calculated Values			
		Texture	Depth in	% coarse Frags	Depth rate	Detach,	Permeability	% coarse
575	Canoecreek, Sproulish-Redwohly 30-50% slopes,	very gravelly loam	78	40	1	17	2	5
5505	Crazycoyote Sproulish Canoecreek, 30-50% slopes	very gravelly loam to loam	54	23	2	17	2	8
574	Sproulish-Canoecreek-Redwohly complex dry 30-50% slopes	gravelly silt	59	43	1	14	3	5
5506	Crazycoyote Sproulish Canoecreek, 50-75% slopes	gravelly silt loam to loam to gravelly loam	41	23	3	17	2	8
567	Crazycoyote-Sproulish_Caperidge 15-50% slopes	loam to very gravelly loam	49	18	2	17	2	8
649	Windynip-Wirefency-Devilshole complex 30-50% slopes	loam	55	19	2	17	2	8
569	Crazycoyote-Windynip-Caperridge 30-50% slopes	gravelly loam to gravelly clay	52	33	2	17	2	7
663	Yorknorth-Windynip complex, 15-50% slopes	loam to silty clay loam	48	16	2	11	3	9
579	Sproulish-Gibsoncreek-Redwohly complex 50-70% slopes	loam to gravelly loam	41	18	3	17	2	8
646	Wirefence-Windynip-Devilshole 5-30%	gravelly loam to clay	57	27	1	17	2	7
576	Gibsoncreek-Sproulish-Redwohly complex 30-50% slopes	loam to clay loam	43	5	2	12	3	10
506	Caperidge-Taylorspeak-Northbear complex 50-70% slopes	gravelly silty loam to very gravelly loam	35	41	5	15	3	5
505	Northbear-Caperidge-Taylorspeak complex 30-50% slopes	gravelly loam to very gravelly loam	39	35	4	17	3	6
578	Sproulish-Telegraph-Redwohly complex 30-50% slopes	loam	53	3	2	17	3	10

- Almost 25% of the West_1 subbasin and 59.2% of the West_2 subbasin were not mapped due to being on BLM land. As such, the distribution of soils that were mapped represents a close approximation of the soil distribution on Program lands. The west_1 subbasin has 12.7% Caperidge-Taylorspeak-Northbear complex soils on 50-70% slopes with textures of gravelly silty loam to very gravelly loams. About 9.2% of this subbasin is Canoecreek-Sproulish-Redwohly complex soils on 30-50% slopes with very gravelly loam textures and 7.9% Crazycoyote Sproulish-Canoecreek complex soils with very gravelly loam to loam soils. The other major soil in this subbasin is the Northbear-Caperidge-Taylorspeak complex soils on 30-50% slopes with textures of gravelly to very gravelly loam. There are quite a number of minor soils that comprise between 1-10% of this subbasin that are not described here but are similar to the main soils in this subbasin.

- West_2 has 35.1% of the subbasin in Canoecreek- Sproulish-Redwohly complex soils, which are very gravelly loams, and 22.1% Crazycoyote Sproulish-Canoecreek complex soils with very gravelly loam to loam soils. In addition, 10.2% of this subbasin is comprised of Crazycoyote Sproulish-Caperidge complex soils with loam to very gravelly loam textures.

3.7.2 Regulatory Setting for Geology and Soils

The primary laws and regulations that relate to the Program's operations on forest soils and unstable geologic types are those contained in the California Forest Practices Act and the Forest Practice Rules. The FPR's contain multiple sections with explicit language related to soils, soil stability and soil erosion and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to soils and soil stabilization. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE. The California Forest Practices Act at PRC 4562.5 governs soil erosion practices, while PRC 4562.9 governs soil stabilization measures. The primary FPR requirements related to soils are found at 14 CCR 916.7 (reduction of soil loss in WLPZ's), which is the section describing treatment to stabilize soils, and 14 CCR 916.9(n), in the rules for watersheds with listed anadromous salmonids. However, the FPR's contain numerous other regulations regarding soils such as heavy equipment operations when soils are saturated, or where soils are unstable, requirements to estimate erosion hazard of soils (912.5), etc.

The primary laws and regulations that relate to the Program's operations on unstable slopes are those contained in the California Forest Practice Rules. The FPR's contain multiple sections with explicit language related to geology and unstable slopes, which are not enumerated here. Unlike the FPR's, the Forest Practices Act makes no mention of slope stability or landsliding. Various sections of the FPR's address geologically unstable features under 14 CCR 914.2, tractor operations, 14 CCR 914.7, operations during the winter period, 14 CCR 916.4, unstable areas within the WLPZ and 14 CCR 923.1, planning roads and landings on or near unstable features. Among important requirements are those found at 14 CCR 916.9 (Protection and Restoration of the Beneficial Functions of the Riparian Zone in Watersheds with Listed Anadromous Salmonids) that requires a professional geologist to review inner gorge delineation on slopes over 65% in a class I or II watercourse. (However, this requirement would be irrelevant to participants in the Program, because PTHPs preclude harvests on steep streamside

slopes of 65% and greater, as described in section 2.1.B.4, page 2-34.)

In addition to the regulatory requirements described above, as well as the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2 – Program Description. As a result, Program participants would be further regulated by Program-specific restrictions, including:

- Limitations on harvest beyond the FPR's on highly erosive soils
- Use of the Mattole-specific slope stability flow chart prepared by a Registered Geologist (see Appendix B) for operations on areas mapped by CGS as high or very high.
- No timber harvest on inner gorges and an additional 10-foot buffer area beyond the headwall of an inner gorge.
- Harvesting on high or very high field mapped features requires retention of 50% of overstory and understory canopy evenly distributed
- Limitations on skidding on slopes > 50% beyond those in the FPR's
- Limitations skidding and log hauling during the winter period beyond those in the FPR's

3.7.3 Significance Criteria for Geology and Soils

Based on policy and guidance provided by CEQA (PRC Section 21001) and Appendix G of the CEQA Guidelines; the proposed Program and Alternatives would have a significant effect on soils and geology if they would cause a relatively high magnitude, persistent, or permanent change in:

a) Soil erosion rates, loss of topsoil, or soil quality;
b) Exposure of people or structures to the risk of loss, injury, or death involving landslides;
c) In a geologic unit or soil that is unstable, or that would become unstable as a result of the Program or Alternatives, potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

3.7.4 Thresholds of Determination for Geology and Soils

The Program and Alternatives are considered to create a significant effect when a treatment or treatments causes:

a) Substantially increase mass wasting in the form of landslides or other geologic hazards,
b) The erosion hazard rating of a soil to increase more than one class or changes to extreme;
c) The site quality of the soil is degraded by more than one site class or becomes non-productive.

3.7.5 Data and Assumptions for Geology and Soils

<u>Geology</u>

To account for landslide potential, the available landbase and the footprint for the Program and the alternatives were intersected in GIS with the NCWAP landslide hazard to determine the acres of the Program or alternatives by landslide potential. In addition, to account for landslide potential it was assumed that with implementation of the Program requirement to use the Geologic Flowchart in Appendix B, 80% of the high and 65% of the very high landslide potential lands would be available for uneven-aged harvests. Although plan submitters may rely on a professional geologist's report to justify harvest on areas that would be placed off-limits by the flowchart, it was assumed that the cost of such a consultation would make the choice of a PTHP instead of a THP an uneconomical decision. Thus, PTHP filers are assumed to confine their harvest to what is allowed under the flowchart. For Alternative I, it was assumed that 80% of the high hazard and 65% of the very high hazard ground would be available for even-aged harvest, after the use of professional geologic advice. In Alternative II, it was assumed that 80% of the high and none of the very high would be available for even-aged harvest. Alternative three, which is similar to the Program, was modeled assuming uneven-aged harvests only on 80% of the high and 65% of the very high landslide potential terrain in the commercial timber types.

The analysis of impacts is also based on using the Program's allowable practices on mapped high and very high landslide hazard lands as described in Appendix B. The allowable practices in Appendix B on high and very high landslide hazard lands include restrictions on silvicultural prescriptions, yarding and road building including:

1. No group selection is allowed on high or very high landslide hazard areas where there are no geomorphic indicators of slope instability but slopes are > 50%,
2. When there are geomorphic indicators and the areas has a high potential to deliver sediment to a class I, II or III watercourse then no harvest is allowed
3. No harvest on any inner gorge slopes
4. A requirement to establish equipment exclusion zones for areas mapped as high with geomorphic indicators indicators.
5. A requirement to consult a registered geologist when building any permanent road on high or very high hazard areas or temporary roads across areas of high hazard with geomorphic indicators.

For Alternative I, the Status Quo, the assumptions include FPR Class I (30' each side) and Class II (15' each side) no-harvest inner buffers, limited removal of trees in outer WLPZ, Class III 30-50' equipment limitation zone with 50% retention of preexisting vegetation, and a professional geologist must review any proposed even-aged harvest proposed for any inner gorge slope > 65% when are operations are proposed in a Class I and II stream.

For Alternative II, the assumptions include no harvest on very high landslide hazard lands, 150' no harvest each side on class I streams, 100' each side on II streams, 50' each side on III streams, no harvest on inner gorge slopes, and the requirement to use Geologic Flow Chart (see Program summary of Geologic Flow Chart elements above)

For Alternative III, the assumptions include using the FPR WLPZ buffer widths, with 30' each

side no harvest inner buffers on FPR Class I watercourses and 15' each side no harvest Class II water courses and 30-50' equipment limitation zone for Class III watercourses, commercial thin with slash treatment allowed in outer portion of WLPZ, no harvest on inner gorge slopes, and the requirement to use Geologic Flow Chart (see Program summary of Geologic Flow Chart elements above).

Soils

To account for impacts to soils from implementing the Program, preliminary tabular soil data, which is subject to change, was obtained from the NRCS based on their very recent mapping of the Mattole. Acreage by soil mapping unit specific to each subbasin was obtained along with the physical soil descriptions and the NCWAP estimate of soil slope categories. These data were then used to populate the CAL FIRE Appendix 1 Soil Erosion Hazard Rating sheet for each subbasin. Two-year return interval, 1-hour rainfall intensities were used from the Mattole, which range from 0.6"/hour to 0.7" per hour. Finally, the Program footprint for each subbasin from Chapter 3.1 was used to estimate the proportion of the Program on the different soil erosion hazard classes.

The analysis of impacts is also based on using the Program's allowable practices with respect to soil erosion. The allowable practices in the Program require that vegetative cover not be removed such that it would raise the erosion hazard rating of a soil to the upper half of the "high" category. In addition no operations are allowed on soils currently rated as extreme erosion hazard nor in the upper half of "high". In addition, the Program requires that tractors not operate on slopes > 50% without preparation of a SPP.

3.7.6 Direct Impacts From Implementing the Program/Alternatives on Geologically Sensitive Terrain

Table 3-21 below summarizes the percent of the Mattole watershed and the Program area in the various landslide categories. Table 3-22 below describes the distribution of land by subbasin by CGS landslide potential. By design, the Program area excludes much of the very high and high landslide potential categories as well as inner gorge slopes, and instead focuses management on the low and moderate categories.

Table 3-21
Percent of Mattole Basin and Program Area by Landslide Potential Category

Landslide Category	Percent of Basin	Percent of Program Area
Very Low	4.5%	1.5%
Low	11.7%	13.3%
Moderate	34.3%	42.7%
High	23.3%	25.7%
Very High	26.2%	16.8%

Table 3-22
Percent Landslide Hazard Category By Subbasin For Program Lands Only

Subbasin	CGS Landslide Hazard Categories 1/				
	1	2	3	4	5
East_1	0.8%	11.9%	33.9%	29.7%	23.7%
East_2	1.2%	20.9%	52.7%	15.6%	9.6%
North_1	0.7%	5.4%	36.1%	31.2%	26.7%
North_2	0.5%	5.4%	30.1%	26.2%	37.8%
South_1	4.2%	23.6%	49.8%	10.5%	11.9%
West_1	2.7%	9.7%	41.8%	24.6%	21.2%
West_2	1.2%	14.1%	39.2%	25.8%	19.7%

1/ 1= Very low, 2 = low, 3 = moderate, 4 = high, 5 = very high

Table 3-23 below summarizes some of the key metrics for the NCWAP basins. A combination of the amount of soft terrain by subbasin, slope steepness and road density helps to explain both the natural and anthropogenic erosion rates among the four NCWAP basins.

Table 3-23
TMDL Derived Geologic And Geomorphic Features 1/

Item	NCWAP Basin			
	East	North	South	West
Sediment Yield tons/mi 2/yr				
Natural	1,900	4,500	1,800	2,500
Road	6,800	2,500	1,700	2,900
Harvest	840	1,200	910	2,400
Total	9,500	8,200	4,400	7,800
Sediment Yield % of Total				
% Natural	20%	55%	41%	32%
% Roads	72%	30%	39%	37%
% Harvest	9%	15%	21%	31%
Road and Stream density lineal mi/mi 2				
Road density	6.0	3.0	9.1	6.2
Stream Density	4.1	4.4	4.2	4.2
Percent of Basin				
Slopes > 65%	12%	17%	17%	23%
Soft terrain	37%	43%	0%	19%

1/ Source, TMDL report.

The two North subbasins have the highest proportion of soft terrain, the lowest road densities, the highest proportion (59%) of natural erosion rates and a moderate amount of steep (>65%) slopes. The two north subbasins have the second highest sediment delivery at 8,200 tons/mi 2/yr. The two East subbasins have the highest sediment delivery rates, the vast majority of which comes from roads (72% of all sediment is thought to be produced by roads based on NCRWQCB (2002)). These basins have the second highest proportion of soft terrain, almost as

much as the North subbasins, however they have twice the road density as the North subbasins which may be contributing to the high amount of management related sediment generated by these subbasins. The West subbasins have nearly the sediment delivery in tons per square mile as the North subbasins. In addition these two subbasins have the highest proportion of steep slopes in the Mattole, but they have relatively little soft terrain. The West subbasins have the highest amount sediment being generated by timber harvest activities, both in actual tons per square mile and as a proportion of the total (mostly as a result of legacy harvests, since there has been relatively little harvest in the West subbasins since 1993). The South subbasin generates the least amount of sediment.

The following is a subbasin-by-subbasin description of the potential environmental impacts of implementing the Program associated with geology. As noted above, Program requirements eliminate timber harvest in class I and Class II no-cut areas and on all inner gorge slopes to help reduce the potential for the Program to operate on terrain that is landslide prone. Also, the Program requires treatment of legacy road issues, which is an important factor in the East and West subbasins. The Program also requires implementation of the Geologic Flow Chart when operating on mapped high or very high landslide potential areas or on areas with indicators of slope stability. As a result of all of these factors, the Program's practices, when applied on the ground, will not substantially increase mass wasting in the form of landslides or other geologic hazards. In addition, when compared to the Status Quo, the Program's practices will not result in a significant adverse impact to the geologic environment.

- East_1 and East_2. The Program is projected to operate on about 10.3% of the East_1 subbasin and only 6.7% of the East_2 subbasin. All harvest would be by uneven-aged prescriptions, and operations on the high and very high landslide potential categories would be constrained by the requirement to follow the practices in the Geologic Flow chart. Generally these two subbasins combined have slopes that are somewhat less steep than the Mattole watershed as a whole (31% of these two subbasins are on greater than 50% slopes while in the Mattole as a whole 40% of slopes are greater than 50% slope). Most operations are expected to take place on slopes under 50%. The most landslide prone terrain type comprises less than 20% of these two subbasins. Small point landslides comprise less than 0.3% of these two subbasins. The majority of the small landslides in these two subbasins occurred on the hard and moderate terrain types and consists mostly of shallow debris slides associated with steep slopes. The highest proportion of sediment generated by roads occurs in these two subbasins. Since most operations will take place on gentler slopes, avoiding existing small landslides should be relatively easy. About 6.8% of these two subbasins are in historically active landslides as mapped by CGS. The vast majority of the mapped gullies in these two subbasins occur on the relatively infrequent soft terrain. However gully erosion is a substantial on-going contributor of sediment from soft terrain areas within these two subbasins.

  Implementation of the Program occurs at a slightly higher proportion on the high or very high landslide potential lands than the distribution of these two terrain types across these two subbasins. Implementing the Geologic Flow Chart requirements along with upgrading roads to address the amount of road related sediment generated by these two subbasins, along with other Program requirements should help reduce potential adverse

impacts. Conversely these two subbasins have a low proportion of small landslides (0.3% of these two subbasins combined), small area in historically active landslides (6.8%), a small footprint within the two subbasins (between 6.7-10.3% of the subbasins) and relatively gentle slopes as noted above.

- North_1 and North_2. The Program is projected to operate on about 12.5% of the North_1 and 10.1% of the North_2 subbasins. All harvest would be by uneven-aged prescriptions and operations on the high and very high landslide potential categories would be constrained by the practices in the Geologic Flow chart. These two watersheds have the highest proportion of soft terrain within the Mattole watershed, which is the terrain type with the highest level of active landsliding and gully erosion. About 38% of these two subbasins are comprised of terrain that is more than 50% slope. Over 60% of these two subbasins are in the high to very high landslide potential classes. These two subbasins have approximately the same proportion of area in small landslides as the East subbasins, but the proportion of the land within these two subbasins in historically active landslides is 8.3% compared to the Eastern subbasins at 6.8%. Overall, more than half (51%) of all historically active landslides found in the Mattole are found in these two subbasins.

  Operations under the Program in the North_1 subbasin are projected to take place on high and very high landslide potential lands at a rate slightly lower than the distribution of such lands in these two subbasins combined. Conversely, the projected location of the Program's operations takes place on a higher proportion of the very high landslide potential lands in the North_2 subbasin (37.8% under the Program, compared to 31.9% combined for the two subbasins together). Because the high and very high landslide potential lands are well distributed across the landscape, it will likely be difficult to avoid such lands when implementing the Program. However, each PTHP filed under the Program will include a site-specific evaluation that may lead to more or less land being placed off-limits to cutting.

- South_1 subbasin. The Program footprint in this subbasin is projected to be around 3.6% of the entire subbasin. The vast majority of this subbasin is underlain by hard terrain, which is less landslide prone than the other terrain types, however, 41% of the South_1 subbasin is located on slopes > 50% which is slightly higher than for the Mattole as a whole. The vast majority of the projected Program operations are expected to take place on slopes less than 50%. Gullies have not been observed in this subbasin, and inner gorges are present at levels proportional to the subbasins areal extent. Nearly all of the historically active landslides are small debris slides on steep slopes and along inner gorges.

- West_1 and West_2. These two subbasins are the steepest in the Mattole with 48% of their terrain comprised of ground that is greater than 50% slope. However, the Program is projected to operate on a relatively low proportion of these two subbasins, comprising only 6.8% of the West_1 subbasin and only 3.4% of the West_2 subbasin. These two subbasins have the second-highest proportion of hard terrain following the South subbasin.

About 0.3% of these two subbasins are comprised of small point landslides and consist primarily of shallow debris slides associated with steep slopes. The proportion of historically active landslides (2.5%) is considerably below the Mattole watershed as a whole (18.4%), likely due to the proportion of hard terrain in these two subbasins. Gully erosion in these subbasins is a substantial on-going contributor of sediment to streams in the Mattole. Conversely, the two West subbasins have the highest proportion and the highest absolute amount of sediment being generated by legacy timber harvest in the Mattole watershed, possibly due to the amount of gully erosion as determined by NCWAP.

Gully erosion is an on-going contributor of sediment to streams in the Mattole and particularly in these two subbasins. However, the Program emphasizes treating legacy roads, requires making sure that skid trails do not divert small channels, and employs uneven-aged silviculture all in an effort to reduce mass wasting and gully erosion.

Alternatives Impacts

Alternative I has both a substantially different footprint and substantially different silvicultural practices than the Program. The overall footprint of the Status Quo is nearly the same as the Program (14,715 acres for the Alternative I compared to 15,038 acres for the Program); however much more of the harvest is concentrated in the North_1 and North_2 subbasins than in the Program. Much less harvest is proposed in the East_1 and East_2 subbasins and the West_1 and West_2 subbasins than in the Program. Up to 30% of the harvest in this Alternative is even-aged with the likely result that most of the stand is removed at the time of harvest. While 70% of harvest in this Alternative is uneven-aged, the FPR's allow more removal than would be allowed under the Program. In addition, this Alternative does not require the use of a professional geologist except when even-aged operations are proposed on inner gorge slopes. This alternative also allows harvest on inner gorge slopes, and the "no-cut" buffers in the FPR's are narrower than in the Program. The following is a subbasin-by-subbasin assessment of environmental impacts to geologically sensitive slopes as a result of the continued implementation of the Status Quo.

- Timber harvest using 30% even-aged and 70% uneven-aged harvest in the East_1 and East_2 subbasins occurs on a relatively few number of footprint acres (7.5% of the East_1 and 3.1% of the East_2) during the 2010-2060 period. These two basins have the second highest proportion of soft terrain and the highest proportion of road related sediment production. The FPRs require upgrading legacy roads, but there is no limit to the amount of new road construction allowed for timber harvest. As a result of the small footprint and the requirement to upgrade roads while at the same time allowing inner gorge harvest, 30% even-aged harvest and operations on steep slopes including harvest throughout the majority of the WLPZ, continuing the Status Quo in these subbasins would likely worsen the impacts of mass wasting in the form of landslides or other geologic hazards.

- Operations in the North_1 and North_2 subbasins take place on about 15% of the total

area of these two subbasins, the highest proportion of all of the subbasins in this alternative. These two subbasins have the highest proportion of high and very high landslide potential, however, other than for even-aged management on inner gorges, the FPR's do not require use of a geologist prior to operations on these slopes. As a result of the "large" footprint, 30% even-aged harvest, and operations on steep slopes including harvest throughout the majority of the WLPZ, continuing the Status Quo in these subbasins would likely worsen the impacts of mass wasting in the form of landslides or other geologic hazards.

- The footprint of the Status Quo in the South_1, West_1 and West_2 subbasins is relatively small, particularly in the West_1 and West_2 subbasins. Although the West subbasins have the steepest slopes, only around 1% of each of these subbasins is likely to be operated on under the Status Quo. Conversely, these three subbasins have the lowest proportion of soft terrain. The combination of soft terrain, steep slopes and low harvest footprint as a result of continuing the Status Quo means that operations in the West_1 and West_2 subbasins would likely have a less than significant effect. Given the footprint in the South_1 subbasin, it is likely that operations under the status quo would have a moderately adverse impact on mass wasting in the form of landslides or other geologic hazards.

Alternative II has the fewest available acres, but its footprint is slightly larger than Alternative I. The range of silvicultural prescriptions in this alternative is similar to Alternative I, 30% even-aged and 70% uneven-aged. The distribution of footprint acres is substantially different than Alternative I such that there is twice as much harvest in the East_2 subbasin as Alternative I, and substantially more harvest in the West_1 and West_2 subbasins than Alternative I. Conversely, harvest in the critical North_1 and North_2 subbasins is less than either the Program or Alternative I.

Alternative II incorporates all of the Program's practices related to use of the Geologic Flow Chart, no harvest on inner gorge's, upgrading roads, road construction limits, etc. A key feature of this Alternative is the extra-wide no-cut buffers and no harvest on very high landslide hazard lands. Conversely, as noted above, this alternative allows up to 30% even-aged harvest and use of the PTHP process, which is partly the reason that from an economic standpoint this Alternative has the second highest proportion of footprint acres. Because it places sensitive areas off-limits to cutting, Alternative II's practices will result in a less-than-significant impact to the geologic environment, as compared with the Status Quo.

The following is a subbasin-by-subbasin assessment of environmental impacts to geologically sensitive slopes as a result of implementing Alternative II.

- Timber harvest using 30% even-aged and 70% uneven-aged harvest in the East_1 and East_2 subbasins occurs on the largest number of footprint acres compared to the Program and Alternative I during the 2010-2060 time period. These two basins have the second-highest proportion of soft terrain and the highest proportion of road related sediment production. Alternative II requires upgrading legacy roads, requires use of the Geologic Flow Chart and wide no harvest buffers on all classes of watercourses as well

as on inner gorges. As a result of the moderate to large size footprint of this Alternative and 30% even-aged harvest and operations on steep slopes, implementing Alternative II in these two subbasins may cause a moderate increase mass wasting (in the form of landslides or other geologic hazards).

- Operations in the North_1 and North_2 subbasins take place on a much smaller footprint area in these two subbasins compared to the Program or to Alternative I. These two subbasins have the highest proportion of high and very high landslide potential lands, however, this Alternative requires use of the Geologic Flow Chart prior to operations. As a result of the "smaller" footprint (compared to Alternative I), 30% even-aged harvest, but with operations constrained in inner gorges and in all Classes of WLPZ's, implementing Alternative II in these subbasins is expected to have a less-than-significant impact on mass wasting in the form of landslides or other geologic hazards.

- Operations in the West_2 and South_1 subbasins take place on a footprint that is similar to the Program, while operations in the West_1 subbasin are higher than in the Program. Given this Alternative's wide buffers, which is offset to some extent by the amount of even-aged harvest, implementing Alternative II is expected to have a less-than-significant effect on mass wasting in the form of landslides or other geologic hazards in the South_1, West_1 and West_2 subbasins.

Alternative III has the smallest footprint of all Alternatives (75% of the Program) and incorporates all of the Program requirements associated with no-harvest in inner gorges, 100% uneven-aged management, etc. However, this alternative uses the smaller FPR WLPZ widths and allows commercial thinning within the harvestable portion of the WLPZ in contrast to the Program. Given the small footprint of this Alternative, but recognizing the narrow widths of the WLPZ's, implementing this alternative may cause a less-than-significant impact on mass wasting in the form of landslides or other geologic hazards in all subbasins, except for the West_2 subbasin where the impacts would be negligible.

3.7.7 Direct Impacts to Soils From Implementing the Program/Alternatives.

Soil Impacts in General

The potential for erosion following logging is largely a function of the area of exposed mineral soils. Exposed mineral soils are created from skidding logs, re-opening skid roads and mechanical site preparation. The potential loss of soil due to erosion is minimized by utilizing as many existing skid trails as possible as well as following the requirements of the FPR's and the Program's practices. In addition, the Program effectively requires disconnecting the skid trail and truck road system from the hydrologic system so that the erosion that does occur is not delivered to the Program (and Alternatives) watercourses. In addition, any exposed mineral soil resulting from timber operations is expected to be quickly colonized by early successional vegetation, as such exposure to precipitation is expected to be short term (1-2 years of exposed bare soil at most).

The impacts of timber harvest can vary from merely removing some of the litter (light selection

or light commercial thin, prescribed burn) to completely removing (scalping) the duff layer and the organic matter in the upper soil layers (even-aged harvest with tractor piling). If the duff is completely removed, the mineral soil is exposed to rain splash and overland flow. However, as Robichaud, et al., 2007 state that:

> *"In general, erosion rates are acceptably low when the proportion of bare soil is less than 30 to 40 percent (Benavides-Solorio and MacDonald 2005; Gary 1975; Swank and others 1989)."*

When cover of vegetation and litter exceeds 75%, only about 2% of rainfall becomes runoff and erosion is low (Robichaud et. al. 2000). Conversely, when ground cover is reduced to less than 10% through severe disturbance, erosion can increase by three orders of magnitude (Robichaud et al. 2000).

It should be remembered that changes in erosion hazard rating are heavily influenced by the inherent erosion potential of the soil, slope steepness and likely rainfall intensity expected in the bioregion.

Treatments such as skid road construction and tractor piling drastically disturb the top 8 to 12 inches (or more) of the soil profile. Typical tractor logging includes machines with grapples, which require backing up to each log to be removed and then dragging such logs to a main skid trail. The one time pass of a tractor (or skidder) to "pick-up" a log directly disturbs only the top few inches of topsoil and organic matter. Skidding logs to a main skid trail results in minimal soil disturbance and can provide a layer of mulched organic material to protect the soil from erosion and other impacts. Unpublished work at Hoopa (Blomstrom, 2001) showed that in tractor clearcuts of old growth, 12% of the area within the cutblock was undisturbed, 34% had a log dragged over the ground, 17% had a single pass of a tractor and 27% of the ground had skid trails with more than three passes of a tractor.

Neary et al. (2005) reports that landscape-disturbing activities such as mechanical site preparation can generate as much as 6.7 tons/acre of soil erosion (Neary, et. al. 2005). Page-Dumroese et al. (2006) found that on average about 16% of areas treated mechanically had detrimental soil disturbance, which they defined as more than 15% of an area in wheel/tractor ruts, excessively deformed soils, etc. In addition, they also found there was a substantial difference between rubber-tired and tractor mechanical equipment, with rubber-tired equipment leaving only 15% of the treated area in a detrimental condition compared to 45% with a tractor.

Non-commercial thinning operations (without yarding) have small, short-lived impacts on runoff and sediment production, even when operations extend over large areas (Neary et al. 2005)

Mechanical treatments can potentially result in excessive soil erosion and loss of productivity. As long as the uprooting of vegetation on areas with low or moderate erosion hazard rating is limited so that less than 30%-40% of the treated area is left as bare ground, erosion should decrease substantially beyond the first few years after treatment (Robichaud, et. al., 2007). For soils which are currently rated as on the high end of moderate erosion hazard, a reduction in surface cover due to mechanical treatments of more than 40% could result in a change from

moderate to high erosion hazard; or, if 70% or more of the treated area is classed as bare ground after treatment, the resulting mechanical treatment-related erosion hazard rating could change by two classes and/or change to extreme.

Soil temperature increases generated during prescribed burns are usually low and of short duration assuming the prescribed burn goes as planned. This type of fire would be carried by the surface litter and would probably not consume much standing vegetation, although it might affect some smaller trees.

Neary et. al. (2005) states that the difference in impacts to soils between wild and prescribed fires is mainly the amount and rate at which the plant canopy is consumed. During wildfires burning in severe fire weather conditions, the entire plant canopy can be consumed within a matter of seconds, and large amounts of heat that are generated by the combustion of the aboveground fuels are transmitted to the soil surface and into the underlying soil. In contrast, under cooler burning conditions (for example, higher fuel moisture contents, lower wind speeds, higher humidity, lower ambient temperatures, using northerly aspects) such fire behavior is less explosive. Under these cooler burning conditions, the shrub canopy may be not be entirely consumed, and in some cases a mosaic burn pattern may be created (particularly on north-facing slopes).

Smoldering fires do not have flames, are slow moving and visually unimpressive, but frequently have long burnout times and may have a deep burning front. Soil heating during this long duration smoldering process may be substantial. Temperatures within smoldering duff often are between 932 and 1,112 F (500 and 600 C). The duration of burning may last from 18 to 36 hours, producing high temperatures in the underlying mineral soil (Neary at al., 2005).

The highest soil temperatures are reached when concentrated fuels such as slash piles and thick layers of duff burn for long periods. Neary (2005) reports that soil temperatures under a pile of burning eucalyptus logs reached lethal temperatures for most living biota at a depth of almost 22 cm in the mineral soil. It must be kept in mind, however, that this extreme soil heating occurred on only a small fraction of the area, although the visual impacts on plant growth were observed for several years.

Bradley et al. (2006) state that in Northern California shrub ecosystems which were masticated and then subjected to prescribed burning, the mean flame length was significantly greater (29 vs. 10 inches) as was the flame zone depth (20 vs. 6 inches) in the masticated (chipped) units than in units that were not manipulated, as were the mean temperatures at the litter surface (657°F vs. 219°F) and at 1.64 ft (0.5 m) above the litter surface (277°F vs. 59°F). Greater flaming and heat release in the masticated units led to increased mortality of overstory and pole-sized oaks and conifers, posing conflicts with the management objective of retaining overstory vegetation.

Prescribed fire is not expected to adversely degrade soil productivity due to excessive temperatures, except under piles and concentrations of slash, as most prescribed fire would be conducted using ignition and timing techniques that result in a short duration flaming front.

Soil heating during a fire can produce a water-repellent layer at or near the soil surface that further impedes infiltration into the soil. The severity of the water repellency in the surface soil layer, however, decreases over time as it is exposed to moisture; in many cases, it does not substantially affect infiltration beyond the first year. Coarse-textured soils (e.g., sand and loamy sand) with low particle surface area are more prone to the formation of water-repellant layers than fine-textured soils (e.g., clay). The soil's moisture content also affects the depth to which hydrophobic substances generated by fire penetrate: in dry soils: these substances tend to penetrate to a greater depth than in wet soils (DeBano et al. 1979).

Soil microorganisms are complex. How they respond to Program practices depends on numerous factors, including severity of the disturbance, site characteristics, and pre-treatment community composition. Most studies have shown strong resilience by microbial communities to fire and disturbance. Recolonization to pretreatment levels is common, with the amount of time required for recovery generally varying in proportion to disturbance.

Neary et al. (2005) state that almost by definition, low-severity prescribed fire has a minimal effect on soil biota. The maximum temperatures are generally non-lethal, except in the upper litter layer, and therefore the consumption of forest floor habitat is limited. Changes in microbial activity, in fact, often show a positive response to this type of fire, particularly with respect to nitrogen fixation and availability. Rates of litter decay and enzyme activity are generally unaffected by low severity underburning.

Mycorrhizal fungi are easily affected by fire and mechanical treatments, and the extent of damage depends upon severity of the disturbance, the reproductive structures exposed to soil heating and the type of fungi (such as endoor ectomycorrhiaze). Mycorrhizae and roots frequently occupy the uppermost duff layers of soil and as a result are subjected to the most disturbance.

The most important soil physical characteristic affected by timber management is soil structure. The loss of soil structure increases the bulk density of the soil and reduces its porosity, thereby reducing soil productivity and making the soil more vulnerable to post-fire runoff and erosion. Powers (1998) states that on a sandy textured soil in California, moderate compaction improved seedling growth (due to increased water holding capacity), but that moderate compaction of a clay loam soil reduced conifer seedling growth due to reduced soil moisture availability. Powers also cites work from western Washington which showed that increasing bulk density of a loam by 28% reduced aeration capacity below the standard (0.1 cubic meters per cubic meter) considered vital for root respiration in forest soils.

Grier et al. (1989) note that soil compaction is a problem commonly associated with a variety of harvesting and site preparation techniques, mostly using tractors and rubber tired skidders. They note that changes in bulk density can occur with less than three passes of heavy equipment. As soil compaction increases, root penetration is impeded until plant growth is reduced and can lead to greater surface runoff and erosion, particularly on steep slopes. Grier et al. also note that some site preparation techniques can have major impacts on soil physical properties, especially those where the integrity of the soil profile is deeply disturbed or surface horizons are removed, such as in tractor piling.

Organic matter loss can cause a decrease in site productivity due to loss of support for critical soil microbial activity and diminished capability of the soil to store moisture in a form readily available to both plants and soil microorganisms. Organic matter displacement can cause localized or microsite impacts on soil productivity. Organic matter loss can cause loss of nutrients contained in the topsoil and biomass associated with the harvest area. Organic matter loss is primarily from erosion and volatilization. There is normally some loss and displacement of organic matter as a result of tractor skidding. The use of existing skid roads helps to minimize the loss and displacement. In addition, the loss and displacement of organic matter can be minimized by the proper placement of waterbreaks on skid and truck roads. Any loss of organic matter in the uppermost layers of the mineral soil will alter the structure of the surface soil, and the resultant disaggregation of the soil particles can greatly increase its susceptibility to erosion.

At any time, however, whether from wet weather patterns or from intensive operations on soils that are not saturated, compaction from heavy equipment can compact soil and cause adverse impacts to soil productivity. The compacted soil may have reduced infiltration rates, causing increased runoff and substantially accelerated erosion. The bulk density of severely compacted soils is also increased, reducing root penetration and gas exchange, lowering the soil's productivity.

Program practices using heavy equipment are restricted to the period of April 1 to November 15th. In addition, the FPR's have requirements that restrict skidding operations when soils are "saturated".

The soil chemical property most affected by Program practices is organic matter. Organic matter not only plays a key role in the chemistry of the soil, but it also affects the physical properties and the biological properties of soils as well. Soil organic matter plays a key role in nutrient cycling, cation exchange, and water retention in soils. Grier et al. (1989) state that nutrient losses associated with removing organic matter from a site are affected not only by the magnitude of the removal but also by the frequency of removal. If rotation lengths were shorter than the time required for a site to naturally replace nutrients lost in harvest (or treatment) then productivity losses due to depletion of these nutrients would tend to occur.

NCWAP states in its limitations section that it did not measure surface soil erosion and so sedimentation rates from surface soil erosion may be understated. NCWAP did state that, "*Timber harvest impacts in soft terrain may be higher risk than the THP required estimated surface soil erosion hazard rating worksheet may indicate.*"

The TMDL report notes the magnitude of the estimated surface soil erosion rates for the NCWAP basins varying between 10 and 52 tons/mi 2/year (see Table 3-24 below). Surface soil erosion rates as a percent of total harvest related erosion vary from 1% in the East basin, to a high of 4% in the South basin. Surface soil erosion as a percent of total sediment (includes natural sources) is on the order of 0.3% to 0.8% of total sediment delivered to streams. TMDL sediment delivery from skid trails is accounted for as a part of mass wasting, and is estimated at around 630 to 670 tons/mi 2/year. Skid trails are a major component of harvest related sediment

delivery but as a percent of total delivery only represent between 8% and 15%. Sediment generated from skid trails is addressed in chapter 3.16.

Table 3-24
Skid Trail And Surface Soil Erosion Rates For NCWAP Basins

Item	East	North	South	West
Rate of Erosion in Tons/sq. mi/year				
surface erosion soil rates	24	10	35	52
skid trail erosion rates	631	673	645	637
Erosion Rates as Percent of Sediment 1/				
surface erosion as % of harvest	3%	1%	4%	2%
surface erosion as % of total	0.3%	0.1%	0.8%	0.7%
skid trail erosion as % of harvest	75%	56%	71%	27%
skid trail erosion % of total	7%	8%	15%	8%

1/ See Table 3-23

Soil Impacts Specific to the Mattole From the Program

Table 3-25 below shows the Technical Rule Addendum Soil calculated Erosion Hazard Rating for each subbasin for operations under the Program. Soil factor is the acreage-weighted combination of NRCS soils estimates for detachability, permeability, depth to bedrock, percent coarse fragments, protective vegetative cover and two-year one-hour rainfall intensities for each subbasin by the CAL FIRE EHR slope factor. Rainfall intensities, as noted above were fixed at 0.7"/hour for the two-year, one-hour rainfall event, even though the eastern subbasins are likely in the 0.6"/hour range. Protective vegetative cover remaining after operations for the selection prescription in the Program is estimated to average 80% which is a combination of slash remaining after treatment and overstory vegetation. All basins under the Program's practices have low erosion hazard ratings on slopes up to approximately 35%. For slopes between 40 and 70% ratings are moderate, though for slopes 51-70%, erosion hazard rating is on the high end of moderate. The acreage-weighted average slope erosion hazard rating by basin ranges from a low of 53 (low end of moderate) to a high of 58 (approximately middle moderate) in the South_1 and West_1 subbasins to the highest rating of 58 for the West_2 subbasin. No operations, even on slopes 71-80% are rated as extreme after timber harvest operations. Note that these are area-weighted averages for each sub-basin. Any individual site may have a higher or lower value, depending on the particular soil at that site.

Table 3-25
Sum of Calculated Erosion Hazard Rating Factors For Selection Prescription in Program, By Subbasin (80% vegetative cover remaining)

Subbasin	Soil Factor	Slope Category						
		5-15 %	16-30 %	31-40 %	41-50 %	51-70 %	71-80+ %	Factor for "Average" Slope
	CAL FIRE Erosion Hazard Rating 1/							
East_1	43	47	48	51	56	63	69	55
East_2	41	45	46	50	54	61	67	53
North_1	43	47	48	51	56	63	69	56
North_2	42	46	47	51	55	62	68	55
South_1	44	48	49	53	57	64	70	57
West_1	42	46	47	51	55	62	68	57
West_2	43	47	48	51	56	63	69	58

1/ ≤ 50: Low; 51-65: Moderate; 66-75: High; and > 75 = Extreme.

Table 3-26 below shows the narrative rating of erosion hazard after implementing the selection prescription under the Program.

Table 3-26
Erosion Hazard Rating For Subbasins For Selection Prescription in the Program

Subbasin	5-15 %	16-30 %	31-40 %	41-50 %	51-70 %	71-80+ %	Factor for "Average" Slope
East_1	Low	Low	Low Mod	Mod	High Mod	High	Mod
East_2	Low	Low	Low Mod	Mod	High Mod	High	Mod
North_1	Low	Low	Low Mod	Mod	High Mod	High	Mod
North_2	Low	Low	Low Mod	Mod	High Mod	High	Mod
South_1	Low	Low	Low Mod	Mod	High Mod	High	Mod
West_1	Low	Low	Low Mod	Mod	High Mod	High	Mod
West_2	Low	Low	Low Mod	Mod	High Mod	High	Mod

For the Program's all-aged prescription, the expected cover remaining after operations is estimated at 50% cover, which is a rating of 7, which in turn increases all of the above ratings by three points, essentially leaving all the ratings by slope category the same. For the Program's group selection prescription, with tractor piling within the groups, protective cover remaining after operations might be as low as 20% which is a rating of 12. Group selection prescriptions with extensive tractor piling (to help reduce tanoak sprouting) could result in erosion hazard ratings of high on slopes 51-70%, though under the Program tractors would not be allowed to operate on such slopes unless accompanied by an SPP. Group selection on 71-80% slopes using yarders would not be allowed to intensively treat slash such that cover was reduced to 20% or less, since the resulting erosion hazard rating would be extreme, which is not allowed in the Program.

Table 3-27
Sum of Calculated Erosion Hazard Rating Factors For Group Selection Prescription With Tractor Pile (20% cover remaining) Under Program, by Subbasin

Subbasin	Soil Factor	Slope Category						Factor for "Average" Slope
		5-15 %	16-30 %	31-40 %	41-50 %	51-70 %	71-80+ %	
	CAL FIRE Erosion Hazard Rating 1/							
East_1	51	55	56	59	64	71	77	63
East_2	49	53	54	58	62	69	75	61
North_1	51	55	56	59	64	71	77	64
North_2	50	54	55	59	63	70	76	63
South_1	52	56	57	61	65	72	78	65
West_1	50	54	55	59	63	70	76	65
West_2	51	55	56	59	64	71	77	66

1/ ≤ 50: Low; 51-65: Moderate; 66-75: High; and > 75 = Extreme.

Based on the NCWAP statement that the CAL FIRE erosion hazard rating is probably too low for operations on soft terrain, for this analysis an arbitrary increase of 10% for the East and 15% for the North subbasins was added to an average cover rating of 50% (for all Program prescriptions) to estimate overall erosion hazard rating by subbasin for the Program.

Table 3-28
Sum of Erosion Hazard Rating Factors by Subbasin, For All Program Prescriptions Combined, with 10% and 15% NCWAP Adjustment for Soft Terrain

Subbasin	Soil Factor	Slope Category						Erosion Hazard Rating For "Average" Slope
		5-15 %	16-30 %	31-40 %	41-50 %	51-70 %	71-80+ %	
	Unadjusted CAL FIRE Erosion Hazard Rating 1/							
East_1	45	49	50	53	58	65	71	57
East_2	43	47	48	52	56	63	69	55
North_1	45	49	50	53	58	65	71	58
North_2	44	48	49	53	57	64	70	57
South_1	46	50	51	55	59	66	72	59
West_1	44	48	49	53	57	64	70	59
West_2	45	49	50	53	58	65	71	60
	NCWAP Adjusted Erosion Hazard Rating 1/							
East_1	49	54	55	59	64	71	78	62
East_2	47	52	53	57	62	69	76	61
North_1	52	56	57	61	67	75	82	67
North_2	51	56	57	61	66	74	81	66
South_1	46	50	51	55	59	66	72	59
West_1	44	48	49	53	57	64	70	59
West_2	45	49	50	53	58	65	71	60

1/ ≤ 50: Low; 51-65: Moderate; 66-75: High; and > 75: Extreme.

The adjusted erosion hazard rating for all Program operations combined (assumes residual cover of 50% after all operations) on slopes under 50% (the cutoff for tractor operations) would always be less than high (essentially high moderate). For yarder operations on slopes of 51-70%, operations would be classified as having a high erosion hazard rating. No Program operations would be allowed to take place on slopes over 71-80% where residual cover was expected to be less than 50%, since such situations might result in a calculated erosion hazard rating of extreme which would not be allowed under the Program.

Impacts to soil structure, soil biota and soil site are expected to mirror the impacts of the Program's practices with respect to soil erosion. The Program restricts all tractor operations to slopes less than 50% unless the landowner prepares an SPP, and no tractor operations are allowed to take place during the period of November 15 to April 1 and no timber harvest is allowed when rainfall exceeds 0.25" in a 24-hour period. Along with the applicable FPR's, which restrict operations when soils are saturated, the potential for adverse impacts to soils due to compaction and changes to soil structure are considered as low. The biggest potential effect to soil biota and mycorrhizal fungi is likely from prescribed burning. While prescribed burning is expected in the Program, its extent is likely to be limited due to liability from escaped fire as well as the need to protect residual trees. A limited amount of pile burning (likely < 1% of all acreage logged each year under the Program) could result in adverse impacts to soil biota and mycorrhizal fungi, but this effect is expected to be extremely limited. Impacts to soil site index are also expected to be negligible as organic matter is not expected to be removed across broad areas during Program operations. Overstory cover and slash on the ground are expected to result in a minimum of 50% residual ground cover (likely more during actual operations) across all of the Program prescriptions.

The Program's practices are expected to result in a less-than-significant benefit to soils as the erosion hazard rating and other impacts to soils are expected to be less than for the Status Quo.

Impacts to Soils from Implementing Alternative I – Status Quo

Alternative I treats slightly fewer acres than the Program, although treatments in particular subbasins are substantially different than in the Program. For the Status Quo alternative, residual cover is estimated to be 40% after operations which is a combination of 50% residual cover for the 70% of operations that would be uneven-aged and 30% residual cover for even-aged prescriptions. No slash treatment is expected under this prescription, so bare mineral soil is expected to be relatively infrequent in spite of 30% of the ground being cut with clearcut, seed tree or shelterwood prescriptions.

Table 3-29
Adjusted Erosion Hazard Rating1/ For Subbasins For Alternative I With 10% and 15% NCWAP Adjustment for Soft Terrain

Subbasin	Soil Factor	Slope Category						
		5-15 %	16-30 %	31-40 %	41-50 %	51-70 %	71-80+ %	Factor for "Average" Slope
East_1	51	56	57	61	66	73	80	65
East_2	50	54	55	59	64	72	78	63
North_1	54	59	60	64	69	77	84	69
North_2	53	58	59	63	68	76	83	68
South_1	48	52	53	57	61	68	74	61
West_1	46	50	51	55	59	66	72	61
West_2	47	51	52	55	60	67	73	62

1/ ≤ 50: Low; 51-65: Moderate; 66-75: High; and > 75: Extreme.

In Alternative I, the Status Quo, operations result in a projected erosion hazard rating of high on slopes 41-50% in the East_1 and North_1 and North_2 subbasins. The FPR's prevent tractor operations on slopes > 50% with a high or extreme rating, as such, Status Quo operations would be limited in these three subbasins to slopes < 50% or conversely would be considered to create significant adverse impacts to soil.

Impacts to soil structure, soil biota and soil site are expected to be somewhat more adverse compared to the Program. The FPR's do not allow tractor operations on slopes > 50% where the erosion hazard rating is high or extreme. Along with the applicable FPR's, which restrict operations when soils are saturated, the potential for adverse impacts to soils due to compaction and changes to soil structure are considered as low to moderate compared to the Program. Some operations under Alternative I might cause detectable soil compaction, as the number of passes by tractors (or skidders) increases dramatically in clearcuts and seed tree cuts compared to the All-aged prescription or the light selection proposed under the Program. Approximately 70% of the prescriptions in Alternative I are expected to be uneven-aged, but the selection prescription in this Alternative can result in as much as 2/3rds of the stand being removed. As with clearcutting and seed tree cutting, the sheer number of passes associated with removing 65-90% of a stand increases the potential for compaction. Thus, there is a potential to have a moderate adverse impact on soils even from the selection prescriptions in Alternative I, particularly in subbasins with higher amounts of soft terrain.

The biggest potential effect to soil biota and mycorrhizal fungi is likely from prescribed burning. More prescribed burning is expected in Alternative I than in the Program because for the even-aged harvests, at least, no effort is needed to protect leave trees. A greater amount of pile burning is expected for this alternative compared to the Program (likely < 3% of all acreage logged each year under the Program), which could result in adverse impacts to soil biota and mycorrhizal fungi, but this effect is expected to be limited. Impacts to soil site index are also expected to be negligible as organic matter is not expected to be removed across broad areas during Alternative I operations. Overstory cover and slash on the ground are expected to result in a minimum of 40% residual ground cover (likely more during actual operations) across all of the Program prescriptions.

Implementation of the Status Quo is likely to result in negligible adverse impacts to soil across most of the subbasins, however, in the East_1, North_1 and North_2 subbasins, the impacts are likely to be negligible to moderately adverse as erosion hazard rating moves from moderate to high, though it only changes one class. Operations on slopes in excess of 70% without adequate residual cover are projected to have a significant adverse effect to the environment as erosion hazard rating would be extreme across all seven subbasins as well as for most subbasins, the projected erosion hazard rating would have changed by more than one class.

Direct Impacts to Soils From Implementing Alternative II

Alternative II treats slightly more acres than either the Program or the Status Quo. The potential soil erosion hazard rating for Alternative II is expected to be slightly more than for Alternative I even though this alternative has the same silvicultural practices as Alternative I. While the impacts to soils are expected to be the same as for Alternative I, the impacts to the environment are expected to be less since this alternative has wider buffers than Alternative I. As a result, the likelihood of eroded soil reaching a watercourse would be less for this Alternative than either the Program or Alternative I due to the wide no cut buffers including no cut buffers on class III watercourses. Impacts to soil structure, soil biota and soil site are expected to be the same as Alternative I. For Alternative II, no soil changes more than one erosion hazard class, though some subbasins change from moderate erosion potential to high erosion potential. As a result, implementation of Alternative II is likely to result in negligible adverse impacts to soils and to the environment. These impacts are slightly less than the impacts of implementing Alternative I due to the wider buffers protecting watercourses from potentially eroding soil.

Direct Impacts to Soils From Implementing Alternative III

Alternative III treats far fewer acres than the Program or Alternatives I or II (approximately 10,200 acres compared to the 15,000 acres of the Program). Alternative III could have lower erosion hazard ratings than the Program if slash were all lopped and scattered. However, with fuel hazard reduction as the goal, it is assumed that much of the slash is removed either through tractor piling or through pile and jackpot burning (jackpot burning is the practice of burning small concentrations of slash while leaving the intervening area unburned). In addition, this alternative has narrow watercourse buffers than the Program and like the Program allows some harvest in the outer buffer. For modeling purposes, this Alternative was modeled with 45% residual cover, which results in erosion hazard ratings in between those of the Program and Alternative I.

Impacts to soil structure and soil site are expected to be similar to the Program (less than significant). The impact of this alternative to soil biota and mycorrhizal fungi is expected to be slightly more adverse than the Program as more tractor piling, broadcast burning and pile burning are likely to take place. Tractor piling and pile burning are likely to have the greatest effect on soil biota and on mycorrhizal fungi, however given that this Alternative only treats 65% as many acres as the Program, the likelihood for significant adverse impacts throughout the treated area is considered low.

Alternative III would likely have negligible adverse impacts to soils and the environment given the small footprint that would be treated as well as the fact that soil erosion hazard ratings would not change more than one class and soil site index would not be degraded by more than one class.

3.7.8 Indirect Impacts of Implementing the Program/Alternatives From Operations on Geologically Sensitive Terrain and on Soils.

Water quality could be impaired due to excessive soil erosion and due to debris slides or operations on landslides, which activate unstable features. There are also potential indirect impacts to water quality from the Program or the Alternatives that result in both the creation of water repellency due to overly hot soil temperatures from prescribed fire and from the creation of compacted soils due to either prescribed fire or from yarding and skidding operations. There could also be indirect impacts to aquatic species if water quality is degraded due to soil erosion.

There are also potential indirect impacts to vegetation due to degradation of soil productivity resulting from implementation of the Program. Compaction of soil, reduction of soil biota and/or reduction of soil nutrients on treated areas could lead to an adverse effect on soil productivity, which could indirectly lead to a reduction in vegetative growth and further to a decline in the health of vegetation. These indirect impacts to vegetation could also have indirect, long-term impacts on wildlife that depend on vegetation.

There are potential indirect impacts to soils as a result of slash treatments in the event of a wildfire. In moderate fire weather, the impacts of a wildfire would be expected to be moderate under the Program, low for Alternative III and moderate to high for Alternatives I and II. In the event of severe fire weather condition, the impact to soils from a wildfire burning through treated areas is expected to be more severe.

3.7.9 Determination of Significance Related to Geology

Table 3-30 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-30
Summary Of Effects[1/]
on Geologic Resources
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS

PS = Potentially Significant Effect; LS = Less than Significant Effect

Program Determination

In the East_1 and East_2 subbasins, the combination of Program activities on high and very high landslide potential slopes together with the likely small footprint of the Program, gentle slopes and road upgrading and other factors described above leads to a determination that that the Program will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards.

For the North_1 and North_2 subbasins, given the Program's improved practices such as limits on permanent road construction, upgrading roads, no harvest on inner gorges, use of the Geologic Flow Chart and other measures, implementation of the Program in these two subbasins will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards.

In the South_1 subbasin, given the Program's requirements associated with no operations on inner gorge slopes, use of the Geologic Flow Chart requirements, upgrades to permanent roads, limitations on road building etc.; implementing the Program in this subbasin will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards.

Given the small footprint of the Program in the West_1 and West_2 subbasins, the small proportion of active landslides and the proportion of hard terrain in these basins along with the Program's requirements, implementing the Program in the West_2 subbasin will have a less than significant adverse impact on mass wasting in the form of landslides or other geologic hazards. For the West_1 subbasin the Program will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards.

Alternatives Determination

Based on the analysis above, implementing Alternative I – Status Quo will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards

Based on the analysis above, implementing Alternative II will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards

Based on the analysis above, implementing Alternative III will have a less than significant adverse effect on mass wasting in the form of landslides or other geologic hazards

3.7.10 Determination of Significance Related to Soils

Table 3-31summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-31
Summary Of Effects[1/]
on Soil Resources
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Adverse Impact; LS = Less than Significant Adverse Impact

Program Determination

For soils, implementation of the Program's practices including uneven-aged management, not operating on slopes over 50% without an SPP, no operations during the period of November 15 to April 1 as well as the FPR restrictions when soils are saturated, and no operations that result in soil changing its erosion hazard rating by more than one class across all subbasins. Indeed, no soil changes erosion hazard rating from moderate to high as a result of Program practices. In addition, as a result of Program practices with respect to soil biota, soil structure, mycorrhizal fungi and soil compaction, no soil is expected to be degraded by more than one site class or become non-productive. As a result, implementation of the Program will have a less than significant effect on soils across all subbasins.

Alternatives Determinations

Based on the analysis above, implementing Alternative I – Status Quo will have a less than significant adverse effect to soils.

Based on the analysis above, implementing Alternative II will have a less than significant adverse effect to soils.

Based on the analysis above, implementing Alternative III will have a less than significant adverse effect to soils.

3.7.11 Similar Impacts to Soils and Geologic Resources Described Elsewhere

The impacts of Program implementation associated with soil erosion, landsliding and sedimentation as they relate to water quality are described in detail in Chapter 3-16.

3.7.12 Mitigation Measures Associated with Soils and Geologic Resources for the Proposed Program

Because the impacts associated with implementation of the Program are less than significant, no mitigation is required.

3.7.13 Literature Cited, Soils and Geology

BLM, 2004. King Range National Conservation Area Resource Management Plan. USDI Bureau of Land Management, Arcata, CA 2005.

Blomstrom, Greg. 2001. Hoopa Valley Indian Reservation Watershed Wide Cumulative Impacts Analysis, November 1, 2001. Hoopa, CA.

Bradley, Tim, Jennifer Gibson, and Windy Bunn. 2006. Fire Severity and Intensity During Spring Burning in Natural and Masticated Mixed Shrub Woodlands In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management—How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 3.

DeBano, Leonard F.; Rice, Raymond M.; Eugene, Conrad C. 1979. Soil heating in chaparral fires: impacts on soil properties, plant nutrients, erosion, and runoff. Res. Paper PSW-RP-145. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 21 p.

Grier, C.C.; Lee, K.M.; Nadkarni, N.M. [and others]. 1989. Productivity of forests of the United States and its relation to soil and site factors and management practices: a review. Gen. Tech. Rep. PNW-GTR-222. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

NCRWQCB, 2002. North Coast Regional Water Quality Control Board. 2002. Mattole River Watershed Technical Support Document for Sediment and Temperature. North Coast Regional Water Quality Control Board, Santa Rosa, California.

NCWAP, 2002. Downie, Scott T., C.W. Davenport, E. Dudik, F. Yee, and J. Clements (multi-disciplinary team leads). 2002. Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program, p. 441 plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

Neary, Daniel G.; Ryan, Kevin C.; DeBano, Leonard F., eds. 2005. Wildland fire in ecosystems: impacts of fire on soils and water. Gen. Tech. Rep. RMRS-GTR-42-vol.4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 250 p

Page-Dumroese, Deborah; Jurgensen, Martin; Abbott, Ann; Rice, Tom; Tirocke, Joanne; Farley, Sue; DeHart, Sharon 2006. Monitoring Changes in Soil Quality from Post-fire Logging in the Inland Northwest. In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management-

How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 605-614.

Powers, Robert F., Allan E. Tiarks and James R. Boyle. Assessing Soil Quality: Practicable Standards for sustainable Forest Productivity in the United States. Soil Science Society of America, Special Publication no. 53.

Robichaud, P.R., J.L. Beyers and D.G. Neary. 2000. Evaluating the effectiveness of post fire rehabilitation treatments. USDA Forest Service General Technical Report. RMRS-GTR-63. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p.

Robichaud, P.R., L.H. MacDonald and R.B. Foltz. 2010. Fuel Management and Erosion. Cumulative Watershed Impacts of Fuels Management: A Western Synthesis. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 79-100.

Simpson, G. 2006. Mattole River Watershed Analysis Mass Wasting Assessment, Signatory Review Team Draft Report. SHN Consulting Engineers and Geologists, Eureka California.

3.8 Impacts of Program/Alternative Implementation on Noise

This section summarizes the impacts due to noise from implementing either the Proposed Program or any of the alternatives.

3.8.1 Environmental Setting - Noise

The assessment area for assessing the direct impacts from implementing the Program's practices on noise is the Program area itself.

Noise is often described as sound traveling through the air, such as traffic from a nearby road. Sound is defined as any pressure variation in air that the ear can detect. If the pressure variations occur frequently enough, at least 20 times per second, they can be heard by the human ear and called "sound". The relative loudness or intensity of sound energy is measured in decibels (dB). A decibel is a logarithmic unit of sound energy that represents the smallest variance in sound that the human ear can detect.

The standard unit for measuring sound is the decibel (dB). Because the human ear is not equally sensitive to sound at all frequencies, a frequency-dependent rating scale has been devised to interpret noise levels relative to the sensitivity of human hearing. The A-weighted decibel scale accounts for this. Environmental noise is usually measured in A-weighted decibels (dBA) and typically fluctuates over time. An 'A-weighted' decibel (dBA) is a decibel corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels

The Program area is located in a rural area containing a small amount of rural residential development and large areas of forested hillsides used for timber production. Permanent noise sources in the vicinity include: (1) area streets and associated traffic; (2) Use of generators, tractors, mowers, and other machinery associated with residential and agricultural development; and 3) intermittent selective logging activities within the Program area and other undeveloped forested areas, including operation of chain saws, logging equipment and log trucks.

There are no freeways, shopping centers, industrial facilities, airports, or other large permanent noise sources within ¼-mile of the Program area. Land uses such as residences, hotels, schools, libraries, churches, hospitals, and nursing homes are considered noise-sensitive because of their expectation for quiet. The only sensitive receptors sites are the residences of local landowners who live in the Program area, and several public schools. There are no known hotels, libraries, churches, hospitals or nursing homes immediately adjacent to the Program area [the area of direct effects, not the entire Mattole basin].

3.8.2 Regulatory Setting - Noise

The Humboldt County General Plan, including the Framework Plan (1984) and the ECP (1995) do not outline specific noise compatibility standards, but such standards are identified in the November 2008 Draft Humboldt County General Plan Update (Chapter 13, Noise Element). These standards are utilized in this analysis in the absence of adopted standards. The noise standard described in the Draft General plan for TPZ is 85 dBA Lmax between 7AM and 10PM and 75 dBA Lmax between 10PM and 7 AM.

The FPR's do not address noise except at 1092.01 where the PTHP checklist is required to have a checklist item about individual and cumulative impacts to the environment from noise. The FPR's do address disturbance to T&E species at numerous places within the rules especially 919.3 where the rules discuss specific nesting period restrictions for numerous species. The FPR's also have substantial restrictions on operations near breeding pairs of Northern Spotted Owls at 919.9 and 919.10.

3.8.3 Significance Criteria - Noise

CAL FIRE considers local noise standards as they relate to the compatibility between the Program and various land uses adjacent to project sites. Thus, local noise standards are used as guidelines for what the CAL FIRE considers as acceptable noise levels in noise-sensitive areas.

Noise impacts would be considered significant if the Program and the Alternatives would cause:

a) Exposure of persons to or generation of noise levels in excess of standards; established in the local general plan or noise ordinance, or applicable standards of other agencies;
b) Exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels;
c) Substantial permanent increase in ambient noise levels in the project vicinity (above levels existing without the project);
d) Substantial temporary increase in ambient noise levels in the project vicinity (above levels existing without the project).

3.8.4 Determination Threshold - Noise

The Program and Alternatives are considered to create a significant effect when a treatment or treatments creates:

a) Noise in excess of 85 dBA at 50', or in excess of 65 dBA at 150 feet at sensitive receptors (schools, residential units, churches, libraries, commercial lodging facilities, and hospitals or care facilities);
b) Noise levels in excess of 70 dBA L_{dn} 1/;
c) The Program and Alternatives are considered to create moderately adverse impacts when noise levels are between 60 and 70 dBA L_{dn}* (State Office of Noise Control 1976).

1/ L_{dn} – The day-night average noise level (L_{dn}), is a 24-hour average L_{eq} with a 10 dBA penalty added to noise occurring during the hours of 10pm and 7am to account for the greater nocturnal noise sensitivity of people. L_{eq} - The energy-equivalent noise level (L_{eq}), is the average acoustic energy content of noise, measured during a specific time period.

3.8.5 Data and Assumptions - Noise

The analysis that follows is based on the data and assumptions described below as well as those in Chapter 3.1, which summarizes the extent and intensity of the Program's practices as well as those of the Alternatives.

Noise levels for various types of equipment likely to be used in the Program (or Alternatives) as well as other types of noise are shown in Table 3-32 below in decibel (dBA) levels at 50' and 150'.

Table 3-32
Noise Levels Of Equipment Likely To Be Operated Under Proposed Program 1/

Equipment	dBA at 50'	dBA at 150'
Logging Helicopter	87-90	83-85
Dozer with grapple skidding logs	85-90	63
Front End or Heel Boom Loader	86-90	60
Hydraulic excavator	81-91	No data
16 wheel Truck	81-87	No data
Chainsaw	90	65
Business Office	70	No data
Conversational Speech	60	No data
Library	50	No data
Secluded Woods	30	No data

1/ Source: CAL FIRE, 2005, JDSF Draft Environmental Impact Report

Cable yarders are not shown, but generally are relatively quiet even when operating at full power when yarding in a turn of logs. However, the air horn mounted on the yarder, which is activated by the crew in the woods using a "talkie tooter" can approach short duration (3-5 seconds) burst of noise as loud as 130-140 dBA.

3.8.6 Direct Impacts From Noise Common From Implementing the Program/Alternatives

Impacts to Human Health and Community Well-Being Due to Implementation of the Program

Noise is often defined as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon. In addition, noise impacts apply only if the noise is heard or felt. The vegetated nature and often high relief of the treatment areas can create an environment in which topographical features and vegetation dampen much of the noise. However, Program practices, such as timber falling, skidding, loading and log hauling can present a source of significant temporary noise.

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment (though hearing loss can also

occur at the highest noise intensity levels), but in terms of inhibiting general well being and contributing to undue stress and annoyance. The health impacts of noise arise from interference with human activities, including sleep, speech, recreation, and tasks demanding concentration or coordination. When noise interferes with human activities or contributes to stress, public annoyance with the noise source increases.

Disturbances associated with mechanical treatments could be substantial, though short in duration. Equipment associated with mechanical treatments can generate noise levels ranging from approximately 75 to 90 dBA at 50 feet, depending upon the equipment being used. Typical operating cycles may involve 2 minutes of full-power operation, followed by 3 or 4 minutes of operation at lower levels. In addition, treatment activities are carried out in stages, during which the character and magnitude of noise levels surrounding the treatment area changes as work progresses, as different equipment is used and the location of the noise-generating work moves throughout the operations area.

Properly maintained equipment produces noise levels near the middle of the indicated ranges. Activities such as timber falling, tractor skidding, tractor piling, log loading and log hauling, etc., are the most common noise generators. As a result, the Program's practices will result in equipment and tools being used that typically will generate noise levels of 70–90 dBA at a distance of 50'. At a distance of 150' however, noise has been attenuated by distance to the extent that 85 dBA of noise produced by a chain saw at 50' is only expected to be around 65 dBA. The dBA L_{dn} of most timber operations is expected to be on the order of 55 dBA L_{dn} given that no operations are expected at night. Also, the sounds from heavy equipment are often dampened or attenuated by the surrounding vegetation and soft ground surface.

The vast majority of the noise generated from Proposed Program practices is likely to be located miles from the very few number of sensitive receptors such as schools. The exception is likely to be residences, particularly neighbors in the area where operations might take place and residences along log haul routes. Typically, operations near residences, whether conducted near the landowner's residence, or near adjacent neighbors would normally occur more than 150' distant from the residence, would be short duration in the immediate vicinity of the residence and normally would not operate continuously for more than an hour or two at a time, e.g. timber falling, skidding etc.

Given the number of landowners participating in the Program in any one-year and the number of acres operated on in any particular subbasin in a year, noise impacts are expected to be minimal. Given reasonable volumes per acre being removed in the Program and reasonable logging production rates, the duration of active logging and truck hauling is expected to range from a low of around 20 days/year in the South_1 subbasin to a high of 75 days/year in the North_1 subbasin.

Both the North_1 and North_2 subbasins have relatively more acres being treated than the other subbasins but while acres being treated are nominally higher in these two subbasins throughout the 50 year projection period, logging production rates are expected to be higher also given the large industrial timberland ownership in the area. In addition, both the North_1 and 2 subbasins are located in areas with a low ownership density. Those areas with a moderate ownership

density such as West_1, West_2 and East_1 have logging job durations on the order of around 50-60 days/year per owner participating in the Program. East_2 with a high ownership density (and thus smaller parcel sizes) has few landowners with sufficient timber to have any sort of harvest – those that do are expected to have logging job durations on the order of 30-40 days/year of active timber falling, skidding and log hauling.

Logging tends to proceed in stages that do not exactly overlap, e.g. falling often begins several weeks before skidding then ends before skidding finishes. Log hauling usually doesn't begin until a week or so after skidding begins and usually ends several days after skidding finishes. Thus a job with 400 MBF of timber to remove at a production rate of 20 MBF/day has noise not for 20 days but typically for 30-40 days/year, 10 days of timber falling in advance of skidding, then 20 days of skidding and then perhaps five additional days of loading and hauling. In addition, clean up often takes several additional days of equipment time.

Throughout the entire Program area (that is, across the entire 74,749 acres spread across the entire Mattole basin) the total number of days with logging related equipment usage is expected to be around 185 days/year. Many of these days will overlap, such that during the normal operating season (May 15 – October 15), logging might be taking place most week days, but at scattered locations throughout the Program area. Between 2011-2060, the most number of days with Program generated noise (249 days/year) might occur sometime in the period between 2040-45 when timber prices are modeled to be high. Conversely, during periods when timber prices are modeled to be extremely low, equipment time is expected to be as low as 37 days/year in 2045-50. Across subbasins, as noted above, in a year with moderate prices, noise from harvest operations is expected to last from a low of around 15 days/year in the South_1 subbasin to a high of around 75 days/year in the North_1 subbasin.

Traffic noise is a function of the receptor's distance from roads, which cannot be adequately assessed at the programmatic level. Rather, it requires consideration during project level review.

In summary, while Program practices might generate noise throughout the Program area for as long as 185 days/year, noise is expected to occur over a relatively short duration in most subbasins (30-60 days). In addition noise is usually generated more than 150' from residences and sensitive receptors such that most noise being generated is not expected to be heard at a level louder than 70 dBA by anyone except for equipment operators.
Noise can have a negative effect on people's recreational experience if operations are conducted on or near public lands such as near campgrounds and trails (e.g. King Range or Humboldt County parks). Program operations in the West_1 and West_2 subbasins are likely to have the most impact on recreation. However, the vast majority of the acreage proposed for treatment is composed of private land where private landowners themselves either operate equipment that generates noise or hire contractors with equipment that generates noise.

Operation of heavy equipment can generate ground-based vibration, particularly operations by dozers. Rubber tired skidders, masticators, mowers, roller choppers, etc., usually do not develop the amount of ground based vibration that a 45,000 pound or larger (D7 or equivalent) dozer can. Most dozer operations and operation of other logging equipment are expected to take place at distances of several hundred feet or more from residences and usually miles distant from

sensitive receptor locations. As a result, vibrations from such operations are expected to be virtually non-existent.

Impacts to Wildlife Health and Well-Being Due to Implementation of the Program

Noise tolerances of nesting protected raptors vary by species. Duration and timing of impacts to wildlife health and well being due to noise generated by the Program is expected to be similar to the impacts experienced by humans. However, the FPR's require that for certain species of wildlife, seasonal restrictions be adhered to such that operations have to be suspended during critical periods for these species. Typically, seasonal restrictions are required during nesting and breeding seasons. Program practices producing loud noise to nesting protect raptors and other sensitive wildlife will be kept at a minimum as a result of FPR seasonal restrictions during mating and rearing season within the FPR required buffer distances.

Impacts to Human Health and Community Well-Being Due to Implementation of the Alternatives

Alternative I, the Status Quo generates the most days of equipment operation and likely therefore the most days of noise being generated. Although the annual harvest acreage in the Status Quo is expected to be about 475 acres compared to 1,160 acres for the Program, volumes being produced from the even-aged harvests take much longer to complete even though equipment operation is expected to be more efficient. In addition, with far less screening from residual trees likely, the noise is likely to carry farther than the noise generated by the Program. As with the Program, given the industrial ownership in the North_1 and North_2 subbasins, noise from logging lasts longer (90 or more days per job) than in other subbasins under this alternative. Logging related noise in the subbasins with moderate ownership density is expected to last somewhat longer than in the Program. West_1 and 2 and the South_1 subbasins are expected to have fewer operations than the Program such that the duration of noise generated by this alternative in these subbasins is likely to be less than the Program. Alternative I produces about 220 days of equipment time spread across the Program area in a year with moderate timber prices. In down years (projected to be 2015-2020), perhaps only as many as 115 days of equipment time and thus noise would be accumulated. In years with exceedingly good timber prices, which is not projected to occur often, as many as 365 days of equipment time and thus noise would be generated. Obviously all of this equipment time would be concentrated during the normal operating season such that a fair number of logging operations might be going on concurrently in the Program area.

Alternative II is expected to produce somewhat fewer days of noise than the Program. The number of days with logging related noise is expected to range from around 150 days in a year with average to good log prices to a low of 67 days per year in a year with poor log prices (projected to occur in 2045-50). In a year with exceedingly good log prices (projected to occur in 2040-45), there might be as many as 219 days of equipment time generated.

Alternative III operates on about 760 acres/year in the first period and then bounces between approximately 300 acres/year being harvested to as many as 938 acres/year being harvested. As with the other alternatives most of the equipment operation is expected in the North_1 and 2

subbasins where ownership density is low. Because the high cost to treat slash restricts the number of landowners with economically viable timber, the number of days of equipment time and thus noise being produced is relatively small compared to the Program or the other Alternatives. Total days of equipment time and thus noise being produced varies from a high of 127 days/year to a low of 28 days/year. Across subbasins in an average year (2010-2015) when timber prices are moderate, the total days of equipment time and thus noise being produced ranges from between 10 days/year in the South_1 subbasin to a high of 45 days/year in the North_1 subbasin.

3.8.7 Indirect Impacts of Implementing the Program/Alternatives

There are potential indirect impacts to human health and to wildlife associated with noise from the Proposed Program. Indirect impacts to human health and to the health of wildlife arise in terms of inhibiting general well being and contributing to undue stress and annoyance.

3.8.8 Determination of Significance

Table 3-33 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-33
Summary Of Noise Impacts 1/
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

Implementation of the Proposed Program (or the Alternatives) including all applicable Forest Practice Rule requirements related to disturbing special status wildlife species will create less than significant adverse impacts from noise based on the following

a) Implementation of the Program or Alternatives would not generate or expose persons at sensitive receptor sites to noise levels of 90 dBA at 50' or in excess of 65 dBA at 150', or 70 dBA L_{dn}. At such distances the noise generated by the Program's practices is expected to be in the range of around 65 dBA. As a result, the Proposed Program or Alternatives will create a less than significant adverse effect to persons at sensitive receptor sites from noise generated by operations.

b) The Program or Alternatives would not generate noise in excess of standards established in the revised noise element of Humboldt County General Plan Update (85/75 dBA

Lmax) since virtually all equipment operation would take place at distances of more than 150' from residences or the very few number of sensitive receptors in the Program area. At such distances the noise generated by the Program or Alternatives' practices is expected to be in the range of around 65 dBA. As a result, the Proposed Program or Alternatives will create a less than significant adverse effect to local residents from the noise associated with operations

c) Implementation of the Program will not generate or expose persons to excessive ground-borne vibration because the extent and intensity of such treatments is both too far distant to most sensitive receptors to be felt or would be of short duration. As a result, the Proposed Program and Alternatives will create a less than significant adverse effect to people from excessive ground based vibration.

d) Because of the transitory nature of the Program's practices, implementation of the Program will not result in a permanent increase in ambient noise levels above levels existing without the project, and therefore would not create a significant adverse effect. As a result, the Proposed Program and Alternatives will create a less than significant adverse effect to ambient noise levels from operations.

e) Most of the Proposed Program treatments are far removed from sensitive receptor sites such as schools, churches, hospitals, and libraries. Noise associated with the Program or Alternatives practices might temporarily increase noise levels from operations including production of noise levels of 80-85 dBA at 50' or in the range of 65 dBA at 150', or 70 dBA L_{dn}, and thus these impacts will have a less than significant adverse effect. The severity of such impacts will be temporary and the impacts are dependent on the actual conditions at the operations site.

3.8.9 Similar Impacts From Noise Described Elsewhere

The impact to the environment from traffic is a similar effect that is described elsewhere.

3.8.10 Mitigation Measures for the Proposed Program

Because the impacts associated with implementation of the Program are less than significant, no mitigation is required.

3.9 Impacts of Program/Alternative Implementation on Population and Housing

This section summarizes the impacts to population & housing due to implementing either the Proposed Program or any of the alternatives.

3.9.1 Environmental Setting – Population and Housing

The assessment area for assessing the direct impacts of implementing the Program's practices on population and housing is the Program area itself.

The population and housing situation within the Mattole has not been well documented, save for information developed and documented in the 2009 MRC Integrated Coastal Watershed Management Plan, Foresight 2020. The estimated population of the Mattole basin in 2010 is approximately 2,000 people (1,250 owners) based on CA. Department of Finance projections in lieu of more up to date (but not yet available) 2010 US Census data. The following material about population and housing is excerpted from the Integrated Coastal Watershed Management Plan.

> *"There are no incorporated towns in the Mattole. Population is distributed in varying densities over the watershed, with higher residential densities generally in the southern and eastern areas. The west side of the watershed is almost entirely in public ownership while the northern portion of the watershed has a higher amount of land in active ranchlands.*
>
> *Total population of the Mattole is near 2000 people. Only three of the five recognized communities have a post office and elementary school; Petrolia, Honeydew and Whitethorn. Ettersburg has no post office, but does contain a school. There is one high school in the watershed, located between Honeydew and Petrolia. Many children attend elementary and high school in neighboring school districts outside of the watershed, in Redway Miranda, Briceland, and Ferndale. All communities in the watershed meet state criteria for designation as "disadvantaged communities" due to low median household incomes.*
>
> *The Mattole Watershed has seven volunteer fire departments; Petrolia, Honeydew, Telegraph, Whitethorn, and Whale Gulch, and two newer departments, Green Fir and Prosper Ridge, both in the lower Mattole. All of these departments have emergency responder equipment and training which allows them to respond to fire and medical emergencies, and are often the first to arrive on fires in the more remote areas of the basin. Briceland, Shelter Cove and Ferndale Volunteer Fire Departments also respond to incidents, emergencies and fires in the Mattole watershed. There are several agency fire stations in the valley including a CAL FIRE Thorn Junction Station, CAL FIRE Honeydew station and a BLM King Range Fire Station near Thorn Junction.*
>
> *There are about 65 active ranches in the Mattole, with the majority of ranching activities occurring in the northern half of the watershed. Ranching in the Mattole is a combination of livestock and timber operations, and takes place on the larger ranches. Many of these ranches are multi-generational family operations and utilize large tracts of land of more than 1000 acres. In addition to the actively managed lands on the existing ranches and industrial timber ownerships, there are a number of ownerships, large and small, that are covered by conservation easements. These easements vary in the types of management and activities that they restrict, but most commonly they restrict the ability of the owner to subdivide by setting a minimum parcel size into perpetuity. However, other conservation easement techniques focus on long-term*

property management that protects or enhances conservation values. In 2009, the economy in the Mattole depended on a mix of ranching (livestock and timber), restoration work, construction, and landscaping work for landowners. Tourists, artisans, and retirees also contribute to the local economy. The Mattole Unified School District, as well as the Southern Humboldt Unified School District, provides employment to a number of residents. Others work in the towns surrounding the watershed, such as Redway, Garberville, or the towns surrounding Humboldt Bay."

NCWAP characterizes the basin's population as follows:

"Ninety percent of the Northern Subbasin's total population lives within three miles of the population centers of Petrolia or Honeydew, which are both near the southern boundary of this subbasin. The Eastern Subbasin has the most pockets of population. This is due to the numerous rural subdivisions in this area. This trait is shared with the Southern Subbasin. The major difference is that Southern Subbasin populations are concentrated along the Mattole River and its major tributaries. Most of the Western Subbasin population lives near the county roads running along the northern, eastern, and southern edges of this area. These roads lie near the river from the Estuary to Honeydew, near the downstream terminus of the Eastern Subbasin, and then generally follow the ridge tops until reaching the boundary of the Southern Subbasin."

Figure 3-9 below (Figure 19 from Foresight 2020, the Mattole Integrated Coastal Watershed Management Plan) depicts the likely ownership density in the watershed. Average family unit size in the Mattole is expected to be near the average for the US at 2.3 people/household, which equates to about 800-1000 dwelling units within the basin.

3.9.2 Regulatory Setting – Population and Housing

The Program area is located in the unincorporated portion of Humboldt County and as such as covered by the Humboldt County General Plan. The Humboldt County General Plan, including the Framework Plan (1984), the ECP (1995) and the updated Framework Plan 2003 housing element have specific population and housing goals and policies. None of the goals or policies relates to population or housing vis a vis the Program's proposed practices, which are all related to forest management.

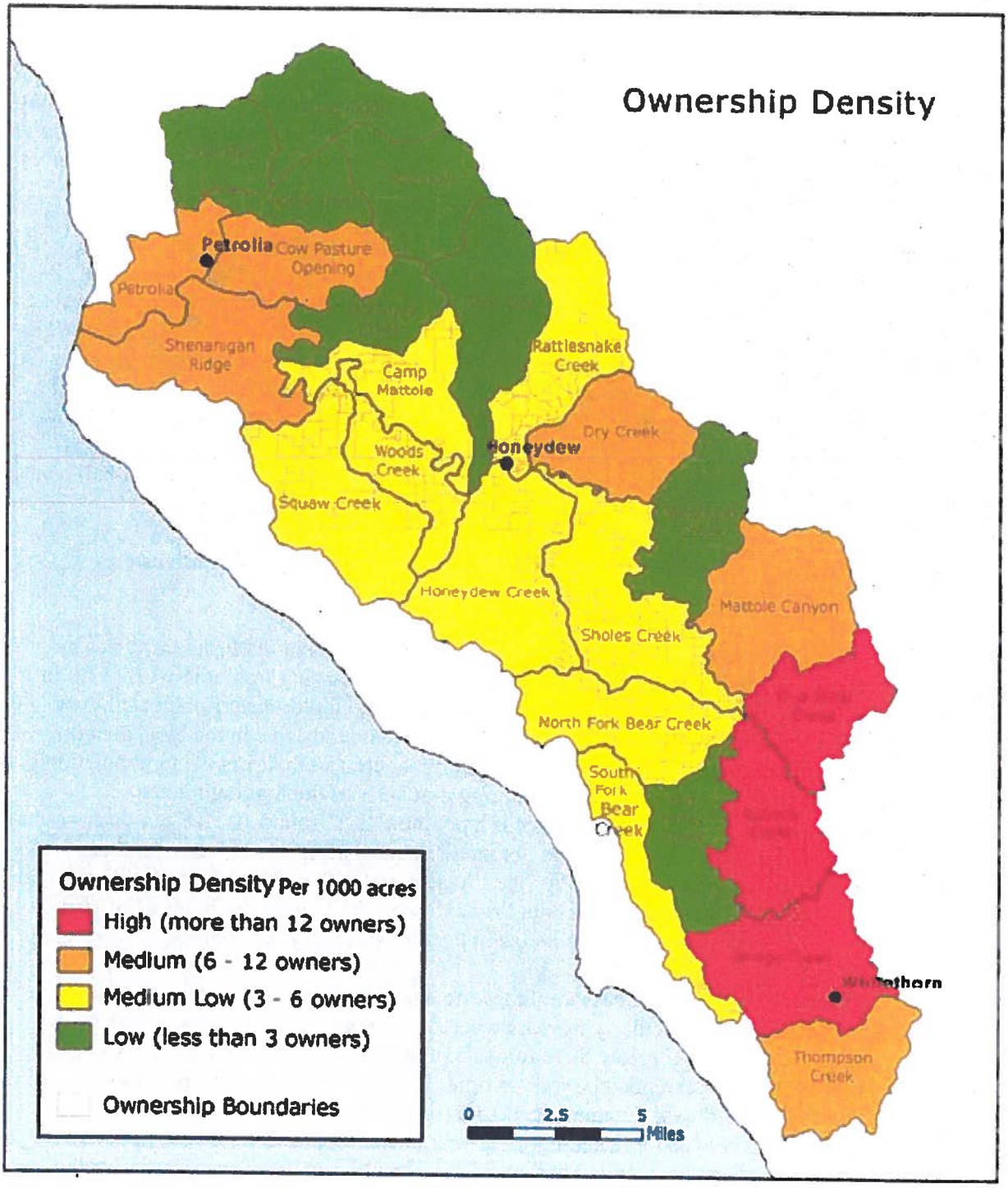
The General Plan Update and 2008 draft General Plan contain a variety of goals and policies related to population and to forestry, but there are no specific forestry goals or policies that would "regulate" any of the practices proposed in the Program.

3.9.3 Significance Criteria – Population and Housing

Appendix G of the CEQA Guidelines, the CEQA Environmental Checklist contains only one question, which is relevant to the Program. The Program and Alternatives would be considered to create a significant effect if treatments:

- Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

Figure 3-9


Ownership Density
Petrolia
Cow Pasture Opening
Petrolia
Shenanigan Ridge
Camp Mattole
Rattlesnake Creek
Dry Creek
Honeydew
Woods Creek
Squaw Creek
Honeydew Creek
Mattole Canyon
Sholes Creek
North Fork Bear Creek
South Fork Bear Creek
Thompson Creek
Ownership Density Per 1000 acres
High (more than 12 owners)
Medium (6 - 12 owners)
Medium Low (3 - 6 owners)
Low (less than 3 owners)
Ownership Boundaries
0
2.5
5
Miles

3.9.4 Determination Threshold – Population and Housing

While there is no accepted percentage population increase to be used as a threshold, population change less than a certain amount can easily be considered to be negligible. For this project, an increase in population less than 0.5% in the basin resulting from implementation of the Program would be considered negligible.

3.9.5 Data & Assumptions – Population and Housing

Implementation of the Program might temporarily increase the population in the Mattole as a result of out-of-basin logging personnel coming into the basin to work on logging projects. In order to determine how much of an increase in the population the proposed Program represents, information about the number of jobs and the number of days of woods work were developed in the Noise chapter and are used here. Total number of days of logging, and production rates were turned into full time equivalent (FTE) jobs by assuming a 250-day work year. Production rates are based on two fallers and two tractor/skidder operators per job, plus one person loading and chasing logs on the landing and four truckers producing around 20 MBF/day in all subbasins except for North_1 and North_2 where production is expected to be much more "high-ball" on the industrial lands at 50 MBF/day.

3.9.6 Direct Impacts Common From Implementing the Program/Alternatives on Population and Housing

The estimated full time yearly number of people needed to implement the Program varies by period as a result of changes in the price of timber, essentially varying from a low of 9 FTE in the second period to a high of 39 FTE in 2040-2045. Average employment is expected to be around 30 FTE per year. Most of these FTE are expected to already live in the local area (or commute daily from outside the area such as from Fortuna, etc.) so their impact to population and on housing is expected to be limited. Assuming that 2/3's of the logging related employment already lives in the Mattole, there is a potential that around 10 FTE per year would be "in-migrants" to the basin every year and potentially contributing to a small population increase within the basin. The FTE of 30 for the Program is 10 FTE above the Status Quo of 20 FTE, which results in a small benefit from the Program over the Status Quo in terms of employment but potentially a negligible adverse impact to population and housing.

The projected small population increase might lead to a need to construct several new homes within the basin each year, particularly in years where the timber market reaches a high point. Conversely in years where FTE is low there might be a net out-migration of people looking for work who leave the area for extended periods of time. Differences at the subbasin level are considerable and associated with the number of acres logged by subbasin by period. FTE in East_1 and East_2 vary between five and ten FTE/year to as low as two FTE/year in the South_1 subbasin. An FTE increase that resulted in a population increase of 10 people just meets the threshold of 0.5% increase being equivalent to a less-than-significant effect.

The Status Quo Alternative generates a fewer number of FTE than the Program even though acreage and volume logged are higher in most periods, principally because production rates are

expected to be substantially higher. Average annual FTE from the Status Quo is expected to be around 18-20 logging related jobs per year, dipping to a low of around 8 and reaching a high of around 28. Differences at the subbasin level are associated with the different number of acres logged per year varying in an average year from 3-5 FTE in the North_1 and North_2 subbasins to 3-4 FTE in the East_1 and East_2 subbasins. In this alternative, the South_1 subbasin has virtually no harvest until 2030 when Barnum Timber Company lands reach rotation age and harvest begins, averaging around four FTE/year thereafter. Given the average employment figure for this alternative, it is expected most of the logging related work will be filled by people who already live within the basin and thus there is no expectation that this alternative might have anything but an imperceptible impact on population or housing

Alternatives II and III have employment levels proportionate to the acres being logged, with Alternative II having as much employment as the Program and Alternative III employment more in the range of 12-15 FTE per year. Alternative II impacts on population and housing are expected to be similar to the proposed Program impacts, which are expected to be negligible. Alternative III impacts on the local population and housing are expected to be less than Alternative I, that is they are likely to have at most a negligible beneficial impact.

3.9.7 Indirect Impacts to Population and Housing of Implementing the Program/Alternatives

The indirect impacts of additional people moving to the basin and the potential for building a small number of new houses per year might result in indirect impacts to water supply and increased air pollution resulting from the increased number of vehicles on the road. Other indirect impacts resulting from a projected increase in the population in the Mattole from additional logging related employment include the possibility of increased wildfire ignitions, increased impacts to wildlife, increased noise from additional habitation, a potential for increased traffic fatalities, etc.

3.9.8 Determination of Significance – Population and Housing

The Proposed Program or Alternatives would not induce substantial population growth in the Mattole basin, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure) because there would be a less than 0.5% increase in population resulting from the additional logging related employment. As a result, implementation of the Program or Alternatives will have a less than significant effect to population and housing in the Mattole.

3.9.9 Similar Impacts Described Elsewhere – Population and Housing

The only similar impact described elsewhere is the impact to sensitive receptors and to people as a result of noise generated by the Program or alternatives.

3.9.10 Mitigation Measures for the Proposed Program

Because the impacts associated with implementation of the Program are less than significant, no mitigation is required.

3.9.11 Literature Cited

MRC, 2009. Integrated Coastal Watershed Management Plan, Foresight 2020. Mattole Restoration Council, 2009. Petrolia, CA.

NCWAP, 2002. Downie, Scott T., C.W. Davenport, E. Dudik, F. Yee, and J. Clements (multi-disciplinary team leads). 2002. Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program, p. 441 plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

3.10 Impacts of Program/Alternative Implementation on Recreation

This section summarizes the impacts to recreation due to implementing either the Proposed Program or any of the alternatives.

3.10.1 Environmental Setting-Recreation

The assessment area for assessing the direct impacts from implementing the Program's practices on recreation is the Program area itself.

The Program area by definition is composed of privately owned parcels where public recreation is restricted by the landowners. The BLM King Range National Conservation area (KRNCA) provides recreation opportunities to the public including camping, hiking, mountain biking. Etc. Humboldt County operates the A.W. Way County Park where camping and picnicking can take place. There are 30 tent campsites at A.W. Way County Park. The vast majority of public lands occur in the West_1 and West_2 subbasins, with lesser amounts in East_1 and still fewer in South_1.

The KRNCA (some of which is outside of the Mattole basin) has approximately 80 miles of trails, six developed campgrounds, four upland backcountry campsites and a visitor's center near Whitethorn. The only BLM campgrounds within the Mattole basin are the 14 unit Mattole Campground and the Honeydew Creek campground with 5 tent/trailer campsites. A recent Master's Thesis completed in May, 2010 (Pope 2010) states that approximately 4,650 people self registered to hike the Lost Coast Trail, with an estimated 80-90% self registration rate.

The mouth of the Mattole is heavily used for beach access by visitors and local residents and is the primary access route for the Lost Coast trail and for day hikes to Punta Gorda lighthouse.

In spite of the Program area being comprised of private land where recreation, other than by the individual landowners themselves, is severely limited, there are a number of recreation activities that do take place within the area. Sightseeing via driving local roads is a common recreational activity within the Program area as is wildlife viewing and photography. Hunting of deer, bears and squirrels occurs within the Program area, though hunting trends are declining in the Program area, the King Range and throughout California. Since the King Range is the largest block of public land in the local area, conflicts can arise between hunters and private landowners who border the KRNCA. Mountain biking is gaining in popularity; however, the main trails are outside the Mattole basin, and are not expected uses of the Program area except by the landowners themselves.

Fishing is a popular recreational activity, on the mainstem of the Lower Mattole River. Fishing on the Mattole is closed above the confluence of Honeydew Creek. Fishing for coho and Chinook salmon is closed the entire year throughout all streams of the Mattole. Fishing is also closed all year from the mouth of the Mattole to a point 200 yards upstream of the mouth. In the Program area, fishing for steelhead is open on the mainstem of the river only. From January 1 to March 31, fishing is open from a point 200 yards upstream of the mouth to Honeydew Creek; from Memorial Day to August 31, the open area begins slightly further upstream (at the

Stansberry Creek confluence) and extends upriver to the confluence of Honeydew Creek. Any fishing in the Mattole must be done with barbless hooks. Due to the limitations on where fishing may occur, very little of the private, commercial forestland of the Mattole is adjacent to areas that are open for fishing.

3.10.2 Regulatory Setting-Recreation

The FPR's do not regulate recreation vis a vis timber harvest, though RPF's in their cumulative impacts analysis are required to address recreation that occurs within 300' of the plan area.

The Forest Practices Act at PRC 4513 states that while "*...The goal of maximum sustained production of high-quality timber products is achieved ...consideration* [shall be given] *to values relating to sequestration of carbon dioxide, recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment.*

3.10.3 Significance Criteria-Recreation

Appendix G of the CEQA Guidelines, the CEQA Environmental Checklist poses the following questions to be considered in determining whether the Program or Alternatives would cause significant impacts to recreation:

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?

Although not included in Appendix G of the CEQA Guidelines, additional consideration will be given to the possibility that implementing the Program on private lands would affect recreation or tourism on public lands.

3.10.4 Determination Threshold-Recreation

An effect is considered significant if it would:

a) Cause use of existing campgrounds on County or BLM lands to increase 25% due to use by forest workers; or
b) Alter recreational patterns on public lands

3.10.5 Data and Assumptions-Recreation

There were no data relating to public recreation on private lands in the Mattole. We assume that no significant publicly available recreation occurs on privately owned lands in the Mattole.

However, there were historical accounts of activity on private lands affecting recreational fishing potential in the Mattole River;

From: Smith, Emil, et al. 1973, revised 1976. Coastal County Fish and Wildlife Resources and Their Utilization. Dept. of Fish and Game.

> *"It appears that the Mattole River would support much larger runs of salmon and steelhead, if current abuses of the watershed were to be discontinued. "The impacts of poor forest management practices are the primary factors limiting present runs of anadromous fish in this drainage. The by-products of logging--accelerated erosion, siltation, increased water temperatures, reduction of streamside vegetation, destruction of habitat and blocking of fish spawning areas--could be materially reduced by better legislation and law enforcement..." "...Past logging activities have caused severe damage to Bear River salmon and steelhead habitat. Reestablishment of streamside cover destroyed by logging should prove worthwhile."*

From: Preliminary Report, Recreation Resources, 1958. National Park Service, Pacific Southwest Field Committee. pp. 111-114.

> *Mattole River Basin (narrow basin less than 300 square miles in area). "The River is renowned for steelhead, attributed in considerable degree to the rapid clearing of the stream after minor flooding. There are also salmon and, in the higher reaches of the Mattole and source tributaries, rainbow trout. Fishing leads in active recreation...*
>
> *"It is unfortunate for the recreation potential of the Mattole River that the valuable timber resources are being unwisely exploited by numerous small private operators. This is being done with little consideration for the importance of eventually achieving a sustained yield. The results of this mismanagement have been especially noted by the U.S. Fish and Wildlife Service, which has also found evidence of serious overgrazing on a scale to cause highly detrimental erosion. Sediment and slash are wrecking steelhead spawning areas. In short, the economically important recreation fishery resource is being critically jeopardized. This is certain to operate adversely on the entire recreation potential of the Valley, which could, with improved access, assume increasing rather than less appeal with the growing population. Under present conditions, there can be little incentive for providing recreation facilities, either by public or private enterprise."*

Based on these historic accounts of the linkage between intensive land use (grazing and logging) we assume that it is possible for activity on private lands to impact public recreational potential, particularly fisheries.

According to data from the KRNCA Environmental Impact Statement for the Resource Management Plan (BLM 2004) camping and hiking were by far the most common uses of the area in terms of visitor days (Table 3-34). Other recreational pursuits such as hunting, fishing or horseback riding accounted for 1-2 orders of magnitude fewer visitor days. We assumed that recreational patterns documented in KRNCA were similar to other public recreational lands within the Mattole (County and State Parks), e.g. backpacking and camping were the most popular recreational uses of the Mattole.

Table 3-34
Estimate of Visitor Usage in KRNCA by Recreation Type

Recreational Category	Annual Visitor Days
Backpacking	8,198
Camping	4,433
Horseback Riding	771
Hunting (Big Game)	650
Driving for Pleasure	602
Hiking	443
Picnicking	260
Wildlife Viewing	171
Swimming	122
Gathering Non-Commercial Forest Products	98
Nature Study	55
Photography	53
Viewing Interpretive Exhibits	48
Fishing (freshwater)	16
Viewing- Other	11

3.10.6 Direct Impacts Common From Implementing the Program/Alternatives-Recreation Backpacking

Backpacking was the most common use of KCRNA lands. Most of this usage occurs on the 'Lost Coast' hiking trail, of which only a small portion is in the Mattole watershed. That portion does not traverse commercial forestland and thus would not likely be affected by the Program.

Existing Camping Facilities

After backpacking, camping was the most common use of KRNCA lands. As of 2010, there were 49 publicly available campsites in the Mattole Watershed on county and federal lands. An average of 760 acres per year would be harvested under the Program. If the average harvest unit was 75 acres, that would mean that there would be about 10 logging operations per year occurring in the Mattole watershed. It is likely that at least half of the logging jobs would be conducted by Humboldt County residents who would commute from home each day. Of the 5 logging jobs conducted by crews that were too far from home to commute, at least half would stay with their equipment in a trailer on the privately owned jobsite. That leaves at most 2-3 logging operations per year that could occasionally use public campsites.

Each crew would probably occupy 1-3 sites at a camping facility, for a maximum use of 9 sites of the 49 total sites or 20%. The use would occur mid-week when occupancy is lowest at campsites. All other Alternatives were projected to harvest fewer acres and thus would require fewer logging crews. This low level of potential use by the Program and Alternatives is not likely to impact public camping facilities.

Fisheries and Hunting

It was determined in the Aquatic Resources Section (Section 3.4) that the Program would not have a significant adverse effect on fisheries resources. This is in contrast to the historic accounts of very intensive logging activities of the 1950-1970 time period destroying the fisheries resources. It is not clear how grazing practices have changed since the 1950-1970 time period where it was estimated that 'overgrazing' was occurring (see above).

The most common big game animal hunted in the Mattole Area was black tailed deer. The Program will not directly impact this species and modifications to habitat will be minimal. Alternatives I and II, which permit even-aged harvesting may have a positive effect on deer abundance due to the periodic creation of early seral conditions, leading to increased forage availability for deer. Alternative III is likely to be similar to the Program.

Scenic Resources

Most of the recreational activities described in Table 34 rely on the natural scenic beauty of the Mattole watershed. It is determined in Chapter 3.15 that impacts of the Program on visual resources would be less than significant, due primarily to the reliance on uneven-aged silviculture methods. Alternatives I and II, which permit even-aged silviculture, were likely to have a greater impact on visual resources, but still not significant due to the low rate of harvest expected. Alternative III was determined to have similar potential impacts to visual resources as the Program.

3.10.7 Indirect Impacts of Implementing the Program/Alternatives-Recreation

There are not likely to be any indirect impacts of implementing the Program or Alternatives on Recreational resources.

3.10.8 Determination of Significance-Recreation

Table 3-35 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-35
Summary Of Impacts[1/]
To Recreational Resources
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The Program is expected to create a less than significant adverse impact to Recreational Resources because implementation of the Program will not increase use of public campgrounds by >25%, impacts, if any, to existing recreational resources will be minimal and no new recreational resources will have to be built to accommodate the Program.

Alternative I (Status Quo) is expected to create a less than significant adverse impact to Recreational Resources because implementation of the Alternative I will not increase use of public campgrounds by >25%, impacts, if any, to existing recreational resources will be minimal and no new recreational resources will have to be built to accommodate the Program.

Alternative II is expected to create a less than significant adverse impact to Recreational Resources because implementation of the Alternative II will not increase use of public campgrounds by >25%, impacts, if any, to existing recreational resources will be minimal and no new recreational resources will have to be built to accommodate the Program.

Alternative III is expected to create a less than significant adverse impact to Recreational Resources because implementation of the Alternative III will not increase use of public campgrounds by >25%, impacts, if any, to existing recreational resources will be minimal and no new recreational resources will have to be built to accommodate the Program.

3.10.9 Similar Impacts Described Elsewhere-Recreation

Similar impacts to visual resources were described in Chapter 3.15.

3.10.10 Mitigation Measures for the Proposed Program-Recreation

No impacts on recreation will arise from implementing the Program so no mitigations are required.

3.10.11 Literature Cited-Recreation

Bureau of Land Management (BLM). 2004. King Range NCA Proposed Resource Management Plan and Final Environmental Impact Statement, November 2004. Arcata, California.

Kristen E. Pope, 2010. Visitor perceptions of technology and rescue in the wilderness. Thesis submitted to the Department of Natural Resources: Planning and Interpretation, Humboldt State University, May 2010.

3.11 Effects of Program/Alternative Implementation Associated With Hazards or Hazardous Materials

This section primarily relates to the use, transportation, storage, and disposal of hazardous materials that are likely to result from the Proposed Program or the Alternatives. The term "hazardous material" refers to both hazardous substances and wastes. A material is defined as hazardous if it appears on a list of hazardous materials prepared by a federal, State, or local regulatory agency, or if it has characteristics defined as hazardous by such an agency. Two other types of materials that are regulated separately from hazardous chemicals and materials are biohazardous materials (i.e., that contain biological material capable of causing disease in humans) and radioactive materials (i.e., that spontaneously emit ionizing radiation). Neither of these two types of materials will be generated by the Proposed Program or the Alternatives, so will not be analyzed.

Herbicides may be categorized as hazardous materials and may be used in the Mattole watershed to control unwanted vegetation. Herbicides are not allowed to be used under the Program or Alternatives II and III while a PTHP is active; however, landowners may choose to apply herbicides before or after implementing at PTHP, during a time period when the Program's provision do not apply to them. Herbicide use is allowed within Alternative I, the status quo.

The primary hazard(s) not related to accidental chemical contamination include injury, loss, or death from escape of prescribed fire, and/or exposure to hazardous materials generated from combustion of non-target substances (e.g., burning buildings).

3.11.1 Environmental Setting-Hazards and Hazardous Materials

The assessment area for assessing the direct effects from implementing the Program's practices in relation to hazardous materials is the Program area itself.

Occasionally, illegal dumping occurs in the Program area. County workers dispose of the waste properly, and when feasible, the responsible party is identified and legal remedies are sought. No known landfills or other hazardous waste sites are known to occur on in the Program area. Currently, the volume of hazardous waste that is generated in the Mattole watershed does not exceed the small quantity generator threshold.

The California Department of Toxic Substances Control Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners. However, a search of the sites listed showed there are no HWMP sites in Humboldt County.

The Program area is located within a State Responsibility Area (SRA; Humboldt County 2006), and thus also falls within the fire protection service area of the California Department of Forestry

and Fire Protection (CAL FIRE), Humboldt Del Norte Unit. CAL FIRE provides wildland fire protection services in undeveloped resources lands such as the project site. Wildland fires are a risk in the Program area (see chapter 3.17).

The Mattole Watershed has five volunteer fire departments, including; Petrolia, Honeydew, Telegraph, Whitethorn and Whale Gulch. Briceland, Shelter Cove and Ferndale Volunteer Fire Departments also respond to incidents in the Mattole Watershed. There are several agency fire stations in the valley including a CAL FIRE Thorn Junction and Honeydew Stations and a BLM King Range Station.

3.11.2 Regulatory Setting-Hazards and Hazardous Materials

The state and federal laws and regulations that address waste management in the King Range include the federal Resource Conservation and Recovery Act and the California Health and Safety Code, Title 22.

Title III, Division 11, Chapter 1, §3111 of the Humboldt County Code sets forth the SRA Fire Safe Regulations (HCFSR) implemented by the County on the behalf of CAL FIRE as authorized by §4290 of California's Public Resources Code. These regulations constitute the basic wildland fire protection standards within the County's SRA areas, including emergency access, emergency water (fire flow), and perimeter wildland fire protection standards, and are required to be written into the conditions of approval of construction, development permit, and tentative map covered by the code.

The Public Resources Code (PRC) establishes CAL FIRE and the regulations for the prevention and control of wild fires. In Humboldt County, developments must meet fire safe standards by constructing the project in conformance with Humboldt County Code, Title III, Division 11, Chapter 1, §3111, which CAL FIRE has accepted as functionally equivalent to PRC 4290.

The Humboldt County Emergency Operations Plan (EOP; 2002) serves to address the planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies in or affecting Humboldt County (Humboldt County 2002). The EOP establishes the emergency management organization required to mitigate significant emergencies or disasters, identifies the policies, responsibilities and procedures to protect health and safety, and establishes the operational procedures associated with field response to emergencies.

The Program and all Alternatives must follow the Forest Practice Rule standards regarding the safe handling of hazardous materials. The specific Forest Practice Rules (FPR; Forest Practice Rules 2010) are summarized as follows:

- Prohibition against allowing petroleum products to enter a watercourse. (Article 6 § 916.3)
- Prohibition on the servicing of equipment used in timber operations in a manner or location which would allow grease, oil, or fuel to pass into lakes or watercourses (Article 4 § 914.5)

The Program and all Alternatives must follow the Forest Practice Rules (Title 14 California Code of Regulations (14 CCR) §895, et seq). to reduce fire hazards. These are primarily intended to address accidental fires associated with timber harvest activities. The specific Forest Practice Rules are summarized as follows:

- Site preparation is to be conducted in a manner that minimizes fire hazards (Article5 § 915).
- Standards for burning vegetation in regards to site preparation shall be complied with (§ 915.2).
- Submittal each year, by timber operators, of a fire suppression resource inventory either before April 1st or before the start of timber operations. The inventory must provide the following (Article 8 § 918): name, address and 24-hour telephone number of an individual and an alternate who has authority to respond to Department requests for resources to suppress fires number of individuals available for firefighting duty and their skills available firefighting equipment
- Timber operators must keep roads passable during the dry season until all snag and slash disposal has been completed (§ 918.3).
- Smoking and warming fire limitations on persons engaged in timber operations and a requirement that the timber operator specify procedures to guide actions of his employees or other persons in his employment consistent with these limitations (§§918.4 and 918.5).
- Timber operators shall provide a diligent fire watch service at the scene of any blasting or welding operations (§ 918.7).
- Timber operators shall conduct a diligent aerial or ground inspection within the first two hours after cessation of felling, yarding, or loading operations each day during the dry period when fire is likely to spread (§ 918.8).
- During the period that burning permits are required, all blocks on a cable setting will be located in the center of an area that is either cleared to mineral soil or covered with a fire proof blanket that is at least 15 feet in diameter. A shovel and an operational full five-gallon backpack pump or a fire extinguisher bearing a label showing at least a 4A rating must be located within 25 feet of each such block before yarding begins (§ 918.10).

Use of herbicides for control of competing native or non-native vegetation is not a design element or program goal of the Proposed Program or Alternatives II and III. The PTEIR/PTHP process does not authorize herbicide use, and permitting of such use is not within CAL FIRE's responsibility. However, the creation of group openings or even-aged harvest areas as proposed under the Program and Alternative II facilitates a situation where herbicide use might be implemented by private landowners. Although use of herbicides is controversial in Humboldt and Mendocino counties, their use under certain conditions is legally allowed, and many landowners choose to use them instead of hand/mechanical treatments or prescribed burning.

If some landowners were to apply herbicides as part of their maintenance of group openings or even-aged harvest areas, this application would likely occur prior to harvest to kill standing hardwoods individually using the "hack and squirt" technique or after timber harvest in the spring when brush and hardwoods are sprouting. This use might not occur until timber harvest and brush reduction activities specified by the PTHP were carried out, which may well be subsequent to the period of CAL FIRE oversight of a PTHP (and in any case is not under the authority of CAL FIRE, see below).

There are over 20 different herbicides registered for use on Douglas-fir and ponderosa pine plantations alone in California. There are 197 herbicides registered for use on "brush". Herbicides are registered (or delisted) for use every year. For purposes of this analysis, the herbicides most likely to be used within the Program area are based on the herbicides applied in Humboldt and Mendocino counties in 2008 as shown in the Table 3-36 below. Given the small size and adjacency of the private parcels included in the Program area, aerial spraying of herbicides is unlikely. The most likely form of application would be by backpack sprayer or pre-harvest "hack and squirt" of overstory hardwoods that would be specifically targeted to individual plants, trees or stumps. Application of herbicides via backpack sprayer and/or "hack and squirt" uses a minimal amount of active ingredient and is very precisely applied to target plants- and therefore does not include the risk of application to non-target species or habitat types associated with aerial application.

Table 3-36
Pounds of Herbicides Applied for Forestry Applications in Humboldt and Mendocino Counties

Chemical	Humboldt	Mendocino
Atrazine	8,449	
Atrazine, Other Related	178	
Clopyralid, Monoethanolamine Salt	43	
2,4-D, Butoxyethanol Ester	102	
2,4-D, Isooctyl Ester	3,912	
Diphacinone	0	
Fatty Acids, Mixed	239	
Glyphosate, Isopropylamine Salt	1,437	307
Hydrotreated Paraffinic Solvent	454	
Imazapyr, Isopropylamine Salt	2,497	3,411
Methylated Soybean Oil	8,360	904
Mineral Oil	1,603	
Alpha-(Para-Nonylphenyl)-Omega-Hydroxypoly (Oxyethylene)	2,297	105
Oleic Acid, Methyl Ester	1,502	248
Sulfometuron-Methyl	53	
Tall Oil Fatty Acids	268	53
Triclopyr, Butoxyethyl Ester	4,705	627
Triclopyr, Triethylamine Salt	4	
Alpha-Undecyl-Omega-Hydroxypoly(Oxyethylene)	35	53
Total	36,144	5,711

Data Source: California Department of Pesticide Regulation (DPR)
http://www.cdpr.ca.gov/docs/pur/pur02rep/02_pur.htm

The U.S. Environmental Protection Agency (EPA) regulates pesticide use nationwide and has exclusive authority over pesticide labeling. Use of a pesticide is limited to the applications and restrictions on the label, and the label restrictions are legally enforceable. The California Department of Pesticide Regulation (DPR) regulates pesticides within the State of California and has legal authority to adopt restrictions on pesticide use going beyond the regulations of the EPA. (See 7 U.S.C.A. Sec. 136v.).

Under California law, pesticide products must be registered by DPR in order to be sold and used in California. Before a substance is registered as a pesticide for the first time, DPR conducts an evaluation. If DPR determines that further restrictions need to be placed on the use of a pesticide product to mitigate potential adverse effects including human health effects and environmental effects, DPR classifies the pesticide as a restricted pesticide, and individual applications need a permit from the county agricultural commissioner. After a pesticide is registered for use in this state, DPR has an ongoing obligation to review new information received about the pesticide that might show new problems beyond those identified in the registration process. Where the review of new information shows that a significant adverse impact has occurred or is likely to occur, DPR is required to reevaluate the registration. DPR operates a statewide program of regulation and is the lead agency for regulating herbicide use under CEQA. DPR has the greatest authority of any state agency for analyzing and regulating herbicide use. Further, DPR acts before any other state or local agency can act because a herbicide product must be registered by DPR before it can be used at all. This lead agency role was confirmed in *City of Sacramento v. State Water Resources Control Board* (3d Dist, 1992).

DPR does not prepare environmental impact reports (EIRs) but prepares other documents in compliance with CEQA. DPR's registration process takes into consideration that most herbicides will be used statewide. Because the registration evaluation process considers use of an herbicide in a broad area and in a variety of conditions, the documents are the functional equivalent of a program EIR for each pesticide. Site specific application and use of restricted pesticides is evaluated by the county agricultural commissioner during the review of applications for restricted materials permits. Not all pesticides are restricted, and only restricted pesticides require a permit from the county agricultural commissioner, except that for a pesticide that DPR has not designated as restricted, the commissioner can require a permit for its use if the commissioner makes a finding that the pesticide will present an undue hazard when used under local conditions.

Finally, application of herbicides is not a project within the meaning of CEQA and it is not a part of the PTEIR Program because the facts of its occurrence are too speculative; if we nevertheless undertake an analysis of potential impacts and alternatives, given the current state of the scientific knowledge of the products registered for use on conifer forest lands, the speculative nature of the amount and timing of use of these products on forestlands, and considering the typical pattern of use of these products, the history of past use, and the label restrictions and regulations on the use of these chemicals, there is no significant adverse environmental impacts from the application of these registered materials if they are used in accordance with existing labeled precautions. These products do not totally eliminate grasses, herbs, weeds, and brush species, but do provide for a reduction in

competition for conifer seedlings so that they may be able to survive and grow more rapidly (CAL FIRE, 2010). Herbicide use, though prohibited within the lifespan of a PTHP, is one way that a landowner may alter the trajectory of stand development if the landowner determines that competition from undesirable species poses a significant risk to establishment and growth of desired tree species. It is not feasible to prohibit or analyze the use of herbicides outside of the active lifespan of PTHPs.

If use of herbicides were described in a PTHP as an integral part of the timber operations, CAL FIRE would need to review the proposed use and its possible environmental effects; but since no herbicide use is proposed in the PTEIR, it could not be proposed in a PTHP tiered to the PTEIR. Any subsequent use of herbicides is therefore considered a related but not integral part of the timber harvest permitting process. The use of herbicides is subject to decisions of the timberland owner, a pest control advisor, and in the case of restricted herbicides, the county agricultural commissioner.

3.11.3 Significance Criteria-Hazards and Hazardous Materials

Based on Appendix G of the CEQA Guidelines, an impact would be considered significant if the Proposed Program and Alternatives would:

a) Create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
b) Create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
c) Create hazardous emissions, or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of sensitive receptors (existing or proposed schools, hospitals, assisted living facilities, etc.);
d) Expose people or structures to the risk of loss, injury or death involving escape of prescribed fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands; or
e) Create a public nuisance.

3.11.4 Determination Threshold-Hazards and Hazardous Materials

For the purposes of the following evaluation, impacts from the Proposed Program or the Alternatives are considered "significant" within an appropriate time frame and ecological context if they cause relatively high magnitude, persistent, or permanent changes to:

a) Population size, distribution, viability, or recovery potential of a special status species.
b) Levels of water contaminants above the limits established by Regional Water Quality Control Boards.
c) Conflicts with local, State, or federal biological resource protection plans, policies, and regulations.
d) The health or safety of workers associated with the implementation of manual,

mechanical, or chemical treatment measures.

e) Public health or safety of sensitive subpopulations (existing or proposed schools, hospitals, assisted living facilities, etc.) through the routine transport or storage of hazardous materials.

f) Workers or the public through reasonably foreseeable upset and accident conditions involving the release of hazardous materials.

3.11.5 Data and Assumptions-Hazards and Hazardous Materials

Heavy machinery fuel, lubricants, coolants, etc.

The primary hazard posed by fuels and chemicals used on machinery in the Program or Alternatives is contamination of surface and ground water. Contaminated water could then impact organisms dependent on the water supply, including plants, animals and humans. Accidental discharges/spills of these hazardous fluids are the primary mechanism for introducing them into the environment and are a possibility on every project where hazardous materials are used. None of the Program treatment types use or discharge hazardous materials as a means of treating vegetation. It was assumed that large (>1,320 gallons), permanent storage containers would not be used on any Program or Alternative project, due to the remote nature of the projects.

There were no data regarding the frequency or volume of hazardous materials releases due to timber harvest in the Mattole watershed. There has been greater community discussion of diesel spills related to generators used for indoor marijuana growing operations.

Herbicides

The quantity of herbicides applied or acres treated within the Mattole watershed is unknown, data is only reported at the county level (Table 3-36). Historically, there has been public controversy surrounding the use of herbicides by Barnum Timber Company in the South_1 subbasin (KMUD News Archive July 22, 2009).

Escaped prescribed fires

It was assumed that use of prescribed broadcast burning would be fairly rare as a site preparation method within the Program or Alternatives and would generally occur on <10% of the harvested area annually (see Section 3.17). The more common slash cleanup/site preparation methods would be lopping and scattering, pile burning, removal or chipping.

A recent federal review of prescribed burns for the period 1996-2004 indicated that 99% of prescribed burns were "successful", which means that they did not escape (Dether 1995). The four federal agencies reviewed were the Forest Service, US Fish and Wildlife Service, Bureau of Land Management and National Park Service. These federal agencies conduct 4,000 to 5,000 prescribed burns annually, of which 40 to 50 escape or have near miss (minor but controlled escape) incidents.

There were no data available regarding the frequency of use or escapement of prescribed fires in the Mattole watershed.

3.11.6 Direct Effects Common From Implementing the Program/Alternatives-Hazards and Hazardous Materials

Effects of Hazardous Materials Release

The Program and Alternative II, which include marginally more harvested acres than the other alternatives, would have the highest risk of contamination due to hazardous materials due the greater amount of heavy equipment needed to carry out the logging.

There are six schools in or immediately adjoining the Mattole watershed (Mattole Elementary School in Petrolia, Honeydew School, Mattole Triple Junction High School between Petrolia dn Honeydew, Ettersburg Elementary, Whitethorn Elementary, and Whale Gulch School southwest of Whitethorn) and no hospitals. The Honeydew, Ettersburg, Whitethorn, and Whale Gulch schools are located within one quarter mile of commercial timberlands. It is possible that timber harvest and/or log hauling could occur near these schools under any of the Alternatives.

Due to the rules contained in the Forest Practice Act regarding safe handling of hazardous materials on timber harvest plans and equipment limitation zones near watercourses it is unlikely that any accidental releases would occur, and any releases that did occur would be likely to occur well away from a watercourse.

Effects of Herbicides

Alternative I (status quo) is likely to include a higher level of herbicide use than the other Alternatives because herbicide use is allowed during the life of the THP, whereas herbicide use would be prohibited during the life of PTHPs tiered to this PTEIR.

However, the future prescription of herbicides for treatment maintenance purposes is too speculative under CCR 15145 to make a determination as to significance. The uncertainty as to significance is due to the fact that:

1. The decision to use herbicides is an individual landowner's decision whether to treat chemically or not. While landowners may be sensitive to herbicide use given the contention surrounding herbicides in Humboldt and Mendocino Counties, it is impossible to predict whether some, many or all of the landowners might use herbicides. Principal among landowner considerations about herbicide use will be the amount of brush or hardwood re-growth after treatment, something that is virtually impossible to predict.

2. The particular herbicides registered for use at that time are impossible to predict. There are currently 12,319 pesticides registered for use in California. There are over 20 herbicides registered for use on plantations of Douglas-fir or ponderosa pine. Landowners have a variety of herbicides to choose from and predicting the impacts

from the range of herbicides available for use is considered too speculative for projection purposes.

3. Besides the uncertainty associated with which species of vegetation would need to be treated (e.g. widely different herbicides are prescribed for grass compared to sprouting brush species), as well as the types of herbicides that would be prescribed, there is also substantial uncertainty associated with the "prescription" recommendation of a certified Pest Control Advisor (PCA) as to the timing (spring or fall) of the application, the type of herbicide recommended (see 2 above), the number of treatments to be applied, the stage of vegetation growth to be treated, and finally the spatial extent of the vegetation to be treated (e.g. _ acre, 5 acres, 40 acres, etc.). Ultimately, the PCA, if involved, would require that label directions specify the requirements for safe herbicide usage, handling, exposure and disposal. Also, all applications will be in accordance with label instructions and, where appropriate, per the direction of a PCA and applied by qualified applicators.

Effects of Escaped Prescribed Fires

It is assumed that prescribed fires within the Program will have a similar success rate of approximately 99% as described above. Thus for the Program, which will implement approximately 10 timber harvest operations per year, of which one may opt to use prescribed burning for site preparation, it would take one hundred years of Program implementation for a single escaped prescribed fire to occur- statistically. Thus for the 50 year analytical time frame there is an extremely low probability that an escaped prescribed fire will occur. The other Alternatives treat an equivalent or lower acreage, so have a similar or even lower probability of fire escapement.

The main effects of an escaped burn include one or more of the following (CAL FIRE 1981):

- Burn more area than planned, i.e. more of a watershed, and burn at a higher intensity than planned.
- Burn improvements such as homes, barns, fences, or crops.
- Require additional resources for suppression.

Due to the unplanned and accidental nature of escaped burns it is not possible to prevent them entirely. All reasonable measures to prevent escapes are standard practice and are incorporated into prescribed fire burn plans.

3.11.7 Indirect Effects of Implementing the Program/Alternatives-Hazards and Hazardous Materials

There were no indirect effects of implementing the Program or Alternatives expected.

3.11.8 Determination of Significance-Hazards and Hazardous Materials

Table 3-37 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-37
Summary Of Effects from Hazards and Hazardous Materials 1/ Due to Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The Program and all of the Alternatives are expected to create a less than significant adverse impact due to hazards and hazardous materials for the same reasons, as follows:

- Compliance with all Federal and State laws, codes, and regulations will minimize to less than significant levels any potential impact that may result from the transport, storage, handling, and disposal of the hazardous materials.

- Escapement of prescribed burns is rare but cannot be avoided. However, due to the relatively small number of timber harvest operations likely to use prescribed burning each year it is extremely unlikely that either the Program or any Alternative will lead to an escaped prescribed burn.

- The potential impacts from hazards and release of hazardous materials will not have a significant adverse impact on the following items due to the infrequency of their occurrence and avoidance measures incorporated into the Forest Practice Rules:

a) Population size, distribution, viability, or recovery potential of a special status species.
b) Water quality contamination above the limits established by Regional Water Quality Control Boards.
c) Conflicts with local, State, or Federal biological resource protection plans, policies, and regulations.
d) The health or safety of workers associated with the implementation of manual, mechanical, or chemical treatment measures.
e) Public health or safety of sensitive subpopulations (e.g., schools, hospitals) through the routine transport or storage of hazardous materials.
f) Workers or the public through reasonably foreseeable upset and accident conditions involving the release of hazardous materials.

3.11.9 Similar Effects Described Elsewhere-Hazards and Hazardous Materials

Hazards due to wildfires are discussed in Chapter 3.17.

3.11.10 Mitigation Measures for the Proposed Program-Hazards and Hazardous Materials

No impacts arising from hazards and hazardous materials will arise from implementing the Program so no mitigations are required.

3.11.11 Literature Cited Hazards and Hazardous Material

California Department of Forestry and Fire Protection (CAL FIRE). 1981. Chaparral Management Program; Final Environmental Impact Report. California Department of Forestry and Fire Protection, Sacramento, CA.

California Department of Forestry and Fire Protection (CAL FIRE). 2010. THP # 4-10-001ELD

Dether, Dierdre M. 1995. Prescribed Fire Lessons Learned: Escaped Prescribed Fire Reviews and Near Miss Incidents. Wildland Fire Lessons Learned Center.

Humboldt County, 2006. Humboldt County Master Fire Protection Plan. Eureka, California.

3.12 Impacts of Program/Alternative Implementation on Transportation/Traffic

This section summarizes the impacts to transportation and traffic due to implementing either the Proposed Program or any of the alternatives. Only the impacts of traffic volume are analyzed. Issues related to road design, road condition, etc. are analyzed in the water quality section.

3.12.1 Environmental Setting – Transportion/Traffic

The assessment area for assessing the direct impacts from implementing the Program's practices on transportation is the road system within the Program area.

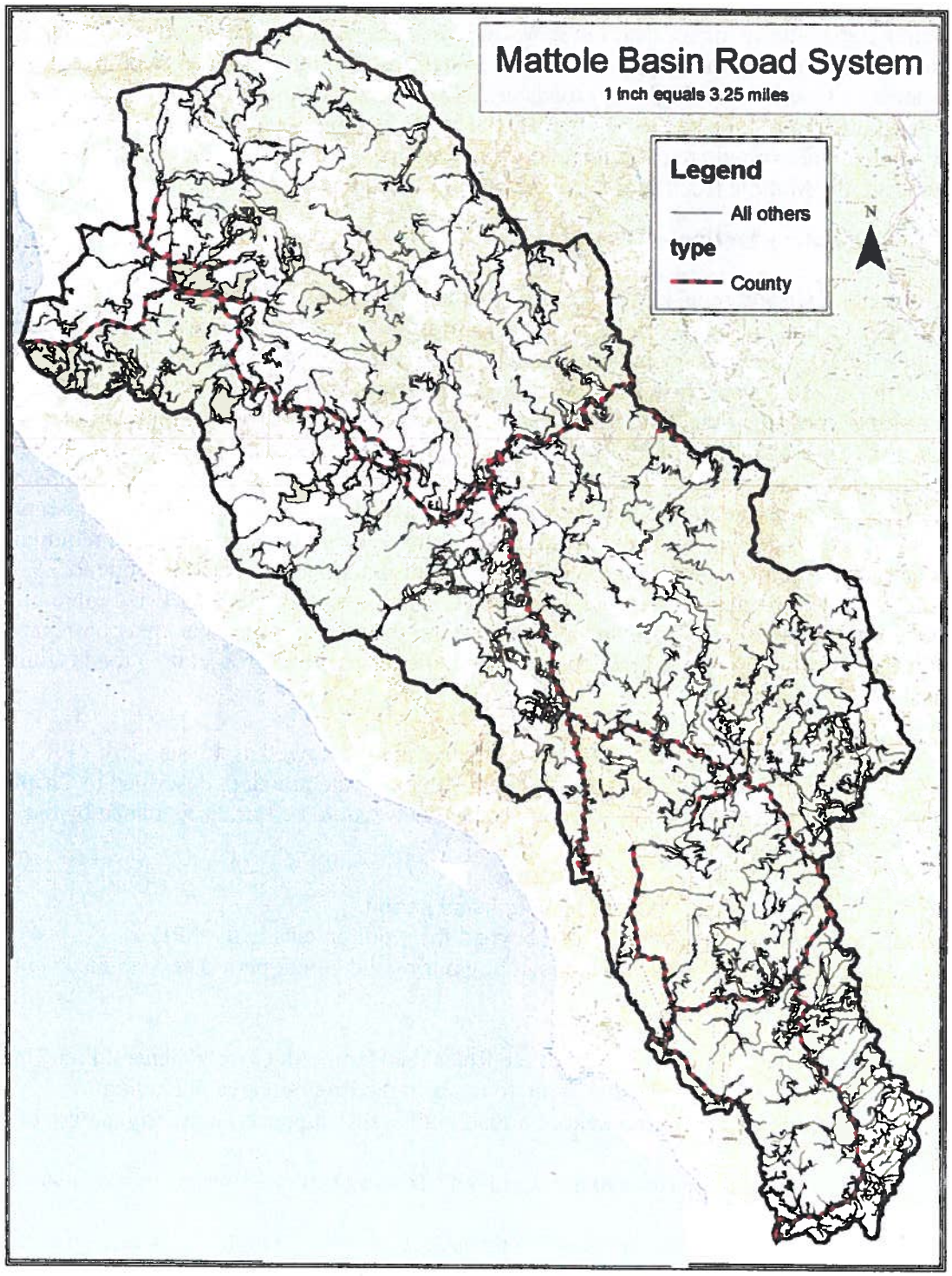
The main access routes into the Program area are the Mattole road from Ferndale to Petrolia and on to Honeydew, the Bull Creek-Panther Gap road from Highway 101 to Honeydew, the Briceland-Thorn road and Shelter Cove Roads, the Ettersburg road, the Wilder Ridge road and the King Peak Road. Other public roads that serve year round residents include the Telegraph Ridge Road, Paradise Ridge Road, Lighthouse Road, and Chemise Mountain Road.

The TMDL report, citing information from Perala (1993) estimated there were about 3,310 miles of road in the basin of which 2,800 miles were abandoned, 100 miles were County roads, 25 miles were BLM roads and 385 miles were being actively used. Most of the roads in the basin were constructed for timber harvest purposes. Very little of the Mattole has seen much timber harvest in the past 10 years, so the THP GIS information is a poor representation of the road system in the basin other than in the immediate area of the THP. Given the dispersed nature of the Program area, virtually all of the 3,310 miles of roads in the Mattole, save for roads in the KRNCA, are located in the Program area. Figure 3-10 below shows the road system as the MRC GIS information had it in 2008.

Traffic counts from the 2002 Humboldt County Regional Transportation Plan estimate average daily traffic volume as:

- 900 vehicles per day on the Mattole Road
- 800 vehicles per day on the Bull Creek/Panther Gap Road
- 800 vehicles per day on the Shelter Cove Road (and by extension on the Briceland Thorn Road)

Figure 3-10


Mattole Basin Road System
1 inch equals 3.25 miles
Legend
All others
type
County
N

Data from the CHP's Statewide Integrated Traffic Records System shows that there were about 121,500 registered motor vehicles in Humboldt County in 2008 and that there were nearly 98,000 licensed drivers in the County. Humboldt County has a ratio of 0.91 vehicles/person, which is substantially higher than the statewide average of 0.74 vehicles/person. In the unincorporated part of the county there were 7 fatalities, 170 injuries and 316 property damage accidents on County (non-highway) roads in 2008. The accident rate for the Mattole Basin and the Program area is expected to be proportional to the Mattole's acreage compared to the County as a whole, while vehicle registration at 0.91 vehicles per person would put the total number of vehicles in the Mattole basin at somewhere around 1,800 vehicles.

3.12.2 Regulatory Setting – Transportation/Traffic

The primary laws and regulations that relate to the Program's operations with respect to roads and transportation are those contained in the California Forest Practices Act and the Forest Practice Rules. The FPR's contain multiple sections with explicit language related to roads and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to roads. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE. Article 12 of the FPR's at 923.1 through 923.9 regulate roads and landings, principally classification (permanent, seasonal, etc), season of use, surface material, grade, etc. Section 923.3 regulates road practices at watercourse crossings, while 923.4 regulates the requirements related to road maintenance. 923.8 regulates planned abandonment of roads while 923.9 regulates road construction, use, maintenance, etc., within watersheds with listed salmonids. 923.9 requires that the RPF evaluate all roads within the plan area and that are appurtenant to the plan area. Finally, the Forest Practices Act also contains provisions regulating roads within the "area of timber operations."

In addition to the regulatory requirements described above, as well as the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2 – Program description. As a result, Program participants would be further regulated by the Program's restrictions including:

- Road construction is limited by length and period
- Existing roads must be upgraded beyond the requirements in the FPR's
- Limitations on skidding and log hauling during the winter period beyond those in the FPR's

For roads not covered by the Forest Practice Rules the Humboldt County General Plan Update has proposed goals and policies that apply to roads in the Program area, including:

- C-P1, Encourage development of a road system that supports an orderly pattern of land use
- C-P1(E) Improving roads to accommodate existing land uses served by a sub-standard road classification.
- C-P5 The County shall endeavor to manage its streets and highway system so as to maintain Level of Service C operation on all roadway segments, except for any portion of U.S. 101, where Level of Service D shall be acceptable.

- C-P20 Best Practices for County Road Maintenance. Continue use of the Five County Water Quality and Stream Habitat Protection Manual for County Road Maintenance or a functional equivalent, as amended and approved by state and federal resource agencies, for County road maintenance and maintenance yards to minimize impacts to watersheds from roads and maintenance yard facilities.
- C-P21 Road construction and maintenance activities performed by the County or under the County's land use jurisdiction shall be consistent with and support approved state and federal salmon or steelhead recovery plans, Clean Water Act Total Maximum Daily Loads (TMDLs) and the National Pollution Discharge Elimination System Stormwater Program.

3.12.3 Significance Criteria – Transportion/Traffic

An effect will be considered significant if results of the analysis indicate that any of the following criteria will be met due to implementation of the Program or Alternatives:

1. An increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections).
2. Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways.

3.12.4 Determination Threshold – Transportation/Traffic

The following threshold is used to determine whether there is a substantial adverse effect to local residential or commercial development due to traffic generated by the Program or any of the Alternatives:

- Traffic increases in excess of 10% Average Daily Trips (ADT) of the capacity of roads that serve residential and/or commercial areas near Program areas.

3.12.5 Data and Assumptions – Transportation/Traffic

It is assumed that daily traffic is limited to the 510 miles of "useable" road that are comprised of 385 miles of private largely poorly maintained roads, 100 miles of gravel or paved county roads and the 25 miles of BLM road, which are mostly gravel. For traffic estimation purposes, figures from the noise and population and housing chapters, which have estimates of volumes and days of operation, were used to calculate the number of vehicle trips that might occur as a result of Program implementation. It was assumed that two pickup trucks travel to each logging job each day for as many days as is required in order to finish the falling, skidding and loading. Each rig is assumed to carry two people. The number of log trucks required to remove the Program harvest compared to the Status Quo and the other alternatives is based on an average load of 4.5 MBF. Since half of the harvest is conifer and the other half is hardwood, the total volume to be hauled is half of the total volume since it would be highly speculative to imagine hardwood hog fuel prices being high enough to make logging hardwood economical.

Much of the of the timber harvest is located in the North_1 and North_2 subbasins and as a result, much of the traffic will take place on roads owned and/or controlled by Humboldt Redwood Company and/or on the following County roads, Upper Bear River, Rainbow Ridge, and Fruit Ranch Roads as well as the Mattole Road for timber in North_2. To account for the different harvest occurring on different road systems, half of the total traffic from operations in North_1 and 2 and East_1 and 2 was assumed to haul out private roads along with Upper Bear River, Rainbow Ridge and Fruit Ranch roads and the other half on the Mattole Road through Bull Creek, while South_1 and West_2 were assumed to haul out the Briceland Road and West_1 was assumed to haul out the Wildcat Road through Ferndale.

3.12.6 Direct Impacts Common From Implementing the Program/Alternatives on Transportation/Traffic

Differences in acreage harvested and volume per acre account for the differences in traffic generated by the Program compared to operations under the Status Quo. In the Program during the first period there would be an estimated 1,115 vehicle trips per year on the private and county roads heading east from North_1 and 2 and the same number of vehicle trips on the Mattole road along with an additional 890 logs trucks per year on each road system. There would be an estimated 740 vehicle trips and 410 log truck loads per year on the Briceland road and 450 vehicle trips and 250 log truck loads per year on the Wildcat road. For the 50 year projection period there would be an average of 750 vehicles and 645 log trucks per year on the Mattole/pvt roads, 377 vehicles and 289 log truck trips on the Briceland road and 381 vehicle trips and 132 log truck trips on the Wildcat road per year. The average number of vehicle trips and log truck trips combined, generated by the Program over the 50 year period is estimated at 3,975 trips per year. As noted below, the Status Quo generates about 3,800 trips per year on average so the Program is projected to increase the combined total number of vehicle and log truck trips by about 175/year. If all of the additional traffic were assumed to occur on the Mattole road with 900 vehicles/day or on the Shelter Cove Briceland road at 800 vehicles/day, the Mattole road would experience about a 0.05% increase in daily traffic and the Shelter Cove Briceland road would experience an increase of about 0.06% in daily traffic. If all of the log truck and vehicle traffic were concentrated onto one road and to the period of June 1 through October 15, the increase in traffic would be the equivalent of a 0.23% increase in ADT loads.

In the first period, the Status Quo is projected to generate about 845 vehicle trips and 840 log truck loads per year on the private roads heading east out of North_1 and 2 and the same number of vehicle trips and log truck trips out the Mattole road through Honeydew. The Briceland road is projected to experience about 70 vehicle trips and 40 log truck trips per year and the Wildcat road about 190 vehicle trips and 180 log truck loads per year. The average number of vehicle trips and log truck trips combined, generated by the Status Quo over the 50 year projection period is estimated at 3,800 trips per year.

The average number of vehicle trips and log truck trips combined generated by Alternative II is projected to be 4,900/year and for Alternative III is projected to be about 2,500/year. Alternative II traffic loads could cause a negligible adverse increase in ADT compared to the Status Quo and Alternative III, with fewer average yearly and daily trips would likely create a negligible beneficial decrease in ADT compared to the Status Quo.

3.12.7 Indirect Impacts of Implementing the Program/Alternatives on Transportation/Traffic

The slight increase in traffic (0.05%) above the Status Quo might lead to a very slight increase in vehicle accidents. In addition, the slight increase in traffic might lead to deterioration in surface condition on the roads traveled. An increase in traffic load will likely increase the very small amount of oil and hydrocarbons that are deposited on roadways through leakage, spillage, etc.

3.12.8 Determination of Significance – Transportation/Traffic

Table 3-38 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-38
Summary Of Effects to Transportation/Traffic 1/ Due to Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The impact to transportation/traffic from treatments under the Proposed Program or Alternatives to the Program are such that the Program/Alternatives will neither cause a substantial increase in traffic nor will they individually or cumulatively exceed the level of service established for designated roads or highways in the Mattole. As a result, implementation of the Program or Alternatives will have a less than significant effect on Transportation/Traffic.

3.12.9 Similar Impacts to Transportation/Traffic Described Elsewhere

There are no impacts similar to Traffic/Transportation that are described elsewhere.

3.12.10 Mitigation Measures for Transportation/Traffic the Proposed Program

No significant effects arising from transportation and traffic will occur as a result of implementing the Program, so no mitigations are required.

3.12.11 Literature Cited, Transportation/Traffic

Perala, N.C., T. Dunklin, F. Euphrat, W. Smith, and C. May. 1993. Rapid evaluation of sediment budgets: Annual sediment contribution from roads in the Mattole watershed. Unpublished paper.

3.13 Impacts of Program/Alternative Implementation on Utilities and Energy

This section summarizes the impacts resulting from implementing either the Proposed Program or any of its alternatives to utilities and energy, including the electricity grid, telecommunications facilities, and water supply facilities.

3.13.1 Environmental Setting - Utilities and Energy

The assessment area for assessing the direct impacts from implementing the Program's practices on utilities and energy is the Program area itself.

Within the Program area are publicly regulated electrical transmission lines and substations, cell phone towers and many miles of private water lines. There are no power generation facilities such as biomass to energy plants, hydro plants, etc., other than the very small-scale private landowner power generators such as small-scale hydro, etc. There are no municipal water agencies in the Mattole watershed. Each landowner (or small group of landowners) maintains a private and individual water supply system. The Program's practices have the potential to affect transmission lines, substations, cell phone towers and small-scale hydro and private water lines.

Within the 74,949-acre Program area are an estimated 8 million tons of standing conifers and 3.7 million tons of hardwoods. The vast majority of this biomass is not economically reachable due to steep slopes, high on-board logging costs, high trucking costs and currently low prices at the power plant. On board logging costs on tractor ground for selection logging are estimated at $40/ton and haul costs to haul the material to Fairhaven are estimated at $25/ton. Current biomass prices in the local market have been steady at around $20-25/ton. The highest price offered in the local market occurred in 1999 when hog fuel prices got as high as $39/ton. Prices at the power plant would need to be about $70/ton for biomass from selection logging to break even, let alone make a profit. Prices would need to be at least $50/ton for clearcut logging of biomass to break even. Because of the vast difference between price offered and cost to produce over the last 11 years, and with future projections never reaching $70/ton (or even $50/ton), no further analysis of biomass is warranted.

3.13.2 Regulatory Setting - Utilities and Energy

The primary laws and regulations that relate to the Program's practices adjacent to electrical transmission lines, telecommunications facilities, and private water lines are those contained in the California Forest Practices Act, the Forest Practice Rules and the Program's special practices associated with protecting water quality. The FPR's contain multiple sections with explicit language related to operations near electrical lines and near, or on private domestic supply water lines and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to utilities. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE. The FPR's have an inclusive definition of domestic water supply at 895.1, an entire section devoted to domestic water supply protection at 916.10 and the specific requirements that FPR's must follow when requesting information on domestic water supplies at 1032.10. Finally, 916.4(c) describes the protective measures and widths for class I domestic water supplies found

within the Program area where the Program's practices would take place or within 100' downstream of such areas. The FPR's also contain right of way widths or clearing limits for various transmission lines based on their voltage as well as for communications devices, radio repeaters, etc. at 1104.1 under conversion exemptions. 14 CCR 1250-1258 describe the practices that RPF's (and utility companies) must adhere to when operating near electrical distribution lines, communications devices, etc. The California Forest Practices Act at PRC 4551.5 describes protection of water quality, while 4562.5 describes control of soil erosion and 4562.7 describes "Protection of streams; rules." PRC requirements at 4292 and 4293 also supplement the requirements at 14 CCR 1250-1258 vis a vis electrical transmission lines and other utility devices.

3.13.3 Significance Criteria - Utilities and Energy

An impact to utilities and energy is considered to be significant if the Program and Alternatives would:

a.) Cause substantial alterations to water, wastewater, or power systems.
b.) Cause substantial disruption in utility service or access to public facilities.
c.) Cause substantial damage to utilities, utility service or public facilities within the Program area.

3.13.4 Determination Threshold - Utilities and Energy.

Any direct damage to water, power or telecom facilities from a project would be considered a significant impact.

3.13.5 Data & Assumptions - Utilities and Energy

Evaluation of the potential significant impacts are not necessary for most of the criteria found in the CEQA checklist for impacts to Utilities and Energy because the program/alternatives do not fund any building projects or the development of any permanent facilities requiring power or water. As noted above, there are no energy generation facilities located within the Mattole save for small private micro-hydro projects on private lands, which are not regulated by the State Public Utilities Commission.

Implementation of the Program and the Alternatives might impact private water lines, including domestic water supplies originating on the owner's property as well as on neighboring properties.

3.13.6 Direct Impacts From Implementing the Program/Alternatives - Utilities and Energy

Table 3-39 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-39
Summary Of Impacts to Utilities and Energy [1/] From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

A total of approximately 70 landowners per year are expected to use the Program and implement harvest activities on their parcels. Many of the sites where timber harvest is expected to take place are on relatively larger properties where there is sufficient timber and acreage to make timber harvest feasible. Based on the modeling of landowner behavior described in Appendix A, only about 20% of the acreage harvested in the first period is from ownerships of less than 160 acres. Harvest from small ownerships in subsequent decades is projected to increase slightly over time as conifer volume per acre increases but the increase is relatively minor. As a result, the potential for Program practices to impact immediately adjacent neighbor domestic supply water lines is relatively low. It is assumed that landowners operating on or near their own domestic supply sources will not degrade their own water lines or water supplies. The Program's practices as well as the FPR requirements are such that domestic supply water lines are required to be identified on the PTHP maps, flagged in the woods and avoided or mitigated so that interruptions to supply are negligible.

Operations near electrical transmission lines and near substations are already regulated by the Forest Practice Rules. In addition, logging and forest management contractors can be liable for damage to transmission lines or to actions that cause interruptions in electrical supply.

There is a very small potential to impact micro-hydro electrical generation facilities, however, it is assumed that the vast majority of such operations occur on lands under the direct control of the landowner who is implementing Program practices. As a result, it is assumed that landowners operating on or near their own micro-hydro sites will ensure that timber operators working on their land do not degrade their own energy production facilities.

Overall, the implementation of the Program or the alternatives is expected to result in a less than significant impact to utility transmission lines or to energy production.

3.13.7 Indirect Impacts of Implementing the Program/Alternatives - Utilities and Energy

The impacts to water quality are addressed in the water quality section.

3.13.8 Determination of Significance - Utilities and Energy

There is virtually no chance that the Program's practices would cause direct damage to water, power or telecommunication facilities and thus would not cause substantial alterations to water, wastewater, or power systems, would not cause substantial disruptions in utility service or access to public facilities and would not cause substantial damage to utilities, utility services or to public facilities within the Program area.

3.13.10 Mitigation Measures for the Proposed Program - Utilities and Energy

No mitigation measures are proposed as no impacts are expected to be potentially significant.

3.14 Impacts of Program/Alternatives Implementation on Vegetation Including Invasives

This sub-chapter summarizes the impacts to forest vegetation due to implementing either the Proposed Program or any of the alternatives. Each section in this sub-chapter is broken into the several key elements of vegetation resources for discussion and analysis purposes. These include Forest Habitats, Special Status Species, Invasives, and Sudden Oak Death.

3.14.1 Environmental Setting - Vegetation

The assessment area for analyzing the direct impacts from implementing the Program's practices on vegetation is the Program footprint.

The assessment of current and future vegetation in the Program area relies upon the WHR classification system. The methodology for classifying the commercial forest area has been introduced in section 2.0.5 and is explained in further detail in the timber resources sub-chapter. Although the WHR vegetation types provide general descriptions of the forest stands where Program activities will likely take place, there are also microsites supporting various habitats within each broad WHR category. Microsite features develop as the result of anthropogenic activities (road construction and maintenance, timber harvesting) and natural events (fire, landslides, flooding).

Forest Habitats

Chapter 2.0.5 provides information on the location and extent of vegetation in the Program area including Figure 2-2 which shows the location of the commercial forest types, considered part of the Program area, and the non commercial forest types, excluded from the Program area. Table 3.40 shows the acreage and summary stand conditions of the six WHR types comprising the commercial forestland. As fully described in section 3.19.3 – Timber Resources, the actual WHR types in the Program area are a combination of the original types classified in 1998, and then adjusted based on plot data according to size, canopy cover and species distribution. The final vegetation type acreages, resulting from shifting the more hardwood dominated portions of the DFR class into other classes or reclassifying a category altogether, are a more accurate reflection of current forest types in the watershed. For example, the plot data analysis concluded that forest stands typed by CALVEG as MHC4 actually did not have sufficient conifer (25% cover) to be classified as such. This type is more accurately described as MHW, although it will grow into an MHC type over time and potentially has enough conifer to be included in harvests with other veg types within the planning horizon.

Table 3-47 below summarizes the average stand conditions in 2010 for each of the WHR types. Stand characteristics presented are a weighted average of the inventory data for each of the strata comprising the WHR type. Acreages have not been reduced to account for stream zones or geologically hazardous areas.

Table 3-40
Vegetation Type Condition Summary 2010

Actual Whr Type	Private Acres	Trees/ acre	Trees/ acre	Avg. diam. (inches)	Avg. diam. (inches)	Basal Area (ft2/acre)	Basal Area (ft2/acre)
		Conifer	HW	Conifer	HW	Conifer	HW
DFR3D	2,565	289	147	11.9	9.0	272	69
DFR4D	28,915	226	48	12.5	8.7	200	32
DFR5D	6,681	117	11	20.1	10.0	297	5
MHC3D	5,345	175	439	11.1	10.3	116	205
MHC4D	29,562	155	328	11.2	10.9	96	171
MHW4D	13,603	71	488	12.0	11.2	61	207
Total	86,671	168	237	12.4	10.0	147	116

Late Succession Forest Stands

The Forest Practice Rules define late succession forest stands as, "*stands of dominant and predominant trees that meet the criteria of WHR class 5M, 5D, or 6 with an open, moderate or dense canopy closure classification, often with multiple canopy layers, and are at least 20 acres in size. Functional characteristics of late succession forests include large decadent trees, snags, and large down logs.*" Based on the vegetation analysis described above, there are an estimated 6,681 acres of DFR5D forest stands scattered throughout the Program area. Any of these stands which are over 20 acres could potentially qualify as late successional forest provided they contain some of the other habitat elements such as snags and large down logs. Generally a site-specific assessment would have to be done to determine if a stand meets the criteria from the FPR's.

Special Status Species

Federal, State, and CNPS lists of rare, threatened, endangered, and special status species were used to construct the plant species list for this analysis. The habitats for the listed species (FPR 895.1 – plants or animals that are rare, threatened or endangered under federal or state laws or listed as sensitive by the Board of Forestry) described in 2.0.5 include habitats that are not likely to occur in the Program area. For instance, Menzies' wallflower, coastal marsh milk-vetch, short leaved evax, and Oregon coast paintbrush are located on coastal dunes which is a habitat not found within the Program area and will not be considered further. Giant fawn lily was considered for inclusion in the 2001 CNPS inventory of rare and endangered plants, but was rejected because it is not located in California and will not be considered further. Beach layia is located on coast dunes and coastal scrub at elevations of 0-60 meters and thus is not in the Program area and will not be considered further. Species that might occur in the Program area include the following.

- Calamagrostis foliosa – leafy reed grass – state listed rare, CNPS list 4.2
  Occurs in coastal bluffs and in rocky parts of north coast coniferous forest at elevations of 0-4,000'. Many occurrences are located in the King range. It is an

early successional species found on rocky coastal bluffs, in riparian habitats and cliff slopes, and on steep road cuts in Mendocino, Humboldt, and Del Norte counties. It occurs on low nutrient, low moisture substrates, which are unstable and eroding. The large number of known occurrences and the lack of threats to the species support removal of this species from the list of rare plants in California. (t_eplants.pdf)

- Gilia capitata – Pacific gilia state & fed endangered, CNPS list 1B
  found at elevations between 30 and 900' in coastal bluff, scrub and coastal prairie, habitats.

- Erythronium revolutum – coast fawn lily – not state listed, CNPS list 2.2
  Located in bogs and fens, along stream banks in broadleaved upland forests and in north coast coniferous forests at elevations from 0-4,000'. Coast fawn lily is a perennial herb (bulbiferous) that blooms from March to June. Likely found in Program area.
- Lillium occidentale - Western lily – state & fed endangered, CNPS list 1B
  Located in bogs, fens, coastal bluff scrub, coastal prairie, marshes and swamps and in openings in north coast coniferous forests at elevations of 6-600'. Western lily is a perennial herb (bulbiferous) that blooms from June to July. Possibly located in program area.
- Montia howelii – Howell's monti – not state listed or fed list, CNPS list 2.2
  Found in meadows and seeps in North coast coniferous forest, also in vernal pools at elevations of 0-1,800 feet. Annual herb blooms March to May. Previously known from Briceland, but currently extant.
- Packera (Senecio) bolanderi var. bolanderi – seacoast ragwort – Not fed or state listed, CNPS list 2.2
  A perennial herb that blooms June-July. Found in coastal scrub and North Coast coniferous forest at elevations of 0-2,000. Occurrences mostly east of Highway 101, though one occurrence in Redway. No occurrences listed for Mattole basin or Program area. Not likely in Program area.
- Piperia candida – white flowered rein orchid – Not Fed or state listed, CNPS list 1B.2.
  Perennial herb, blooms May to September. Found in broadleaved upland forest, lower montane conifer forest and North Coast conifer forest at elevations of 100-3,500 feet. Likely in Program area.
- Polemonium carneum – Oregon polemonium – Not Fed or State listed, CNPS list 2.2.
  Perennial herb, blooms June-August. Found in northern coastal scrub, coastal prairie, and yellow pine forest habitats. One extant location on Bear River Ridge, possibly in Program area as different sources state that the habitat includes lower montane coniferous forest.
- Sidalcea malviflora ssp. Patula – Siskiyou checkerbloom - Not Fed or State listed, CNPS list 1B.2
  Perennial herb blooms May-June. Found possibly in coastal bluff scrub, and definitely on coastal prairie and North Coast coniferous forest at elevations of 50-2,200 feet. Most occurrences in Del Norte County, one occurrence at Big Lagoon in Humboldt County. Possibly in Program area.

Invasive Species

Invasive exotic species can produce negative impacts to native species assemblages and can affect native species diversity. Rare native plant species associated with forest clearings are especially vulnerable to displacement by exotic invasives. The Mattole Watershed Plan has an entire chapter devoted to invasive species. Important elements are excerpted below.

> *In the Mattole watershed, several invasive plant species have the potential to cause large-scale damage to the native biodiversity in the local ecosystem. Currently, there are six known infestations in the Mattole of Japanese knotweed (Polygonum cuspidatum), which is considered one of the "10 most destructive" invasive species causing worldwide damage and loss of biodiversity (Rowe 2004). This plant grows rapidly and forms dense patches, which shades out other plants and prevents native seeds from germinating, creating a monoculture vegetation community. "The extensive rhizome system of this weed can reach 15 to 20 meters in length and enables the plant to achieve early emergence and great height, which combine to shade out other vegetation and reduce native species diversity" (Sukopp and Sukkop 1988).*
>
> *Other invasive weeds found in the Mattole are also on the National Park Service (NPS) list as posing major threats to rare, endangered, or sensitive species. Most notable are Scotch broom (Cytisus scoparius), French broom (Genista monspessulana), pampas/jubata grass (Cortaderia jubata), Himalayan blackberry (Rubus discolor), European beachgrass (Ammophila arenaria), and English ivy (Hedera helix) (NPS 2002). These species are also on the California Invasive Plant Council's List A, Most Invasive Wildland Pest Plants (Cal-IPC 2005). These species are considered aggressive invaders that displace natives and disrupt natural habitats.*
>
> *Invasive species of shrubs and sub-canopy trees have invaded and dramatically altered forest understories throughout California. Scotch broom, French broom and English ivy are especially aggressive, often becoming a canopy dominant in forests. Though not well studied, some suggest that these aggressive invaders replace native herbs while also suppressing the regeneration of native trees (Bossard et al. 2000).*
>
> *Invasive species of ivy can have devastating impacts on forest ecosystems. It is a large problem in the Bear Harbor area in Mendocino County, where several removal projects have occurred (Tasha McKee, pers. comm). There are a handful of ivy sites in the Mattole at this time, most of which have been planted near homes in the Mattole (Maureen Roche, pers. comm.).*
>
> *Scotch broom is a tenacious invader that enjoys full sun as well as a shaded forest. This invasive broom has been observed in some forest understories throughout the Mattole where it can shade out tree seedlings and prevent the reestablishment of native tree species. Scotch broom alters the natural succession in forests and reforestation areas, also creating fire hazard. In the case of a wildfire, Scotch broom can carry flames to the forest*

canopy and increase the frequency and intensity of fires (Parsons 1992, as cited in Bossard et al. 2000).

The table below summarizes the status of invasive species in the watershed.

Table 3-41
Non-Native Plant Species of concern in Mattole

List A	List B	Watch List
English ivy	**bull thistle** (*Cirsium vulgare*)	**European beachgrass** (*Ammophila arenaria*)
French broom	**Canada thistle** (*Cirsium arvense*)	**German ivy** (*Delairea odorata*)
Japanese knotweed	**fennel** (*Foeniculum vulgare*)	**Ox-eye daisy** (*Leucanthemum vulgare*)
pampas grass	**foxglove** (*Digitalis purpurea*)	**purple loosestrife** (*Lythrum salicaria*)
Scotch broom	**Himalayan blackberry** (*Rubus discolor*)	**smooth cordgrass** (*Spartina alterniflora*)
star thistle	**Italian thistle** (*Carduus pycnocephalus*)	
	Klamath weed (*Hypericum perforatum*)	
	pennyroyal (*Mentha pulegium*)	
	periwinkle (*Vinca minor*)	
	poison hemlock (*Conium maculatum*)	
	tansy ragwort (*Senecio jacobea*)	

List A: This list includes highly aggressive invasive species that pose the greatest ecological threats to the Mattole watershed. These are high priority species and will be the focus of most removal projects.
List B: The species on List B have also been identified in the Mattole but cause a lesser degree of ecological damage. These particular plants may not be the focus of removal efforts but still have the potential to spread rapidly. Therefore, many of these species infestations will be monitored closely.
Watch List: This list consists of species that have the potential to spread explosively throughout the watershed, causing large-scale dramatic ecological changes. The species on this list have not yet been identified in the Mattole. European beachgrass was discovered in the King Range but all known infestations have been removed. If any of the Red Alert species are found in the Mattole, local specialists should be notified immediately.

Sudden Oak Death

According to the SuddenOakDeath.org website:

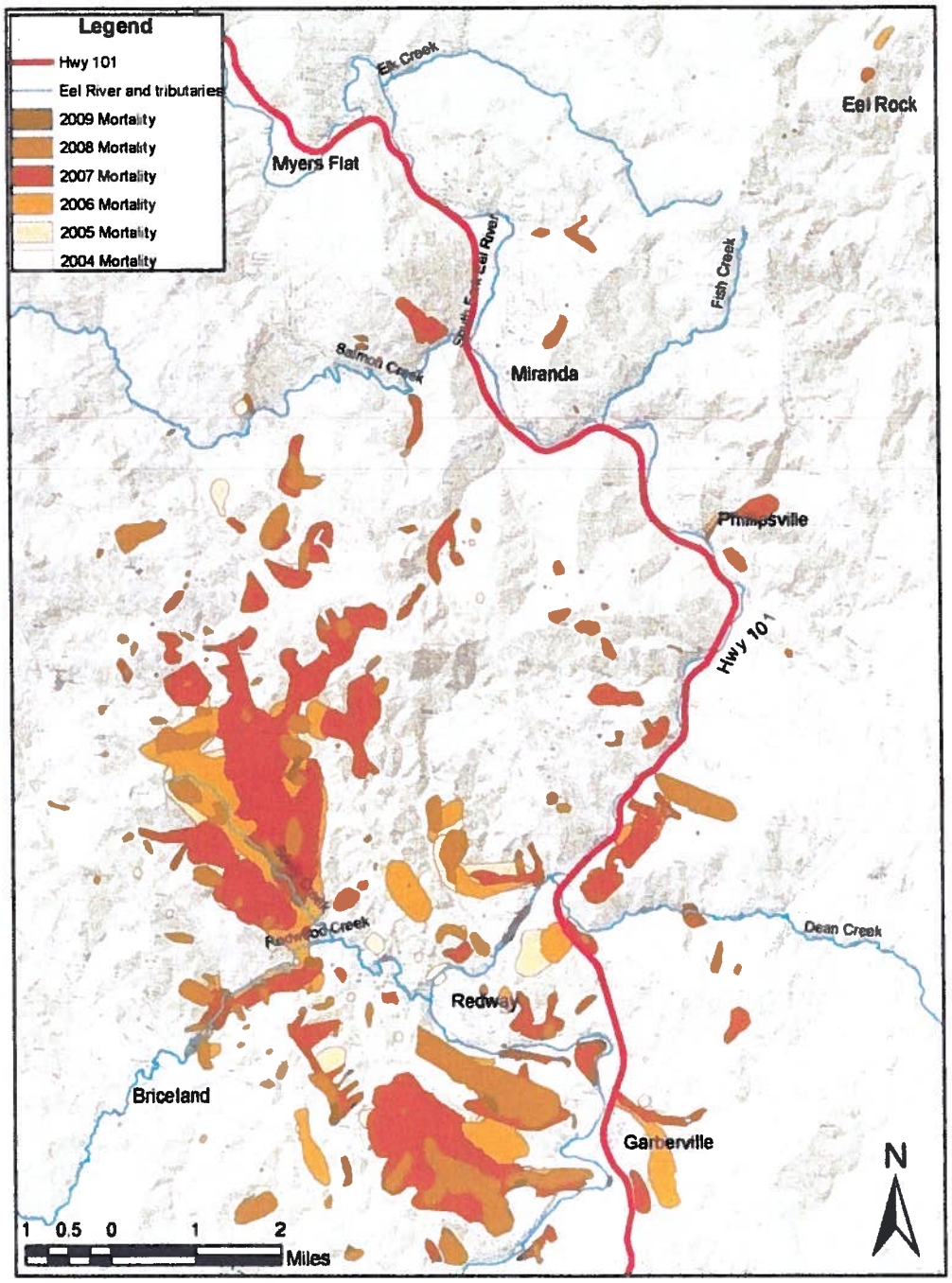
> "*Phytophthora ramorum* is the cause of both Sudden Oak Death (SOD), a forest disease that has resulted in widespread dieback of several tree species in California and Oregon forests, and Ramorum blight, which affects the leaves and twigs of numerous other plants in forests and nurseries.
>
> Since the mid 1990s, *P. ramorum* has caused substantial mortality in tanoak trees and several oak tree species (coast live oak, California black oak, Shreve oak, and canyon live oak), as well as twig and foliar diseases in numerous other plant species, including California bay laurel, Douglas-fir, and coast redwood.
>
> *P. ramorum* thrives in cool, wet climates. In California, coastal evergreen forests and tanoak/redwood forests within the fog belt are the primary habitat. Research in California forests has shown that the greatest predictor of *P. ramorum* is the presence of California bay laurel (*Umbellularia californica*)."

In California, the pathogen is found from Monterey to Humboldt Counties, in redwood/tanoak and coastal evergreen forests. The disease is widespread in Marin, Sonoma, and Santa Cruz Counties, and in the Big Sur area of Monterey County and in Humboldt County in the Redway area and at one spot in Redwood Creek (Y. Valachovic, personal communication). More ominously, SOD has been identified in the Mattole basin in Blue Slide Creek, based on sampling of stream water. Figure 3-12 below shows the extent of infestations in Humboldt County up through 2009, which includes no terrestrial findings in the Mattole. The expansion of SOD in Southern Humboldt has been linked to weather patterns in Northern California, with major expansions occurring after wet springs. According to the National Weather Service, three of the five wettest springs on record happened between 2000 and 2010. These wet springs were followed by much expanded detections the following year.

Most of the infestations are concentrated in urban/wildland interface areas, but some portions of wildlands are heavily affected, such as the Redway area. The counties regulated for SOD at this time (2010) are: Alameda, Contra Costa, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, and portions of Curry County in Oregon. There is a state and federal quarantine preventing transport of infected materials from the infected 14 counties (Zone of Infection or ZOI) to areas outside the infected counties.

Figure 3-12

Southern Humboldt Tanoak Mortality 2004-2009



3.14.2 Regulatory Setting - Vegetation

The federal Endangered Species Act [ESA; 50 Code of Federal Regulations (CFR) Part 17] requires the Secretaries of Commerce and the Interior to list species as threatened or endangered pursuant to procedures established in the Act. Section 7 of the Endangered Species Act directs that Federal agencies must use their regulatory authority to conserve threatened and endangered species and, in consultation with the U.S. Fish & Wildlife Service and NOAA's National Marine Fisheries Service, that the approval agencies ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Section 7 applies to such actions as Federal approval of private activities through the issuance of Federal permits, licenses, or other actions.

The Act prohibits "take" of listed species, including modifying habitat conditions in ways that would adversely affect the species. The Act does authorize the "incidental take" of species (and habitat) pursuant to the consultation process required by Section 7. The primary requirement in the Section 7 consultation process is that the activities proposed to the federal agency not "jeopardize" the continued existence of listed species.

The California Endangered Species Act (CESA; Fish and Game Code §2050 et seq.) prohibits the unauthorized take of birds, mammals, fish, amphibians, reptiles, and plants that are listed as threatened or endangered by the State of California. The CESA also includes prohibitions on "take" for species listed under the Act, and also includes "incidental take permit" authority for the Department of Fish & Game pursuant to otherwise lawful activity, pursuant to § 2081 of CESA.9. The requirements for achieving an Incidental Take Permit pursuant to these regulations are intentionally very similar to those promulgated under the federal act. Impacts to listed species are to be avoided or otherwise mitigated to the greatest extent feasible, and the proposed activity may not jeopardize the continued existence of the listed species.

The state and federal Endangered Species Acts protect the individual plants or animals of species designated as "rare" (state only), "threatened," or "endangered". Both acts protect "critical habitat" of listed wildlife species. However, while the federal ESA also protects the habitats of listed animal species it does not protect plant habitat against removal or disruption.

Besides the ESA and the CESA, the primary laws and regulations that relate to the Program's practices on listed plant species and on late succession forest stands are those contained in the California Forest Practices Act and the Forest Practice Rules. The FPR's contain multiple sections with explicit language related to practices that might impact listed species and late succession forest stands and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to botanical resources.

Section 898.2 and corresponding section 1092.21(d) for PTHPs lists conditions requiring disapproval of plans if the plan as filed would have a significant adverse impact to listed species. THPs are required to document the presence of listed species and include a substantial discussion of listed species in the Cumulative Impacts section. Section 919.16 describes the requirements to which an RPF must adhere when operations might take place in a "late succession forest" stand

as defined in 14CCR 895.1. This is particularly relevant to the Proposed Program since the silvicultural prescriptions are intended to improve and increase late seral stand conditions. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE.

In addition to the regulatory requirements described above and the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2.1 – Program description. These additional Program restrictions include:

- Uneven-aged management only including higher basal area retention requirements
- Snags must be left within all harvest units
- No old-growth trees (established prior to 1850) would be allowed to be cut
- 50% of trees in the largest diameter classes must be retained
- No use of herbicides
- Larger no-cut buffers on Class I & II streams

Sudden Oak Death

Quarantined areas are subject to regulations regarding the movement and use of susceptible plants. County Agricultural Commissioners enforce both California and federal regulations.

The California State Board of Forestry and Fire Protection has approved the establishment of a Zone of Infestation (ZOI) for Sudden Oak Death (SOD) covering all portions of the 14 infested counties identified in the CDFA Section 3700 regulations. Pursuant to 14 CCR 917.9(a) [All Districts], the RPF shall identify feasible measures to mitigate adverse infestation or infection impacts from timber operations (PRC 4527). Other CAL FIRE permitted projects, such as Exemptions, are required to follow all operational rules, and must therefore be conducted in a manner that minimizes the spread of SOD. Before moving susceptible plant material outside the regulated area the County Agricultural Commissioner must issue a permit, or have an active harvest plan that either includes SOD mitigations or has a currently valid, negative finding, "free-from" survey. USDA Forest Service and other agency firewood permits may serve as a permit or compliance agreement.

Current California regulations require a permit for movement of any regulated article from the 14 county regulated area to anywhere outside of those 14 counties. Current federal regulations require a permit (certificate) or treatment before moving any regulated plant material from the 14 infested counties to areas out of the state. Federal rules regulate soil movement from infested counties out of the state, but California does not currently regulate soil movement within the state. Currently there is no provision that allows moving restricted articles (host material susceptible to stem infections - does not apply to redwood and Douglas-fir logs) out-of-state under the federal regulations without removing all bark, or without an approved treatment prior to shipment out-of-state. Even when bark is removed, a certificate must be obtained prior to shipment.

State regulations apply when restricted articles will be leaving the ZOI, and Federal regulations apply if they will be leaving the state. Regulated host material cannot leave the ZOI except as authorized through an approved harvest document with either a valid "free-from" survey or

where mitigations have been addressed minimizing the spread of the pathogen. Mitigation measures must be discussed in harvest documents due to the declarations of the 14-county area as a Zone of Infestation by the Board of Forestry even when host logs are not being moved offsite.

3.14.3 Significance Criteria - Vegetation

Appendix G of the CEQA Guidelines, the CEQA Environmental Checklist poses the following questions to be considered in determining whether the program/alternatives would cause significant impacts to botanical resources:

Would the program:

a) Have an adverse impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status plant species or any of its life forms in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?
b) Have an adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?
c) Have a substantial adverse impact on federally protected wetlands, as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool coastal, etc.), through direct removal, filling, hydrological interruption, or other means?
d) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?
e) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?

Under the Federal Endangered Species Act, activities may not result in the take, direct or indirect, of a listed species. Direct take involves the killing of a listed plant or animal. Indirect take includes the alteration of habitat, harassment and any other activity that may contribute to the reduction in numbers of a listed species.

3.14.4 Determination Threshold - Vegetation

For the purpose of this PTEIR, the following thresholds are used to determine whether there is a substantial adverse impact to botanical resources as a result of implementation of treatments under the Program or any of the Alternatives. A significant impact occurs when there is a:

a) Threat to eliminate a plant community;
b) Violation of any state or federal wildlife protection law; or
c) Contribution directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native species or subspecies at the watershed level.

3.14.5 Data and Assumptions - Vegetation

Special-Status Species

The vegetation in the Mattole basin has evolved in concert with a pattern of frequent disturbances, as described in detail in section 2.0.5. These include frequent landslides that leave exposed soil, periodic windstorms, and wildfires that impact forest stands in a chaotic, mosaic pattern. Through adaptation to disturbance, therefore, all the vegetative types of the basin contain species that can adapt and even thrive through frequent disturbances. The listed species above are all herbaceous plants which are more likely to be found under some forest microsite conditions than others, and it is the maintenance of their habitat type that is key to the long-term viability of any plant population. To the extent that forest management prescriptions implemented under the program mimic the natural disturbance patterns of the vegetation type to which they are applied, it is reasonable to expect the long-term viability of sensitive plant populations to be positive.

However, at the individual project level, there is always the possibility of killing or damaging individuals of a species during treatment implementation. The Forest Practice Rules, acting as the functional equivalent for CEQA, require comprehensive scoping for special status species as part of the preparation of all timber harvesting permits (see THP_BotanicalGuidelines July2005.pdf). At the project level, scoping must identify types of vegetation and habitat found within the PTHP area and potential impacts from proposed management activities. In particular, special habitat features within the forest landscape such as natural openings, rock outcrops, wetlands, and serpentine substrates should be discussed or mapped. Since a landscape level investigation cannot encompass microsite features, the presence of such features merits special attention at the project level.

The species list provided here can serve as a guide in determining which listed species have potential to occur within the Program area and might need to be surveyed for. However, it will still be necessary to check the most recent updates to other information sources such as the NDDB and BIOS available through the DFG Wildlife and Habitat Data Analysis Branch at www.dfg.ca.gov/whdab/html/plants.html. It is important to note that plants which have not previously been found in the Mattole basin according to the NDDB, could still possibly be found there since very few projects requiring plant surveys have been previously implemented in the Mattole.

In the event that surveys are required due to the presence of potential habitat for special status species and the likelihood that project activities could impact individuals or habitat for that species, they must be floristic or comprehensive in nature and not just focused on the list developed during scoping. In any case, the methodology found in "Protocols for Surveying and Evaluating Impacts" from CDFG (Dept of Fish & Game, 11/09) will be followed on a project-by-project basis. Potential direct impacts to botanical resources will be addressed at the project implementation level, in consultation with CDFG, through development of measures that avoid or mitigate impacts to special status plant species.

Invasive Species

Non-native invasive species listed in Table 3-41 respond to clearings that leave exposed soil. Treatments implemented under the Program leave significant amounts of canopy cover post-harvest in general. However, there will still be areas potentially vulnerable to the spread of invasives, such as fresh road cuts and landings. Treatments under Alternatives 1 and 2 leave much larger cleared areas that would be susceptible to the spread of invasives.

The MRC has ongoing programs to address invasive species in the basin, however some monitoring of PTHPs will still be necessary to ensure that any new occurrences of species from Table 3-41 would not go unnoticed.

Sudden Oak Death

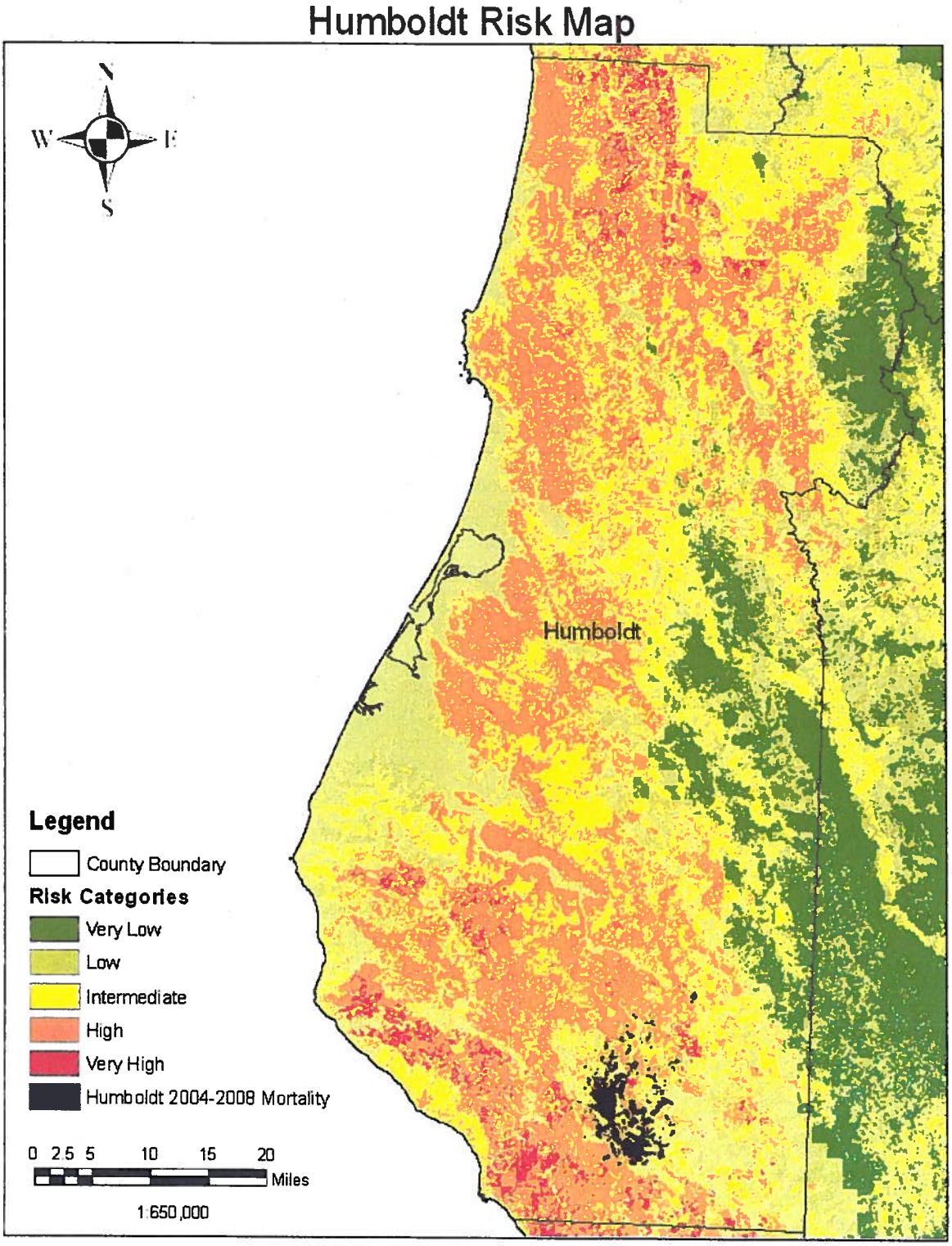
The potential for SOD to have a dramatic impact within the Mattole cannot be overstated. The primary hosts – tanoak and bay – are ubiquitous throughout the watershed, and the mast from tanoak is important to numerous species of animals. Tanoak represents nearly one-third of all trees by basal area and over half of all trees by tree count within the Mattole. Although the potential is dramatic, even in heavily infected areas, not all host trees die. It is expected that if SOD becomes established in the Mattole, infected areas will initially experience heavy tanoak mortality with replacement of tanoak by conifers and other hardwoods. For analytical purposes it is assumed here that about 1,000 acres/year (average of the low infection spread rate in the Southern Humboldt area), would become infected, however this rate of spread is highly speculative.

Although the primary mode of spreading *P. ramorum* is through the air (Rizzo et al. 2005), there is a significant risk of accidental transport of infected material between sites within the quarantine areas if equipment and personnel are not cleaned and disinfected before leaving any SOD-infected site. This is the main mechanism by which Program practices could affect the distribution of *P. ramorum*. Standard preventative practices to be followed in all PTHPs are listed in chapter 2 section C.6.

If infected plants are transported to a suitable environment with suitable hosts, chances are very high that the pathogen will become established. In Program treatments, all vegetative material typically is disposed of or left on site, but there could be accidental transport of vegetative materials off-site via chips, foliage, soil, water, etc. Burning vegetative material on site poses no risk of spread since the organism is killed in the fire. While the risk of spreading the disease is higher if treatments are conducted during the wet season, the Program does not allow ground-based operations during the winter period (November 15 to April 1, and does not allow any operations when there is a chance of more than 0.25" of rain the following day.

Figure 3-13 below shows potential risk in Humboldt County and in the Mattole. Virtually the entire Mattole is at high or very high risk for SOD.

Figure 3-13


Humboldt Risk Map
N
W
E
S
Humboldt
Legend
County Boundary
Risk Categories
Very Low
Low
Intermediate
High
Very High
Humboldt 2004-2008 Mortality
0 2.5 5 10 15 20
Miles
1:650,000

The pathogen does not readily produce spores or spread naturally under dry conditions. Dry soil and organic material will not readily stick to forest workers, their pets, or their equipment.

Infested water has not been proven to be a pathway for P. ramorum to cause new infections in forested areas, but has been shown to cause new infections in nurseries. Hence, drafted water has the potential to spread spores of the pathogen onto roadside hosts during dust abatement operations. Spores of the pathogen have been recovered from water collected beneath infected hosts, as well as from creeks and streams in infested areas. Water is not regulated under either state or federal quarantine regulations. However, some of the practices listed in chapter 2, C.6 are intended to minimize the unintentional introduction of the pathogen.

Standing dead tanoaks pose high fire risk. In Sonoma County, tanoak mortality approaches 100% in some steep inhabited canyons; other parts of the North Coast including the Mattole could soon see similar scenarios. The impact of the spread of SOD on wildland fire behavior is difficult to predict. SOD is almost certain to advance into the Mattole, particularly given the high risk of SOD infection throughout the basin. At an infection rate of 1,000 acres/year (average of the low infection spread rate in the Southern Humboldt area), the spread of SOD is likely to create a substantial adverse impact to fire behavior over time. Within 15 years, at the spread rates above, SOD could easily have a greater impact on the environment than either the Program or the Status Quo. Predicted flame lengths increase from 2.7' to 6.5' in moderate fire weather conditions after tanoak is killed by SOD. Mortality from simulated wildfire is projected to increase from 18% to approximately 45% as a result of SOD mortality. In severe fire weather conditions, SOD affected stands could see a projected increase in flame lengths from 5' to 13' with mortality changes of 55% mortality pre fire to 85% post fire. Over time, killed tanoaks fall over and decay such that their contribution to fuel loading declines at some point after the trees are killed by SOD. A rough estimate might be that a tanoak killed by SOD remains standing for 5-10 years, then falls over and decays at a relatively fast rate. At any one time, there might be as many as 15,000 SOD acres which are likely to have increased wildland fire behavior.

Tanoak acorns are an important mast crop. In low mast years, bears cause increased conifer damage (through stripping bark for food).

Removal of tanoaks from pure or nearly pure stands, such as in large portions of the Mattole watershed, could contribute to increased sediment inputs and bank failures.

Tanoaks support ectomycorrhizal fungi that are important nutrient cyclers and forest products.

Significant losses of tanoaks, acorns and other culturally important plants may threaten north coast tribes' traditional ways of life.

Tanoak mortality affects viewsheds dramatically for at least two years after mass tree death. Sudden Oak Death moves through areas in repeated waves that result in continuous landscapes of brown and skeletal trees.

Forest Habitats

The primary impact to forest habitats, including late-successional stands, in the Mattole from implementing the Program or alternatives is to influence the successional development of forest stands. The commercial forest types where forest management treatments might take place will grow in a predictable trajectory that can be characterized by the WHR classification system. Applying silvicultural prescriptions described in the Program will affect the successional development of stands in different ways depending upon the intensity of the prescription. Some aspects of stand development might be accelerated such as species shift toward conifers and other aspects inhibited such as overall density. Even-aged prescriptions applied in Alternatives 1 and 2 reset the successional development of a stand to an earlier stage, while the selection prescriptions in the Program and Alternative III tend to make adjustments to the path of stand development but do not change it dramatically from a no-management scenario.

Output from the growth and yield model was used to predict the trend in WHR types through time on all the managed land. The results were aggregated at the watershed scale for the footprint acreage in the Program and in each of the alternatives. Results were also summarized for each of the alternatives at the subbasin level. The charts on the following pages provide the context for understanding the broad scale impacts to forest stand conditions in terms of species, size class and density, in the areas where silvicultural treatments are applied. They show which habitat types will be maintained, increased or decreased over time through management.

Figures 3-14 through 3-16 show the trend in WHR types for the whole watershed for the Program and two alternatives. The chart for Alternative II is not shown since it is virtually identical to the Status Quo chart due to having the same suite of prescriptions.

Figure 3-14 - Program Trend in WHR Type

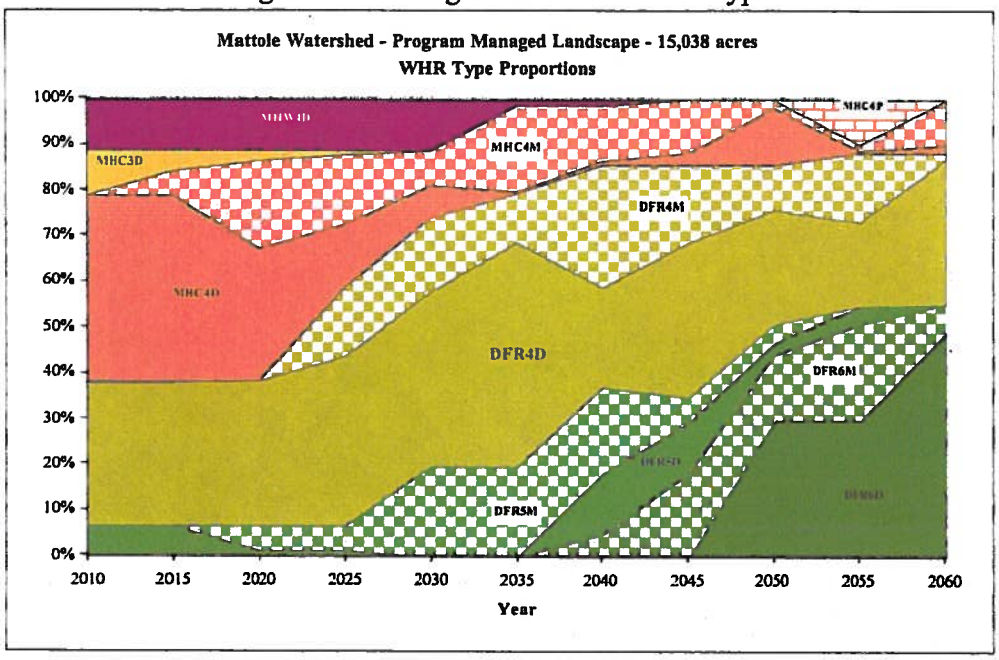


Figure 3-15 - Status Quo (Alt 1) Trend in WHR Type

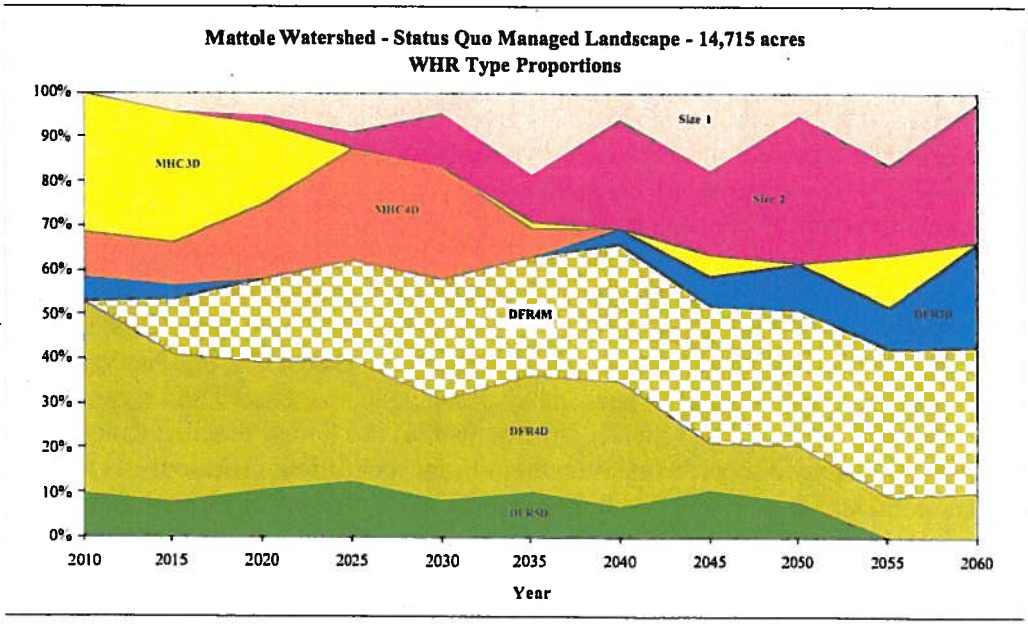
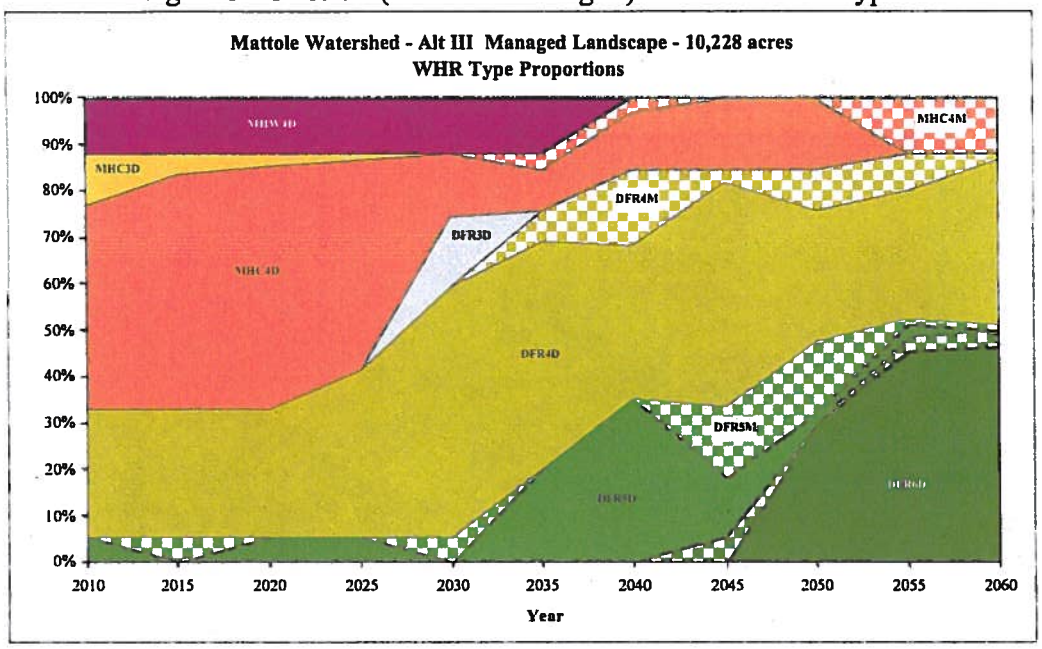


Figure 3-16 - Alt 3 (Fire & Fuels Mgmt) Trend in WHR Type



3.14.6 Direct Impacts From Implementing the Program/Alternatives - Vegetation

Program

Examination of the above figures reveals an obvious trend: under the Program there is a substantial increase in the acreage of WHR types dominated by conifers (mostly Douglas-fir) of larger size classes (the bars shown in shades of green with the notation DFR), and a decrease in the acreage of WHR types dominated by hardwoods (shown in various other colors and labeled as MHW & MHC). These trends are consistent with the Program goals of increasing the average size class and increasing the proportion of conifers in hardwood-dominated stands. Of particular note is the increase under the Program of conifer stands of size classes 5 and 6 from about 6% (960 acres) of the footprint acreage to about 55% (8,270 acres) after 50 years. These WHR classes have an average diameter greater than 24" with class 6 denoting a multi-storied stand. Currently there are no size class 6 stands within the Program landscape, but Program practices are designed to lead to the creation of such stands. Stands of size class 5 and 6 can generally be considered late seral forest. Under the Program as well as the Forest Practice Rules, these stands are required to be managed so as to maintain them in this condition. The analysis here shows that these late seral stands were created through application of the PTEIR prescriptions and their defining characteristics can be maintained by continuing the same style of management.

The MHC and MHW types, which represent stands with greater than 50% hardwood composition, comprise about 60% (9,280 acres) of the footprint acreage in 2010. Through the application of PTEIR prescriptions, the majority of these stands evolve into a conifer classification such that only about 12% (1,800 acres) of the footprint is classified as hardwood dominated by the end of the projection. It is important to note that these stands whose species designation has changed still contain a significant portion of hardwoods. The DFR classification

only requires that greater than 50% of the total canopy cover be Douglas-fir in order to be classified as such. In fact, the growth & yield modeling, which is the basis of all the WHR charts, reveals that the several WHR types that switch species classification begin with 30-38% conifer composition by basal area and develop into stands with 54-61% conifer composition by the end of the planning projection.

Alternative 1 – Status Quo

Conversely, under the status quo (Alt 1), no size class 5 and 6 stands are predicted to develop over the next 50 years on the managed landscape, as commercially valuable conifers are harvested when markets are favorable, consistent with past and current trends. In fact, all the size class 5 that does exist in 2010 is harvested by the end of the projection period. Another noticeable trend in stands managed under the status quo is an increase in the acreage of size classes 1 & 2 from a negligible amount to about one third of the managed landbase (4,960 acres). These are stands with average diameters less than 6".

Alternative 2 – Broader Buffers with Even-aged Management

Impacts to vegetation under this alternative would be virtually the same as Alternative 1 because the standard FPR prescriptions are allowed and would be applied in a similar fashion. The wider watercourse buffers that distinguish this alternative from the status quo don't affect how vegetation is impacted on the managed landbase, because the buffers are off limits to management.

Alternative 3 – Fire & Fuels Management

Examination of the figure for Alternative 3 indicates similarities between the Program and Alternative 3 (although on a much smaller landbase). These correlations are related to the similarities in silvicultural treatments. The main difference in treatments is that Alt. 3 does not allow group selections, which shows up in the chart as much less area in the 'M' (40-60% canopy closure) density class in any given time period. The primary difference in impacts between the Program and Alt 3 is one of magnitude. The program creates about 7,300 acres of late seral stands over the 50 years while Alt 3 creates about 4,700 acres. In addition, about 7,500 acres of hardwood dominated stands transition to conifer under the Program and only about 5,600 acres move into a conifer classification under Alt 3. The expense of more stringent slash treatment requirements is the main reason the Alt 3 footprint is smaller. The result is that stands treated under Alt 3 would have much less vegetation in the understory than in the Program, but this does not affect the WHR classification.

These trends between alternatives tend to be similar across the seven Mattole subbasins, although there is one outlier: the South_1 subbasin, shown below for the Program and Alternative I. Unlike the other subbasins, South_1 is not expected to have any uneven-aged management under the Status Quo due to the pattern of small ownerships and historical trends. The one industrial owner is expected to practice even-aged management, as they have always done in the past, as previously cut-over stands mature enough to support another harvest entry. A relatively small acreage is projected to be managed under the Program. This represents new areas treated rather

than a shifting of management from standard FPR selection to participation in the Program, as is the case in all the other subbasins.

Figure 3-17 - Status Quo (Alt 1) Trend in WHR Type
South_1 Subbasin

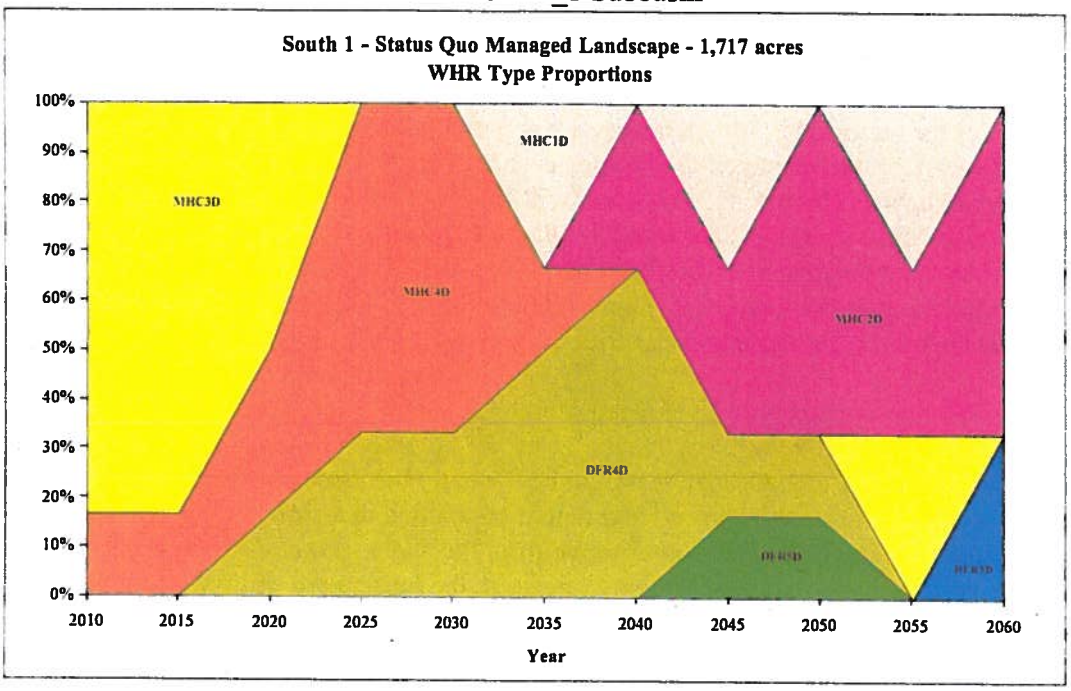
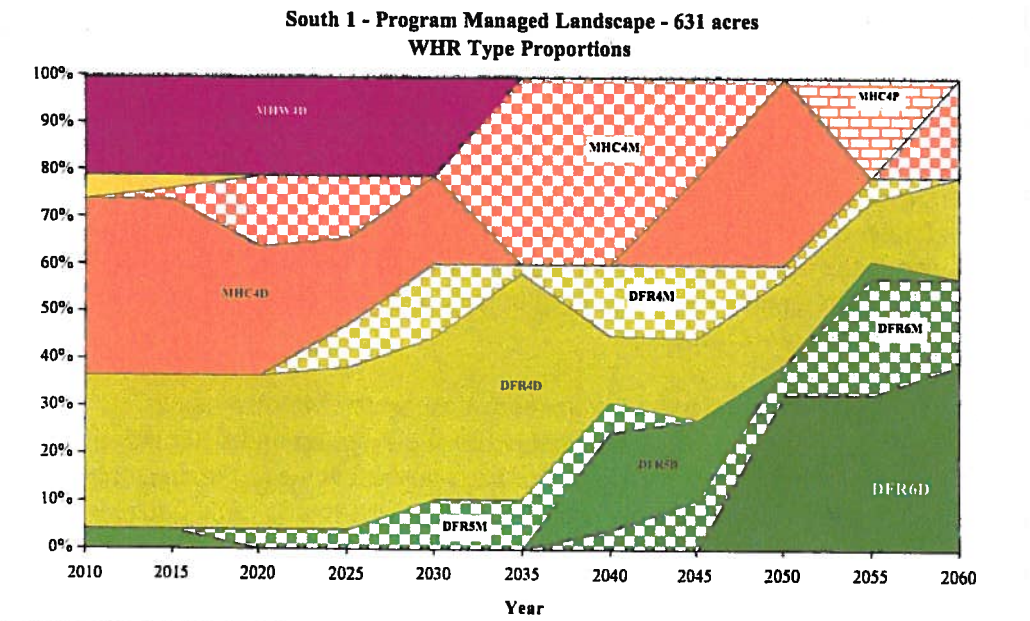


Figure 3-18 - Program Trend in WHR Type
South_1 Subbasin



Special Status Species

Direct impacts to special status species are expected to be less than significant because of the relatively small amount of the landscape treated under each of the alternatives and the measures implemented as a result of conducting scoping and surveys in consultation with DFG. The potential impacts are expected to be similar across all alternatives because the requirements for identifying and protecting Special Status species are the same. They could be considered beneficial because every time a THP or PTHP is prepared, new information is gathered on the presence or absence of Listed species which helps agency biologists improve overall protection strategies. Local DFG staff are particularly interested in more survey information from the Mattole because of the small amount of data gathered to date (Tony Lebanca, pers. Comm.).

3.14.7 Indirect Impacts of Implementing the Program/Alternatives on Vegetation

Indirect impacts come into play after the immediate impacts of a treatment have dissipated and are a function of the desired forest condition and the regeneration process (MRB 2008). These impacts will vary over time as plants respond to seral changes in vegetation structure.

Indirect impacts of timber operations on vegetation are related to changes in habitat conditions (including structure, vegetation composition, soil condition, and microclimate) resulting from treatment. These attributes are often independent of particular silvicultural treatments, since in all cases timber harvest requires removal of individual trees and the creation of openings where those trees stood. Slash must be treated to reduce fire hazard and to open up areas for regeneration. Haul roads must be improved or installed, used and maintained, and are usually decommissioned to some extent after use. Nevertheless, the greater the intensity of the sum of these activities, the greater the potential for changes in microsite conditions for plant propagation on the site. Additionally, many types of timber operations have not been studied enough (particularly in the vegetation types typical of the Mattole) for their long-term impacts to be objectively evaluated. For instance, the all-aged prescription has been developed specifically for the Program, and its impacts have yet to be demonstrated, much less studied.

Sudden Oak Death

There is a state and federal quarantine preventing transport of infected materials from the infected 14 counties to areas outside the infected counties. Despite the quarantine, it is possible that SOD could expand to the Program area via natural wind or other dispersal routes including transport from infected areas outside the Mattole, particularly from Redway into the basin.

Infested areas with high mortality rates typically result in high loading of dead fuels in the forest. This issue is likely to increase in the future as only 20% of the predicted high risk area for infection in California has been impacted as of 2007 and the disease is expected to spread throughout the entire high risk area eventually (Meentemeyer 2004). The high risk area includes the range of tanoak (*Lithocarpus densiflorus*).

3.14.8 Determination of Significance - Vegetation

Table 3-42 summarizes the potential environmental impacts to Special Status Species associated with implementation of the Program or Alternatives.

Table 3-42
Summary Of Impacts to Special Status Species[1/] From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

Implementation of the Program or any of the three alternatives will not be extensive enough in terms of the acreage treated each year, or damaging enough in terms of adverse alterations to natural vegetation types, to create any direct threat to populations of special status plant species. Oversight by the Board of Forestry and CAL FIRE and required adherence to the California Forest Practice Rules in all timber operations, indicates that no significant impacts are likely to occur from the application of the Program or Alternatives 2 or 3.

Table 3-43 summarizes the potential environmental impacts to LateSuccession Forests associated with implementation of the Program or Alternatives.

Table 3-43
Summary Of Impacts to Late Succession Forests[1/] From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	PS	LS	LS
East_2	LS	PS	LS	LS
North_1	LS	PS	LS	LS
North_2	LS	PS	LS	LS
South_1	LS	PS	LS	LS
West_1	LS	PS	LS	LS
West_2	LS	PS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

Program

Over the length of the analysis period, the Program is expected to have a beneficial effect on late seral forest characteristics, as more well developed size class 5 and 6 stands, combined with the larger (than the FPR's) WLPZs add to the extent of late seral timber types over the Program area. As stated numerous times in this PTEIR, stands with late seral characteristics must be managed

to maintain or enhance such characteristics. The stated overall goal of the program is to nurture the development of well-stocked older forests types that can be managed with light touch silviculture. There is a relatively high confidence associated with the prediction of changes in forest habitats from treatments under the Proposed Program. The scale of treatments analyzed is assumed to be on the high side in order to conservatively predict any potential negative impacts, but in regard to developing late seral conditions, more treatments are better.

Alternative 1 – Status Quo

Alternative I is expected to have a potentially significant impact to late seral forest characteristics due to the reliance on more intensive silvicultural practices. Even though the FPRs don't allow the degradation of late succession forest stands, this only applies if they are greater than 20 acres in size. Most of the DFR5 stands that currently exist in the Mattole are less than 20 acres. It is projected that these would be harvested under the status quo due to their commercial value, and no stands within the footprint would be allowed to grow into late seral conditions.

Alternative 2 – Broader Buffers with Even-aged Mgmt

Alternative II is very similar to the status quo on the treated acres, but there are large no-cut areas around streams and unstable zones mixed in the footprint acreage. Therefore, the impacts from this alternative were graded to be less than significant.

Alternative 3 – Fire & Fuels Mgmt

Alternative 3 is also expected to create a beneficial impact to late seral forest conditions, although somewhat less than the Program due to its smaller footprint.

Summary

Because no significant impacts to special status plant species or late-succession forest are expected to occur as a result of implementing the Program or alternatives 2 or 3, no mitigation measures are considered necessary to avoid significant impacts to these resource elements. Minimizing the spread of SOD does require some preventative practices to be followed, but these are included in chapter 2 as standard practices in the Program.

SOD is more likely to be transported by non-Program activities than by Program practices, given the limitations on Program operations during the wet season and the requirement to use best management practices. Program implementation adhering to the best management practices outlined in 2.C.6, will reduce to less than significant, the potential to spread SOD.

With the application of the standard practices previously described, neither the proposed Program nor any of the alternatives are likely to a) threaten to eliminate a plant community, or b) violate any state or federal wildlife protection law; or c) contribute directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any

native species or subspecies at the watershed level.

3.14.9 Similar Impacts Described Elsewhere - Vegetation

The impacts to wildlife in Chapter 3.18 are similar to the impacts to Vegetation. Much of the same baseline data about forest habitats was used in the analysis for both plants and wildlife.

3.14.10 Mitigation Measures for the Proposed Program - Vegetation

No significant impacts to vegetation will arise from implementing the Program, so no mitigations are required.

3.14.11 Literature Cited - Vegetation

Meetenmeyer, Ross, David Rizzo, Walter Mark, Elizabeth Lotz. 2004. Mapping the risk of establishment and spread of sudden oak death in California. Forest Ecology and Management. V200 (2004), 195-214.

Rizzo, D.M., Garbelotto, M. & Hansen, E. (2005) Phytophthora ramorum: Integrative research and management of an emerging pathogen in California and Oregon forests. Annual Review of Phytopathology 43, 309-335.

3.15 Impacts of Program/Alternative Implementation on Visual\Aesthetic Resources

This section summarizes the impacts to visual and aesthetic resources due to implementing either the Proposed Program or any of the alternatives.

3.15.1 Environmental Setting Visual\Aesthetic Resources

The assessment area for assessing the direct impacts from implementing the Program's or one of the alternatives' practices on visual/aesthetic resources is the Program area itself. The FPR-prescribed area for analyzing visual resources is the area within three miles of the timber operations area. There is an estimated 100 miles of public roads within the Mattole basin from which the public might be able to view portions of the Program area. A three-mile buffer around all of these roads encompasses virtually the entire Mattole basin. In addition large portions of the Program area are potentially visible from many of the public (BLM) parcels that are used primarily for recreation, such as the KRNCA. An exception is the North_1 subbasin, where Program-affected areas are more than three miles distant from most public roads or lands.

The Program area is heavily forested with interspersed prairies and oak woodlands. The Mattole basin and the Program area are bisected SE to NW by the Mattole river. The area is rural, with an approximate density of 2000 persons living on 189,000 acres. Numerous power lines cross the assessment area. Elevations in the basin run from 0' at the mouth of Mattole to over 4,000' at the top of Kings Peak. Much of the basin is steep and rugged and many views of potential treatment areas are fleeting. About 5% of the watershed is 0-10% slope, 12% is 11-25%, 61% is 26-60% slope, 21% is 61-100% slope, and 1% is more than 100% slope (NCRWQCB 2002). Important visual resources in the basin include sites of significant scenic value and wetlands, lagoons, streams, estuaries, and marine environments within the Coastal Zone (see Regulatory Setting below), although as described below most of these are not within the Program area. Other visual resources included scenic road corridors such as the Mattole Road and Kings Peak Road, the KRNCA, and parks such as the A.W. Way County Park.

3.15.2 Regulatory Setting Visual\Aesthetic Resources

The Forest Practices Act (the Z'Berg-Nejedly Forest Practice Act of 1973) does not make any statements about visual or aesthetic resources. However, in Section 4512 it makes reference to the Act's intent to protect the "forest resources" of the state. Although forest resources are not defined in the Act, Section 1600, Definitions of the FPR's, contains the following definition:

> *"**Forest Resources**" means those uses and values associated with, attainable from, or closely tied to, forested landscapes, and includes but is not limited to aesthetics, fish, forage, recreation, soil, timber, water and watersheds, wilderness, and wildlife."*

The FPR's contain the following definition of Visual Resources, which includes direction as to determination of visual resources for assessment in timber operations:

> *E. VISUAL RESOURCES: The visual assessment area is generally the logging area that is readily visible to significant numbers of people who are no further than three miles from the timber operation. To assess visual cumulative impacts:*
>
> *1. Identify any Special Treatment Areas designated as such by the Board because of their visual values.*
>
> *2. Determine how far the proposed timber operation is from the nearest point that significant numbers of people can view the timber operation. At distances of greater than 3 miles from viewing points activities are not easily discernible and will be less significant.*
>
> *3. Identify the manner in which the public identified in 1 and 2 above will view the proposed timber operation (from a vehicle on a public road, from a stationary public viewing point or from a pedestrian pathway).*

Aesthetics and visual resources are also addressed several more times in the FPR's, including Section 912.9, Cumulative Impacts Assessment - Technical Rule Addendum No. 2, 913.6, Alternative Prescriptions, 921.6, Hazard Reduction, 1109.2, Public Interest, and 4593, Legislative findings and declaration.

Portions of the Program area are contained within the Coastal Zone, which is defined in the California Coastal Act as

> *"30103. (a) "Coastal zone" means that land and water area of the State of California...specified on the maps identified and set forth in Section 17 of that chapter of the Statutes of the 1975-76 Regular Session enacting this division, extending seaward to the state's outer limit of jurisdiction, including all offshore islands, and extending inland generally 1,000 yards from the mean high tide line of the sea. In significant coastal estuarine, habitat, and recreational areas it extends inland to the first major ridgeline paralleling the sea or five miles from the mean high tide line of the sea, whichever is less... "(http://www.coastal.ca.gov).*

The above definition is relevant to the definition of Coastal Commission Special Treatment Areas contained in the FPR's and excerpted below (with <u>underline</u> added in this document for emphasis)

> *"Coastal Commission Special Treatment Area: (For the Coast Forest District:) means an identifiable and geographically bounded forest area designated within the Coastal Zone that constitutes a significant wildlife and/or plant habitat area, area of special scenic significance, and any land where timber operations could adversely affect public recreation areas or the biological productivity of any wetland, estuary, or stream especially valuable because of its role in a coastal ecosystem1 (Ref.: Sec. 31118.5, PRC).*

1 All Coastal Commission Special Treatment Areas were adopted by the Coastal Commission on July 5, 1977, and they include several specially identified areas, buffer zones adjacent to designated highways within Coastal Scenic View Corridors, and buffer zone adjacent to publicly owned preserves and recreation areas. Maps or designations of Coastal Commission Special Treatment Areas are on file in Department offices in the Coast Forest District. Coastal Commission Special Treatment Areas have been designated according to the following criteria:

A. Scenic View Corridors,
B. Sites of significant scenic value,
C. Wetlands, lagoons, streams, estuaries, and marine environments,
D. Significant animal and plant habitat areas,
E. Recreation areas.

The Coastal Commission has also set forth in its designations special management objectives considered essential by the Coastal Commission for the protection of public values within the Coastal Zone. The following is a listing of the Coastal Commission Special Treatment Areas. In parentheses following the name of each area are capital letters indicating the specific criteria as listed above. The letters referencing the criteria are listed in order of priority of the significance of the various criteria applicable to the area.

***(a)** Del Norte County: Elk Creek Valley (C), Sitka Spruce Grove (D,A), False Klamath Cove (B,A), Klamath River (B,A,C).*

***(b)** Humboldt County: Freshwater Lagoon (B,C,E), Stone Lagoon (A,B,C,E), Big Lagoon (A,C,B), Big Lagoon Bog (B,C,E), Agate Beach Bluff (B,A), Mattole River (B,C)*

The primary direction in the FPR's for the Coast Forest District in regard to the Coastal Zone and Coastal Commission Special Treatment Areas is contained in Section 921.3, Silvicultural Methods [Coast, Special Treatment Area], which specifies limitations to silvicultural prescriptions designed to protect visual and aesthetic resources. These are discussed in more detail in the analysis below. In addition, Section 1092.01, PTEIR and PTHP, specifically notes that aesthetics must be considered in PTEIRs and impacts addressed in the PTHP Checklist.

3.15.3 Significance Criteria Visual\Aesthetic Resources

According to Appendix G of the CEQA Guidelines: the CEQA Environmental Checklist, an aesthetic impact would be considered significant if the Program and Alternatives would:

a) Have an adverse effect on a scenic vista;
b) Damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway; or
c) Degrade the existing visual character or quality of the site and its surroundings.

3.15.4 Determination Threshold Visual\Aesthetic Resources

Visual impacts from the program would be considered significant if the acreage of treatments caused adverse and long term impacts, as determined through the analysis process, exceeding

more than 10% of the scenic vistas or the existing visual quality, caused damage to 10% of the scenic resources within the Program area, or degraded more than 10% of the visual character of the operations sites of a PTHP and its surroundings in any 10 year period. Such impacts would be considered particularly significant if they occurred within the Coastal Commission Special Treatment Areas in the Mattole basin.

3.15.5 Data and Assumptions Visual\Aesthetic Resources

The following items are the most important factors to consider in determining whether a project will have a significant effect on aesthetics.

The potential for and frequency of viewing by the general public

The aesthetic impacts of a project are more likely to be significant if they are highly visible to large numbers of the public over an extended period of time. Projects occurring within sight of major roads or within the Wildland Urban Interface may impact the aesthetics for large numbers of people. Projects that are adjacent to rural residential properties may impact only small numbers of people but over a longer period of time. Projects in remote portions of the landscape, behind locked gates or obscured by vegetation or ridgelines are less likely to significantly impact aesthetics. Changes to views that are seen by limited numbers of people or for only limited duration may be found to be less than significant.

In terms of the Coastal Zone and Coastal Commission Special Treatment Areas, only the extreme western portions of the West_1 and North_1 subbasins potentially lie within these zones. And, as shown on the Ownership Class Map (Figure 2-1) much of this area is occupied by Federal land and would not be affected by the Program or alternatives.

In addition, as noted above, only small portions of the North_1 subbasin are within 3 miles of public roads or public land and therefore visible to the public; operations in this subbasin are therefore assumed to have a low potential to affect visual/aesthetic resources compared to the remainder of the program area. However, as also noted above, the remainder of the watershed is typically visible from one of the main public roads, though the limited acreage of the Program is likely to be only sporadically visible.

The integrity and uniqueness of the existing aesthetic resource

The magnitude of change necessary to create a significant impact to aesthetics is greater in a disturbed or non-unique environment than in a pristine or rare environment. In managed wildland environments, vegetation manipulation is not generally presumed to have a significant adverse effect on aesthetics whereas the same treatment in, for instance, a state park may be significant. Also, vegetation treatments in an area that is typically managed for timber harvest (e.g., surrounded by industrial forestlands), may represent a relatively minor aesthetic change compared to ongoing timber management in the surrounding area. Changes to aesthetics where the area has little integrity or uniqueness may be found to be less than significant.

The magnitude of the change

Projects that are small in size or minimal in their physical changes to the environment are unlikely to cause a significant impact to aesthetics. Aesthetic changes associated with an individual project may appear significant, but in the context of the assessment area may be relatively minor. Treatments which remove most or all of the primary vegetation layer, such as clearcutting, group selection or variable retention will have a much greater impact than treatments which remove relative small proportions of the primary layer at any one entry, such as single tree selection or commercial thinning. Changes to aesthetics where the change is minor may be found to be less than significant.

For the purposes of analysis of direct impacts in the following section, even-aged management is estimated to create a negative effect to visual resources, at least in the short term, while uneven-aged management is expected to have little effect to these resources. As described in the PTEIR Methodology in Chapter 2, Alternative I and Alternative II are estimated to apply even-aged management across 30% of their 'footprint' acres. The Program utilizes no even-aged management, but does permit group selection openings under the group selection and all-aged prescriptions; for analysis purposes, group selection openings are estimated to occupy 10% of the footprint acres of the Program. Alternative III utilizes no even-aged management nor group selection, and requires 60% canopy retention in all harvested areas.

Based on these factors, aesthetic impacts on a programmatic scale were analyzed by assessing the number of acres ascribed to the Program or the three alternatives that are likely to create an adverse visual effect vs. those that disturb less of the scenic values, ranked against the estimated presence of the above-noted factors. Because there is no way to project where such impacts may occur and because much of the landscape within the Program area is within 3 miles of a public viewpoint, the acres of harvest type are the primary criterion used to evaluate the amount of visual/aesthetic impacts by alternative. In order to calculate the potential treatment acreage that actually occurs in a scenic vista or that contains significant aesthetic values, it was assumed that 50% of the treatments are proportionally distributed between areas where an effect would be visible or substantial and 50% in the remainder of the landscape, in the Program area.

3.15.6 Direct Impacts From Implementing the Program/Alternatives

Table 3-44 below summarizes the acreage predicted to have an adverse effect to visual/aesthetic resources from implementing the Program or alternatives in each of the subbasins.

Table 3-44
Potential Visually Adverse Footprint Harvest Acres by Program/Alternative[1/]

Subbasin	Program[2/]	Alternative I[3/]	Alternative II[4/]	Alternative III[5/]
East_1	133	293	409	0
East_2	83	116	312	0
North_1	215	800	596	0
North_2	147	644	366	0
South_1	32	258	98	0
West_1	87	42	344	0
West_2	55	57	185	0
TOTAL	752	2207	2310	0

1/Harvest acreage likely to have a negative effect to visual resources/aesthetics based on amount of primary canopy layer removed (acreage of even-aged vs. uneven-aged management) and estimated 50% visibility of treatment acreage from public roads or public lands.
2/Program acres = Footprint acres x 0.10 (estimated group selection openings x 0.50 (estimated visible acres)
3/Alternative I = Footprint acres x 0.30 (estimated even-aged prescriptions) x 0.50 (estimated visible acres)
4/Alternative II = Footprint acres x 0.30 (estimated even-aged prescriptions) x 0.50 (estimated visible acres)
5/Alternative III = Estimated at 0 adversely affected acres because no even-aged management and no group selection, plus mandatory 60% canopy retention

Impacts from Program and Alternatives

The Program would create up to 752 acres of openings over the next 50 years. These are group openings limited to 2.5 acres in size, and any such openings over 1 acre in size must contain 15 sq ft/basal area in retention trees. These impacts would be most visible during and immediately following logging operations and would essentially disappear from scenic vistas as they are regenerated.

Alternative I utilizes even-aged harvest, such as clearcutting, on a relatively high acreage: 644 acres within the North_1 subbasin, which has a moderate chance of being viewed from public roads or public lands. In the South_1 subbasin this alternative utilizes even-aged management over 258 acres within a relatively short portion of the analysis period, from 2035-2060. While it similarly affects an even higher acreage, 800 acres, in the North_1 subbasin, this subbasin, as noted, has a low degree of public visibility. In the remaining four subbasins the acreage affected is quite low compared to the overall area of the subbasins.

Alternative II is projected to impact 596 acres in the North_1 subbasin; but since this subbasin is rated as having very low potential visibility there would be little if any negative impact to visual resources. Alternative II would affect relatively high acreages, 366 and 364 acres respectively, in the North_2 and West_1 subbasins, which could be treated by even-aged management and be potentially visible from public roads or public lands. In the remaining five subbasins, the acreage affected by FPR even-aged management under Alternative II is low compared to the overall subbasin areas.

Alternative III creates relatively little disturbance to the existing forest cover, in that no openings are created and 60% of the overstory canopy must be retained within harvest units at all times. This type of light touch harvesting would likely be indistinguishable from several types of

unmanaged stands, particularly from a distance, and would be less visible than typical harvest units implemented outside the program (which are analyzed in Chapter 4, Cumulative Impact Assessment). For these reasons the acres of impacted visual and aesthetic resources created by Alternative III are rated as zero.

Impacts to Coastal Commission Special Treatment Area

As noted in the sections above, the most critical area recognized in state law and regulation in terms of potential impacts to visual and aesthetic resources is the Coastal Zone and corresponding Coastal Commission Special Treatment Area. This special treatment area is limited to the first ridgeline visible from the mean high tide line on the coast and/or 5 miles from the mean high tide line. In the Program area the special treatment zone is limited to the extreme western portion of the West_1 and North_1 subbasins, and the Ownership Class Map (Figure 2-1) shows much of this area to be occupied by federal land and thus outside the potential area of treatment from the Program or alternatives. It is possible that a direct view from the mouth of the Mattole River looking east could take in private lands that could be affected by the Program or alternatives. In terms of visual and aesthetic affects, however any such impacts must be disclosed during the PTHP process, as noted in the Regulatory Environment Section above, and would have to be mitigated as guided by the FPR's. Impacts to the Coastal Commission Special Treatment Area from the Program or Alternatives 1, 2, or 3 during the 50-year Program analysis period are therefore expected to be less than significant.

3.15.7 Indirect Impacts of Implementing the Program/Alternatives Visual\Aesthetic Resources

Indirect impacts to visual resources could result from wildfire ignition caused by timber operations, which could spread beyond the boundaries of the treatment area and reduce the quality of visual and aesthetic resources by creating highly visible blackened areas. While certainly possible, this effect is considered relatively unlikely. (See the Wildfire Impacts Section 3.17 for a more thorough evaluation of the potential for fire starts from logging operations and the potential for fires to affect the landscape.)

3.15.8 Determination of Significance Visual\Aesthetic Resources

Table 3-45 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-45
Summary Of Impacts[1/]
To Visual and Aesthetic Resources
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The Program is expected to create a less than significant adverse effect to visual and aesthetic resources because, in addition to the retention requirements and limited size of group openings associated with its silvicultural treatments, as well as rapid regeneration of cutover areas, it would negatively impact less than 1% of the commercial forest acreage in the Program area and less than 1% of the most impacted subbasin.

Alternative 1 is expected to create a less than significant adverse effect to visual and aesthetic resources because, although it would impact substantially more acreage than the Program, the cumulative impact would still total no more than 2% of the commercial forest acreage in the Program area and only around 4% of the most affected subbasin, the North_2 subbasin (although about 5% of the North_1 subbasin could be impacted, this subbasin, as noted, has little public visibility).

Alternative II is expected to create a less than significant adverse effect to visual and aesthetic resources because, although it would impact the most acres of any of the alternatives, this would still total no more than 2% of the commercial forest acreage in the Program area, and only around 2% of the most affected subbasin, the East_1 subbasin (although about 4% of the North_1 subbasin could be impacted, this subbasin, as noted, has little public visibility).

Alternative III is expected to create a less than significant impact to visual and aesthetic resources over the 50-year analysis period because it creates relatively little disturbance to the existing forest cover, and acres harvested are considered essentially invisible in terms of visual quality, as discussed above. Although there might be some diminution of visual resources immediately adjacent to a public road, any such effects would be less than significant.

3.15.9 Similar Impacts Described Elsewhere Visual\Aesthetic Resources

Impacts to visual and aesthetic resources are not very similar to any of the other resource areas described elsewhere. They have some correspondence with impacts to vegetation (Section 3.14) because changes in vegetation caused by the Program or alternatives are essentially responsible for impacts to visual/aesthetic resources. However, visual and aesthetic resources are impacts to

human perception and human values and not to natural resources per se, so there is little direct correlation in terms of analysis of impacts.

3.15.10 Mitigation Measures for the Proposed Program Visual\Aesthetic Resources

No significant effects on visual and aesthetic resources are expected from implementing the program, so no mitigations are required.

3.15.11 Literature Cited Visual\Aesthetic Resources

NCRWQCB (North Coast Regional Water Quality Control Board). 2002. Mattole River Watershed, Technical Support Document for the Total Maximum Daily Loads for Sediment and Temperature. Draft for Public Review.

3.16 Impacts of Program/Alternative Implementation on Water Quality

This section analyzes the potential impacts to water quality and peak flows due to implementing either the Proposed Program or any of the Alternatives.

3.16.1 Environmental Setting-Water Quality

The assessment area for assessing the direct impacts from implementing the Program's practices on water quality is the Program area itself.

The quality and quantity of water produced by the Mattole supports a broad range of uses referred to as beneficial uses. The alteration of vegetative cover from Program practices can have significant impacts on water infiltration, soil erosion, stream sedimentation, and water temperature. This in turn has the potential to degrade or limit the beneficial uses supported by the waters of the Mattole.

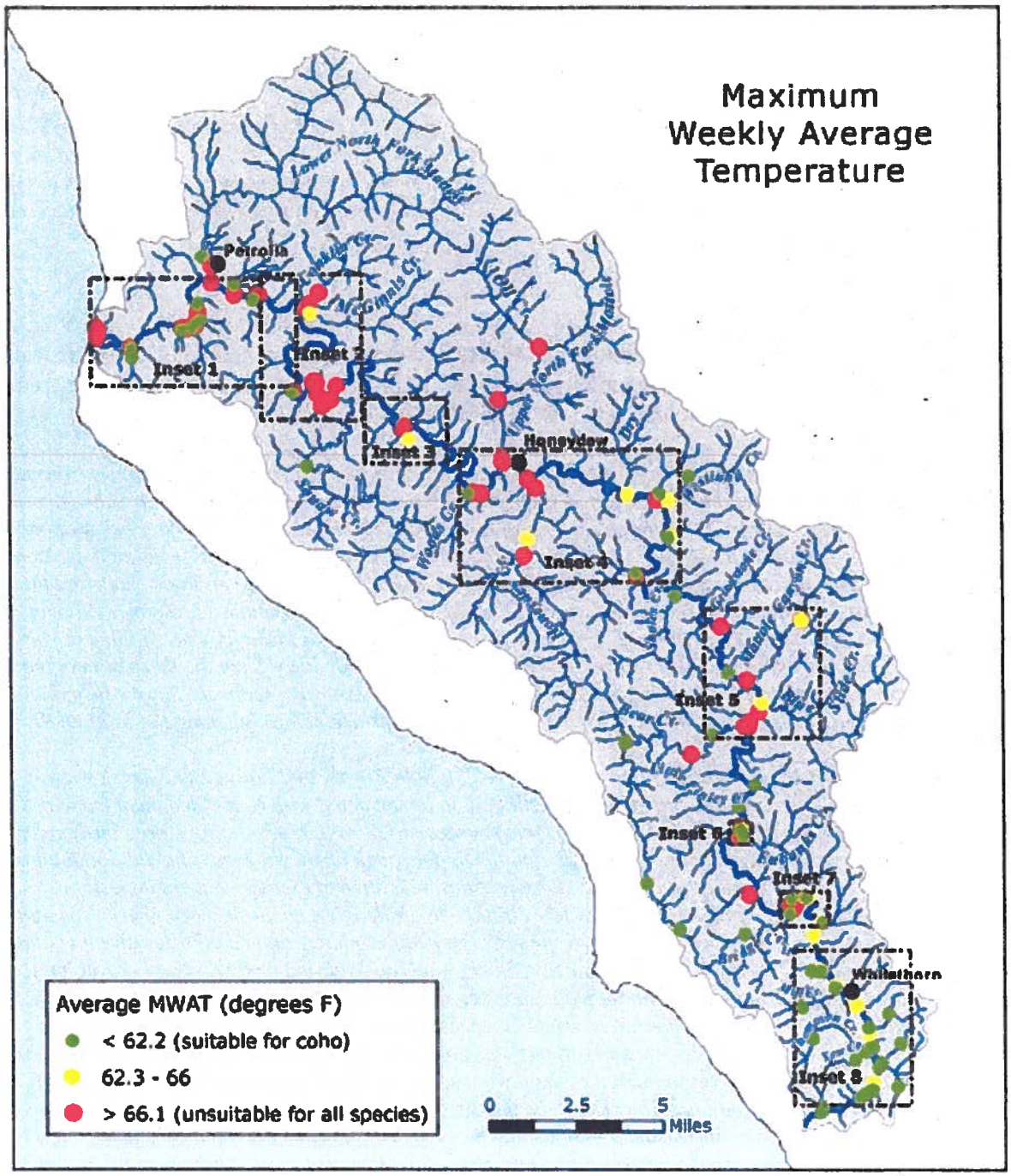
An overview of water quality in the Program area has previously been discussed in chapter 2.0.7 and is not repeated here. Based on a review of CEQA Appendix G, the existing TMDL and NCWAP documents for the Mattole basin, public scoping comments and FPR Technical Rule Addendum 2 the following specific topics were selected for analysis within this Water Quality section: water temperature, sediment loading, peak flows and chemical contamination.

Temperature

The overriding concerns as to water quality are elevated sediment and temperature levels, which have had deleterious impacts to salmonids and other aquatic species. A substantial portion of the discussion in chapter 2.0.6 is dedicated to the impacts to water quality from deleterious water temperatures in the basin. An illustration of the temperature situation is shown below in Figure 3-19 (from MRRP 2009) which shows how temperatures are cooler in the upper basin whereas they become deleterious to fish species in the middle and lower basin areas. The following excerpts from NCWAP characterize the temperature situation within the Program area and in the basin:

> *"Temperature extremes as maximum weekly average temperatures (MWATs) and instantaneous maximums detrimental to salmonids are affecting the lower gradient, downstream reaches of nearly all of the larger tributaries to the Mattole River. This includes the North Fork (NFK) and Upper North Fork (UNFK) Mattole Rivers, Honeydew, Blue Slide, Bear, Mattole Canyon, and Squaw Creeks. The following table shows that the aforementioned larger tributaries all exceeded the fully unsuitable MWAT extreme of 68°F within a maximum of two miles upstream from the mainstem. Average maximum temperatures in the largest streams, except Bear and Squaw Creeks, exceeded the 75°F range deemed unsuitable for salmonid survival. The remaining tributaries in the following table are, in general, smaller in stream length and basin size than the previously cited streams, and most had MWATs and instantaneous maximum temperatures that were within varying degrees of suitability for salmonids. The only exception was an MWAT of 67.9°F at Westlund Creek, a temperature considered moderately unsuitable for salmonids.*

Figure 3-19



Temperature may currently be impacting the salmonid fisheries and other beneficial uses of water in some isolated tributaries for an unknown distance upstream from their confluences with the mainstem, such as Bridge, Squaw, Westlund, and Dry Creeks. Presently there is insufficient data to properly assess the upstream reaches of these tributaries. The latter tributaries had

thermographs placed only within 0.1miles upstream from their confluences with the mainstem. Except Bridge Creek, with an average temperature of 62.4°F, all had average MWATS over 65°F that are presumed representative of a thermal reach for some distance upstream. In all likelihood, the same tributaries probably had temperatures for an unknown distance upstream that may have been between 64-66°F, the ranges determined to be between somewhat suitable, somewhat unsuitable, and fully unsuitable for salmonids. Bridge Creek's 62.4°F average MWAT for all record years did have individual MWATs of 63.9°F and 65.0°F during 1996 and 1998, respectively, but during 1999 and 2001, fluctuated near the upper 60°F range considered suitable for salmonids. Additional monitoring would be necessary at the mid- and upstream reaches of these particular watercourses to determine if MWATs remain elevated, stabilize, and/or decrease over prolonged sampling periods."

Sediment

Chapter 2.0.7 briefly describes sediment as adversely affecting the beneficial uses of the water bodies in the Mattole. A more complete description of the sediment situation in the Program area and in the Mattole is excerpted below from NCWAP.

"Available evidence indicates that sediment is likely currently impacting the salmonid fisheries and other beneficial uses of water in the estuary, the mainstem up to the Southern Subbasin, and the lower gradient, downstream reaches of Lower North Fork and Upper North Fork Mattole Rivers, Lower Bear, Mattole Canyon, and Squaw Creeks. Observations by professionals, local residents, and time sequenced aerial photographs, and CGS's NCWAP analysis show that the low gradient, downstream reaches of nearly all of the preceding watercourses have open alluvial floodplains with numerous mid- and side channel gravel bars, and shallow pools filled to varying degrees with fine sediment. Recent eyewitness accounts and videos from the thermal imaging overflight during 2001 show Mattole Canyon Creek with extensive sedimentation at its mouth that resulted in the stream drying up, possibly flowing subsurface before reaching the Mattole River.

The Lower North Fork and Upper North Fork Mattole Rivers, and Lower Bear Creek were mapped, analyzed, and found, in all likelihood, to be impacted with excess sediment from a combination of natural and anthropogenic sources. CGS's NCWAP analysis, previously referred to, show the lower reaches of each stream flowing through open, widened, alluvial floodplains with a number of mapped channel characteristics indicative of excess sediment deposition. CGS's assessment also agrees with low altitude, live video footage from recent thermal imaging profiles flown along the three watercourses. The profiles photographed all three-stream systems with features, such as elevated alluvial terraces, mid- and side channel sand and gravel bars, and displaced riparian vegetation indicating excess sediment may be impairing the beneficial uses of water in their lower reaches (Watershed Sciences, 2002). The observations of residents and others familiar with these stream systems also corroborate the various agencies' conclusions that excess sediment has accumulated in the lower reaches of these streams (MSG, 1997). Field observations by Regional Board staff during 2000 and 2001 indicate that all three watercourses are slowly downcutting through many of the historically aggraded flood terraces and steam channels. However, the lower gradient reaches of these watercourses still possess characteristics of simplified riverine systems in a state of succession from past disturbances, lacking complex habitat features preferable to most salmonid species, such as regularly spaced deep pools and riffles, large woody debris, and riparian cover.

Elevated temperatures associated with a widened, open alluvial floodplain often combine to impair the beneficial uses of water in the lower reaches of most of the larger tributaries to the

Mattole River. However, in Honeydew Creek, even though temperatures analyzed from thermographs are mostly unsuitable for salmonids, the two sediment metrics gathered to this point in time are protective of the beneficial uses of water and would meet or exceed these numeric targets established for the Garcia River Sediment TMDL. However, like the Garcia River Sediment TMDL, a suite of parameters, including spawning gravel embeddedness, maximum pool depths and widths, and percent fines in different size classes, may also be applied to the future Mattole River sediment TMDL before it can be stated to what degree that Honeydew Creek, and other stream systems in the Mattole Basin are impacted by excess sediment depositions."

Chemical contamination

Excerpts from NCWAP below are inconclusive as to chemical contamination as no scientifically conducted sampling has been undertaken to determine whether oil or other dust retarding materials, equipment fuels, pesticides and the introduction of nutrients from slash burns or wildfires are affecting water quality.

"Herbicide and pesticide residues from commercial timber applications have been anecdotally linked to impacts to water quality. There have been no scientifically conducted sampling efforts and associated data collection in any of the Mattole subbasins to determine if chemical residues are affecting the beneficial uses of water on and from industrial timberlands to local watercourses."

Peak Flow

Excerpts from NCWAP describe the peak flows found within the basin.

"The Mattole Basin lies within the Cape Mendocino Hydrographic Unit, a subunit of the Eel River Hydrographic Area as described by the Department of Water Resources in Bulletin Series 94-8. The Mattole River Hydrographic Unit Code: 18010107 as described by the United States Geologic Survey (USGS). The Department of Water Resources (DWR), Statewide Planning Program delineates the Mattole Basin within the North Coast Hydrologic Region (HR), the Coastal (#03) Planning Subarea (PSA), and the Mattole-Bear (#27) Detailed Analysis Unit (DAU). Winter monthly stream flows in the Mattole River measured near Petrolia average between 1,710 and 4,170 cubic feet per second (cfs). However, peak flows measured on December 22, 1955 and December 22, 1964 were 90,400 and 78,500 respectively. Bank full discharge at Petrolia occurs at approximately 31,000 cfs. "Summer and fall flows drop below 60 cfs, with a minimum measured flow of 15 cfs" (Department of Water Resources). High seasonal rainfall on bedrock and other geologic units with relatively low permeability and steep slopes contribute to the very flashy nature of the Mattole's watersheds. In addition, the runoff rate has been increased by extensive road systems and other land uses. High seasonal rainfall combined with a rapid runoff rate on unstable soils delivers large amounts of sediments to the river. As a result, the Mattole River transports a very high sediment load. This sediment is deposited throughout the lower gradient reaches as it is transported downstream through the system."

3.16.2 Regulatory Setting-Water Quality

The primary agencies responsible for water quality in the Mattole are CAL FIRE and the North Coast Regional Water Quality Control Board.

The basic framework for regulating water pollution in California involves a statewide regulatory agency, the State Water Resources Control Board (SWRCB or State Water Board), and a series of statewide water quality management plans that address water quality (including both point-source impacts and nonpoint source impacts). The statewide plans are derived from both a series of state laws (the most important being the Porter Cologne Act, California Water Code §§ 13000 et seq.) and federal laws (the most important being the Clean Water Act; 33 U.S.C §§ 1251 et seq.) and associated regulations. Primary implementation of the statewide plans is largely delegated by law to a series of regional implementing boards, with the North Coast Regional Water Quality Control Board (RWQCB or Regional Water Board) being the regional board for the Program area.

The State has adopted Water Quality Control Plans (generally known as "Basin Plans") for all waters in the state. The Basin Plans are derived jointly from requirements in both the state's Porter-Cologne Act and federal Clean Water Act. The Basin Plans establish "beneficial uses" for all regulated waters, together with policies that protect the beneficial uses from degradation by human activities. The relevant plan for the Program area is known as the "Water Quality Control Plan for the North Coast Region," which covers the Klamath, Eel, and Russian river basins and all of the smaller coastal drainages in the region outlined by the larger basins.

On April 23, 1998 the North Coast Regional Water Quality Control Board (NCRWQCB) identified the Mattole River as impaired in regard to sediment and temperature. In December 2002, the NCRWQCB issued its Total Maximum Daily Load for the Mattole River building off of the 4/23/98 resolution listing the Mattole as impaired and the 1996 Basin Plan, which identified both numeric and narrative water quality objectives for the Mattole River. Those 1996 objectives pertinent to the Mattole River TMDLs are excerpted below:

Table 2.1 Water quality objectives addressed in the Mattole River TMDL

Parameter	Water Quality Objective
Suspended Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.
Temperature	The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature of any COLD water be increased by more than 5° F above natural receiving water temperature.
Sediment	The suspended sediment load and suspended sediment discharge rate of surface water shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Turbidity	Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

In addition to water quality objectives, the Basin Plan (NCRWQCB, 1996) includes two prohibitions specifically applicable to logging, construction, and other associated nonpoint source activities:

- The discharge of soil, silt, bark, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited; and
- The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities which could be deleterious to fish, wildlife, or other beneficial uses is prohibited.

On June 4, 2009, the NCRWQCB adopted order R1-2009-0038 a Categorical Waiver Of Waste Discharge Requirements For Discharges From Timber Harvest Activities On Non-Federal Lands In The North Coast Region. Categorical Waiver "F" sets the requirements for THP's (and by extension PTHP's) in the Program area; given its length, it's not repeated here. Waiver items F(4), F(5), F(6) and (10) apply particularly to silviculture and WLPZ/riparian practices and to the development of a sediment prevention plan.

The primary CAL FIRE laws and regulations that relate to the Program's practices with respect to water quality are those contained in the California Forest Practices Act and the Forest Practice Rules. The FPR's contain multiple sections with explicit language related to practices that might impact water quality and are not enumerated here. Instead, several of the more important FPR's

are cited below as examples to show the breadth of the rules as they relate to utilities. Technical rule addendum # 2 requires a substantial discussion of water quality. 895.1 defines the term "Quality of water". 898.1 describes the special conditions requiring the director to disapprove of plans that violate basin plans and water quality requirements. 914.8 describes tractor road watercourse crossings. Article 6 (FPR 916 – 916.12) contains 39 pages of water quality rules and regulations that apply to the Program's practices, including 916.12, activities in a 303(d) impaired waterbody.

The Forest Practices Act also contains numerous references to protecting water quality including requirements to promulgate rules for protection of streams at 4562.7 and controlling soil erosion at 4562.5. PRC 4514.3 exempts timber operations from waste discharge requirements while 4582.71 describes the findings by a Regional Water Quality Control Board under which a THP may not be approved. The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE's webpage (see: http://www.fire.ca.gov/resource_mgt/downloads/2011_FP_Rulebook_with_Diagrams_with_Tech_Rule_No_1.pdf).

In addition to the regulatory requirements described above, as well as the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2 – Program description. As a result, Program participants would be further regulated by the Program's restrictions including:

- Uneven-aged management only including limitations on canopy cover and measures for wildlife protection
- Snags must be left in everywhere and down woody material must be recruited in Class I and II watercourses beyond the FPR requirements
- No old-growth trees (sprouted prior to 1850) would be allowed to be cut
- Existing late seral stands have to be managed to increase late seral conditions
- Road construction is limited
- Existing roads must be upgraded beyond the requirements in the FPR's
- Further limitations on harvest in Class I, II, and III WLPZ's beyond those in the FPR's
- Limitations on harvest beyond the FPR's on highly erosive soils
- Limitations on harvest beyond the FPR's when operating on or near unstable slopes
- Limitations on skidding on slopes > 50% beyond those in the FPR's
- Limitations skidding and log hauling during the winter period beyond those in the FPR's

3.16.3 Significance Criteria-Water Quality

Appendix G of the CEQA Guidelines contains the following significance criteria relating to water quality and quantity. An effect will be considered significant if results of the analysis indicate that any of the following criteria will be met if implementation of the Program would:

a) Violate any water quality standards or waste discharge requirements;
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (i.e., the production rate of pre-existing nearby wells would

drop to a level which would not support existing land uses or planned uses for which permits have been granted);

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
f) Otherwise substantially degrade water quality;
g) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
h) Place structures within a 100-year flood hazard area that would impede or redirect flood flows;
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or
j) [Cause] Inundation by seiche, tsunami, or mudflow.

3.16.4 Determination Threshold-Water Quality

The Federal Clean Water Act and State Porter-Cologne Water Quality Control Act are the primary laws regulating water quality in California. Both contain reference to "designated" or "beneficial" uses and water quality "criteria" or "objectives". The concept of "anti-degradation" is also common to both laws and refers to restrictions on activities that will or could decrease the water quality of a receiving body of water even if the water body currently exceeds defined water quality criteria. Although the aforementioned laws ensure that water quality objectives are similar across California, numeric thresholds for water quality are specific to individual regions and water bodies.

The determination thresholds used in the water quality analyses were based on the following narrative standards, which originate in State and Federal water quality control regulation.

The Program and Alternatives will have a significant adverse effect if treatments ultimately result in:

a) A significant degradation of water quality;
b) Violations of basin plan objectives; or
c) Impact a beneficial use.

Determinations were made at the subbasin level based on modeling and qualitative analyses. The ranges of numeric thresholds established in the Regional Basin Plans were reviewed in order make determinations regarding the narrative standards cited above.

3.16.5 Data and Assumptions-Water Quality

Temperature

The TMDL summarized the water temperature conditions as follows (NCRWQCB 2002):\

> *Water temperature is above acceptable limits and likely impacting the salmonid fisheries and other beneficial uses of water in the estuary and the mainstem of the Mattole River up to the Southern Subbasin near river mile 55. Temperature extremes are also affecting the lower-gradient downstream reaches of Lower and Upper North Fork Mattole Rivers, and Honeydew, Blue Slide, Lower Bear, Mattole Canyon, and Squaw Creeks. In the upper reaches of these large tributaries, however, temperatures are within optimal conditions for salmonids. Fish presence data compiled by the California Department of Fish and Game and the Mattole Salmon Group appear to confirm this conclusion. Temperature is currently impacting the salmonid fisheries in many tributaries of the Mattole.*

Another stream temperature dataset was contained in Welsh et al. (2005). Welsh recorded water and air temperatures during one summer season in 49 stream reaches across 21 tributaries distributed across the Mattole River Watershed. Sample reaches were stratified by vegetation types as follows: late seral Douglas-fir forest, mixed species composition second growth forest

and grasslands. For water temperature data the mean maximum weekly maximum temperature[2] (MWMT) values for the warmest 7 days of the year for each vegetation type were reported as follows:

Late seral	*12.74°C (SD 1.69)*
Second growth	*13.54°C (SD 2.17)*
Grasslands	*15.97°C (SD 2.55)*

The maximum (MWMT) temperature considered suitable for coho salmon is 18 °C (Welsh et al. 2005). Using the more common MWAT metric, 16.8 °C is typically considered the upper limit for coho (MRRP 2010). Welsh et al. (2005) reported that temperature regimes in the warmest tributaries containing juvenile coho salmon had MWMT of 18.0°C or less or MWAT of 16.7°C or less; conversely, all of the streams where MWMT was less than 16.3°C or MWAT was less than 14.5°C contained juvenile coho salmon.

Sediment (see Appendix D for additional information)

Predicting the potential impacts of the Mattole Forest Futures Program for sediment-related parameters in the Mattole River Watershed was considered to be one of the most important resource areas. This is due to the fact that the Mattole River is impaired by excess sediment and is on the 303(d) list of impaired watersheds for sediment. The primary sediment parameter associated with the TMDL listing is delivery of sediment to the watercourse from hillslope sources, i.e. sediment yield. Thus, the analysis was necessarily structured around estimating the potential impacts to this parameter. For a complete description of the methods and assumptions used to predict Sediment Yield in this analysis along with a sensitivity analysis see Appendix D.

A challenge inherent in the Mattole Forest Futures Program was that the exact timing, number and location of potential timber harvest activities expected to occur as a result of this project was unknown. This uncertainty was due to the fact that the Program was not a management plan for a defined landbase, but an optional permit that may be invoked by private landowners if they choose to do so. We developed a methodology for predicting the approximate acreage of participating landowners for each sub-basin over the next 50 years (see section 3.1), but it was not possible to predict which particular landowners would harvest which particular acres.

The lack of spatial specificity in defining the potentially affected environment provided a unique challenge for the analysis of potential impacts to sediment yield. Methods and computer models that required the input of spatially specific information such as slope steepness, road location and configuration, landslide hazard, proximity to watercourses, etc. were all limited by lack of information in this particular analysis. The analysis therefore relied on an analysis of annual average sediment yield from various management and natural sources at rates that were specific to each subbasin. This approach is known as a "rapid sediment budget" (Reid and Dunne 1996).

[2] Note that Welsh used the Maximum Weekly Maximum Temperture (MWMT) metric rather than the more common Maximum Weekly Average Temperature (MWAT) metric cited in the Mattole NCWAP, TMDL and MRRP documents.

A sediment budget was developed for the Mattole River TMDL to estimate the relative inputs of sediment from timber harvest, existing roads and natural sources (NCRWQCB 2002). Nineteen watersheds on the north coast of California have had rapid sediment budgets prepared as a part of the TMDL process (NCRWQCB 2009). The rapid sediment budget process is based upon aerial photographic analysis, GIS digital terrain models and limited field investigation. Due to these types of methods, in general, rapid sediment budgets can produce estimates only within an order of magnitude of actual sediment yield (Reid and Dunne 1996). All TMDLs have been publicly and peer- reviewed and are the basis for regulation of land use, e.g. Action Plan for the Garcia River Watershed Sediment TMDL (RWQCB 2001) and the Categorical Waiver (NCRWQCB 2009).

The Mattole TMDL analysis contains the only estimate of watershed-wide sediment yield and is therefore the best available information upon which to base an analysis of potential impacts on sediment yield due to management. Another advantage to using the TMDL sediment budget as the departure point for analysis of future activities is that the TMDL already includes a complete analysis of all past sediment sources, i.e. it is a cumulative watershed impacts analysis for sediment that is current through the year 2002.

The primary management-related question that was addressed in this PTEIR was: what is the net effect of decreasing sediment yield by upgrading roads and fixing legacy sediment sources as compared to increasing sediment yield by installing new timber harvests and building new roads? The context for interpreting the answer to the preceding question is how the management-related net sediment yield compares to the natural rate of sediment yield. For the 1984- 2002 time period, the TMDL estimated that 64% of the total sediment yield in the Mattole watershed was management-related. An independent review of seven North Coast TMDLs by Bedrossian and Custis (2002), however, came to the conclusion that the TMDLs substantially underestimated the natural/background rates of sediment yield.

The Mattole TMDL contained an estimate of the average annual sediment yield from past timber harvest, the current road network and natural sources for each subbasin, as follows:

Table 3-46
Sediment Yield Values From the Mattole River TMDL by Subbasin*

General Category	Sediment Budget item	Tons/acre/year			
		North	East	South	West
Natural	Natural Mass Wasting	5.78	2.50	2.50	3.28
	Stream Bank Erosion	1.23	0.42	0.27	0.56
Harvest Related	Other Harvest Related Delivery	0.94	0.22	0.23	2.34
	Skid Trail Related Erosion	0.92	1.09	1.19	1.33
Road Related	Road Related Gullying	0.16	0.30	0.45	0.31
	Road Related Mass Wasting	3.13	9.22	0.70	3.28
	Road Related Surface Erosion	0.56	1.05	1.22	0.88
	Road Stream Crossing Failures	0.08	0.06	0.25	0.06

*Sediment yield values in the TMDL were originally calculated on a per square mile basis, but were converted to an acreage basis to facilitate analysis of future timber harvest, which occurs on an acreage basis. The sediment budget

time period was 1984-2002.

In order to estimate the relative impacts of the Program and Alternatives on the sediment yield values for each subbasin it was assumed that the data in Table 3-46 represent the average annual sediment inputs that could be expected to occur over the 50-year analytical period of the PTEIR (2010-2060) for 'Natural' and 'Road Related' sediment sources under the status quo. However, for 'Harvest Related' sediment sources it was assumed that inputs from legacy harvest decayed over time, while new harvests added sediment at each entry and subsequently decayed over time. For areas subject to new management (timber harvest and/or road upgrades) the assumptions contained in the TMDL (see below) were assumed to be accurate (NCRWQCB 2002):

> *The load allocations for nonpoint sources reflect Regional Water Board staff's best professional judgment of how effective best management practices are in controlling these sources. For example, techniques are available to greatly reduce sediment delivery from roads (Weaver and Hagans, 1994); therefore, the load allocation for road-related sediment (including road-related gullying, and surface erosion) reflects a reduction of about 90-95 percent from the estimate of the current loading rate. Other road-related mass wasting features, which are greatly influenced by their geologic terrane, may be more difficult to control, so a loading reduction of 80-85 percent may be a more realistic target.*
>
> *Estimates that 95 percent of road-stream crossing failures are controllable (Hagans, et al., 1986), are reflected by a reduction of 90-95 percent from the current estimated loading rate. Furthermore, because road-related sediment accounts for the largest component of management-related sediment of the current loading (64 percent of 5,100 t/mi2/yr), efforts to reduce sediment from roads are expected to be highly effective in reducing sediment overall.*
>
> *The best conservation and land management measures to control sediment associated with landsliding in timber harvest areas are expected to be about as effective as those to control road-related sediment. Therefore, the load allocations for sediment delivery from timber harvest, such as skid trail related erosion and other harvest-related delivery reflect 85-90 percent reductions from the estimate of the current loading.*

The NCRWQCB (2002) did not explicitly define the term "best conservation and land management measures". However, it seems reasonable to assume that the provisions governing timber harvest and road upgrading included in the 2009 Categorical Waiver (Order No. R1-2009-0038) would be consistent with "best conservation and land management measures" cited in the Mattole TMDL (NCRWQCB 2009) since item 15 of the Order includes the following statement, "This Order furthers the objectives defined in the TMDL Implementation Policy and Work Plan". Therefore we assumed that since timber harvests and the associated road upgrading conducted under the Mattole Forest Futures Program will be conducted using practices and standards equivalent to those established in the Categorical Waiver, those actions should achieve the sediment yield reduction targets established in the TMDL.

A computer model was developed that tracked each acre of projected new harvest within each subbasin (see section 3.1) and assigned it a reduced sediment yield rate (consistent with TMDL assumptions above) shown in Table 3-47 and 3-48 and assigned the sediment yield values described in Table 3-46 for areas that were not projected to receive future management (timber harvest and/or road upgrading). The sediment yield from timber harvests was assumed to be

proportional to the amount of canopy removed using the Clear Cut Equivalency CCE method described in NCRWQCB (2006); for example, Clear Cuts were assumed to generate twice as much sediment yield per harvested acre as selection harvest at each entry. Program and non-Program timber harvests were both assumed to result in road upgrades and treatment of legacy sediment sources that resulted in sediment yields that met the 80-95% reduction targets described in the TMDL assumptions (above).

Table 3-47
Sediment Yield Values for New Harvest Areas (Tons/Acre/Year)

General Category	Sediment Budget Item	TMDL Subbasin			
		North	East	South	West
Natural	Natural Mass Wasting	5.78	2.50	2.50	3.28
	Stream Bank Erosion	1.23	0.42	0.27	0.56
Legacy Harvest	Other Harvest Related Delivery	0.14	0.16	0.18	0.20
	Skid Trail Related Erosion	0.14	0.03	0.04	0.35
New Harvest*	New Harvest- Selection	3.30	1.50	3.00	8.90
	New Harvest- Clear Cut	6.60	3.00	6.00	17.80
Upgraded Roads	Road Related Gullying	0.02	0.03	0.05	0.03
	Road Related Mass Wasting	0.63	1.84	0.14	0.66
	Road Related Surface Erosion	0.06	0.10	0.12	0.09
	Road Stream Crossing Failures	0.01	0.01	0.03	0.01
New Roads (tons/linear mile)	Road Related Gullying	3.33	3.17	3.19	3.23
	Road Related Mass Wasting	133.33	196.67	9.89	67.74
	Road Related Surface Erosion	12.00	11.17	8.57	9.03
	Road Stream Crossing Failures	1.67	0.67	1.76	0.65

*New harvest acres were calculated on a per harvested acre rate, rather than subbasin wide average (see Appendix D and table 3.55.1, below for clarification).

Table 3-48
Estimate of Sediment Yield From Each Harvested Acre, Derived from Mattole TMDL Data

Subbasin	TMDL estimated Sed yield for 1970-1990 era harvest (tons/acre/year)	TMDL estimated reduction 85%	TMDL estimated reduction 90%
North	21.7	3.3	2.2
East	10.3	1.5	1.0
South	19.9	3.0	2.0
West	59.0	8.9	5.9

The potential impacts to in-stream turbidity, which is another sediment-related water quality parameter, were also analyzed. Turbidity values in the water column respond to management-related impacts much more quickly than coarse sediment yield, which may take decades to be

detected at downstream locations in the stream network, due to the lag in sediment transport. Klein (2008) characterized the relative differences of sediment yield and turbidity as follows:

> *Much of the research into the impacts of logging on erosion and sedimentation is heavily oriented toward the dramatic, i.e., large storms causing large inputs of sediment to channels, such as occurred during and after the infamous 1964 flood. Sediment budgets have been employed as an effective tool to quantify sediment inputs and the role of management. The yardstick by which the magnitude of impacts is typically evaluated is the volumetric proportion of the sediment budget generated by a particular erosion process or resulting from a particular management practice.*
>
> *Certainly, geomorphically large events are important determinants of the health of aquatic ecosystems and can have long-lasting impacts, and the sediment budget is a fundamental tool for evaluating such events. However, less dramatic, but more chronic erosion and sedimentation processes (rainsplash and fluvial erosion and delivery of fine sediment from bare ground surfaces during small to moderate storms and continued transport between storms) are also important even though they may cumulatively represent a relatively small volume in a sediment budget compared to large storms.*
>
> *Sediment budget studies in the north coast reveal that a large proportion of annual suspended sediment yield occurs during the typically few days when large stormflows occur. For example, Janda and others (1975) found that for Redwood Creek near Orick during water years 1971-73, flows exceeded only 5% of the time (5% exceedence flow) transported about 80% of the total suspended sediment load. By extension, sediment transport during the rest of the time (the other 95%) occurs at lower concentrations and may represent only 20% of the total load. However, we propose that it is an important component of sediment-derived chronic turbidity because of the longer duration, and thus may have disproportionately large impacts on aquatic biota due to the extended duration of exposure. To protect and restore water quality and beneficial uses, land managers must first determine the extent to which human disturbance contributes to elevated sediment loads and the tendency for streams to experience extended periods of turbidity during the winter.*

There were no turbidity or suspended sediment concentration data sets available to compare subbasins in the Mattole watershed. In the absence of site-specific data, the method we used to analyze potential impacts to chronic turbidity levels followed the guidelines set out in Klein et al. (2008). Klein et al. (2008) analyzed turbidity data from 28 Northern California streams (none of them in the Mattole) and concluded that when average annual harvest rate for the preceding 15 years exceeded 1.5%, chronic turbidity levels in the water column were high enough to cause significant impacts to anadromous salmonids and exceed Basin Plan water quality objectives of 20% above background conditions. Therefore we assumed that harvest rates above 1.5% per year (expressed as Clear Cut Equivalency CCE) had the potential to impact beneficial uses in the Mattole watershed, and the harvest rates in the Program and Alternatives were calculated and compared to this threshold value. For streams whose watersheds had been subject to harvest rates below the 1.5% CCE threshold value, the relationship was not clear in the 2008 study, and so harvest below that level was not shown to have significant impacts on turbidity values or beneficial uses sensitive to turbidity.

Chemical Contamination

There were no data on chemical contamination available for the Mattole Watershed.

Peak Flows

Peak flows may be increased by intensive harvest over short time periods in small watersheds during relatively small flood events (~2 to 10 year return interval). However, 20-40% of the basal area of a watershed typically needs to be removed over a short time period (<10-15 years) in order to produce significant increases in peak flows or water yield (Stednick 1996 and Grant et. al. 2008). According to Grant et al. (2008):

> *"In the rain zone, the maximum response line reaches the 10-percent detection limit at approximately 29 percent harvested (fig. 9). This suggests that if less than 29 percent of the watershed is harvested, there are no data supporting a resultant increase in peak flow; in fact, the first detectable reported value occurs at 40 percent. The response line for mean reported change crosses the detection limit at 45 percent harvest. Remembering that this data set inherently includes greater than 2 percent roads in most studies, we posit that a response line representing harvest without the construction of new roads would shift down, suggesting an even higher threshold for harvest prior to detectable change in peak flow. However, the absence of any data to support this prevents us from drawing a without-roads response line for the rain-dominated zone."*

At Caspar Creek, the estimated average peak flow increase for a two-year return period discharge was 27 percent for 100 percent clearcut tributary watersheds (excluding WLPZ areas along streams) and was 9 percent for the 50 percent cut North Fork watershed (Ziemer 1998, Rice and others 2001). For large, infrequent floods such as 20-year+ return period floods, logging does not appear to substantially increase peak flows for these events (Mount 1995, Grant et al. 1999). The reason that land use becomes less important for larger discharges is that the wetter the antecedent soil conditions, the smaller is the difference in discharge between the forested and logged basins (i.e., the difference in discharge between the two situations remains approximately constant as discharge increases, so as a percentage of discharge it decreases (Birkinshaw et al. 2010).

In order to evaluate the potential of the Program and Alternatives to affect peak flows an analysis of cumulative canopy removal due to harvest was prepared, as this is the parameter that is closely associated with increases in peak flows associated with timber harvesting. It was assumed that stands harvested in the Mattole would achieve hydrologic recovery within 15 years after harvest[3]. The canopy cover values removed for each silvicultural type were the same as those contained in the Jackson Demonstration Forest DEIR, Table 5, Appendix 10 (CAL FIRE 2007), e.g. 40% canopy removal for selection silviculture, 100% for clearcut. The acres per subbasin projected to be harvested for the Program and each Alternative (see section 3.1) were multiplied by the canopy cover removal factors, linearly decayed to zero over 15 years and tracked over the 50 year analytical period to calculate average annual canopy cover removal

[3] The hydrologic recovery period chosen for the Mattole was 5 years longer than the 10 year hydrologic recovery period observed in the North Fork of Caspar Creek after logging. Hydrologic recovery was assumed to take longer in the Mattole because summers are hotter and regeneration could be slowed by harsh site conditions.

levels for each subbasin and Alternative. The resultant values were then compared to the 20-40% harvest lower limit of detectability cited above (Grant et al. 2008).

3.16.6 Direct Impacts Common From Implementing the Program/Alternatives-Water Quality

Temperature

As noted above, the TMDL summarized the water temperature conditions as follows:

> *Water temperature is above acceptable limits and likely impacting the salmonid fisheries and other beneficial uses of water in the estuary and the mainstem of the Mattole River up to the Southern Subbasin near river mile 55. Temperature extremes are also affecting the lower-gradient downstream reaches of Lower and Upper North Fork Mattole Rivers, and Honeydew, Blue Slide, Lower Bear, Mattole Canyon, and Squaw Creeks. In the upper reaches of these large tributaries, however, temperatures are within optimal conditions for salmonids. Fish presence data compiled by the California Department of Fish and Game and the Mattole Salmon Group appear to confirm this conclusion. Temperature is currently impacting the salmonid fisheries in many tributaries of the Mattole.*

The low-gradient reaches where water temperatures were unsuitable were also the locations where sediment deposition and unstable channel forms were most common, indicating that sediment routing and storage dynamics exerted a strong influence on water temperature. The relationship between sediment deposition and steam temperature regimes was summarized by MRRP (2010) as follows:

> *These low-gradient stream reaches have suffered disproportionate impacts from the unfortunate coincidence of land-use practices and large floods. Extensive riparian timber harvest decreased bank stability in large flood events, and removed the primary source of large wood, which would have increased channel roughness and stored and sorted sediment. Pre-Forest Practices Act timber harvest often involved using the conveniently flat alluvial terraces as haul roads in addition to removing riparian trees, increasing the chance for transport and re-working of floodplain sediments in high flows. The flat, featureless channels and floodplains that resulted have been slow to recover naturally, as the predominately coarse floodplain material is ill-suited for the establishment of woody plants. Current high water temperatures exist and are due to a lack of riparian cover, and the lack of channel complexity, which has decreased hyporheic exchange rates.*

Essentially, low-gradient reaches have not recovered to a suitable temperature regime because high sediment loads have retarded natural re-vegetation and increased stream widths such that current forest conditions could not provide adequate shade to the watercourse. There has not been any timber harvest activity in Honeydew, Blue Slide, Lower Bear or Mattole Canyon Creeks since at least 1984 and only 80 acres on Squaw Creek since 1984 (Map 2). The Lower and Upper North Fork Mattole River tributaries have had extensive recent harvest, but also had the highest proportion of grasslands of all subbasins in the Mattole, which confounds the relationship between harvest-related shade reductions and natural occurrence of shade-limited systems (Welsh et al. 2005). Based on these correlations, it appears that excessive water

temperatures observed in low gradient reaches were due largely to legacy impacts of pre-FPR logging and the 1965 flood events, rather than recent timber harvest activity.

In the upper reaches of tributaries where stream temperatures were mostly suitable for salmonids (according to the MRRP 2010), sediment residence times were shorter and it appears that natural re-growth of forest vegetation was able to provide adequate shade to maintain suitable water temperatures. For example, in the Southern subbasin where coho populations were highest (MRRP 2010), most of the streams on the east side of the Mattole River were subject to even-aged harvest by Barnum Timber Company (BTC) in the 1980s and 1990s and yet 2000-2008 water temperature data from these same creeks (Gibson, Stanley, Baker, etc.) shows MWAT values of <62.2 degrees Fahrenheit, which is considered suitable for coho (MRRP 2010). Water temperatures may have been elevated on BTC lands shortly after harvest, but apparently have recovered since then.

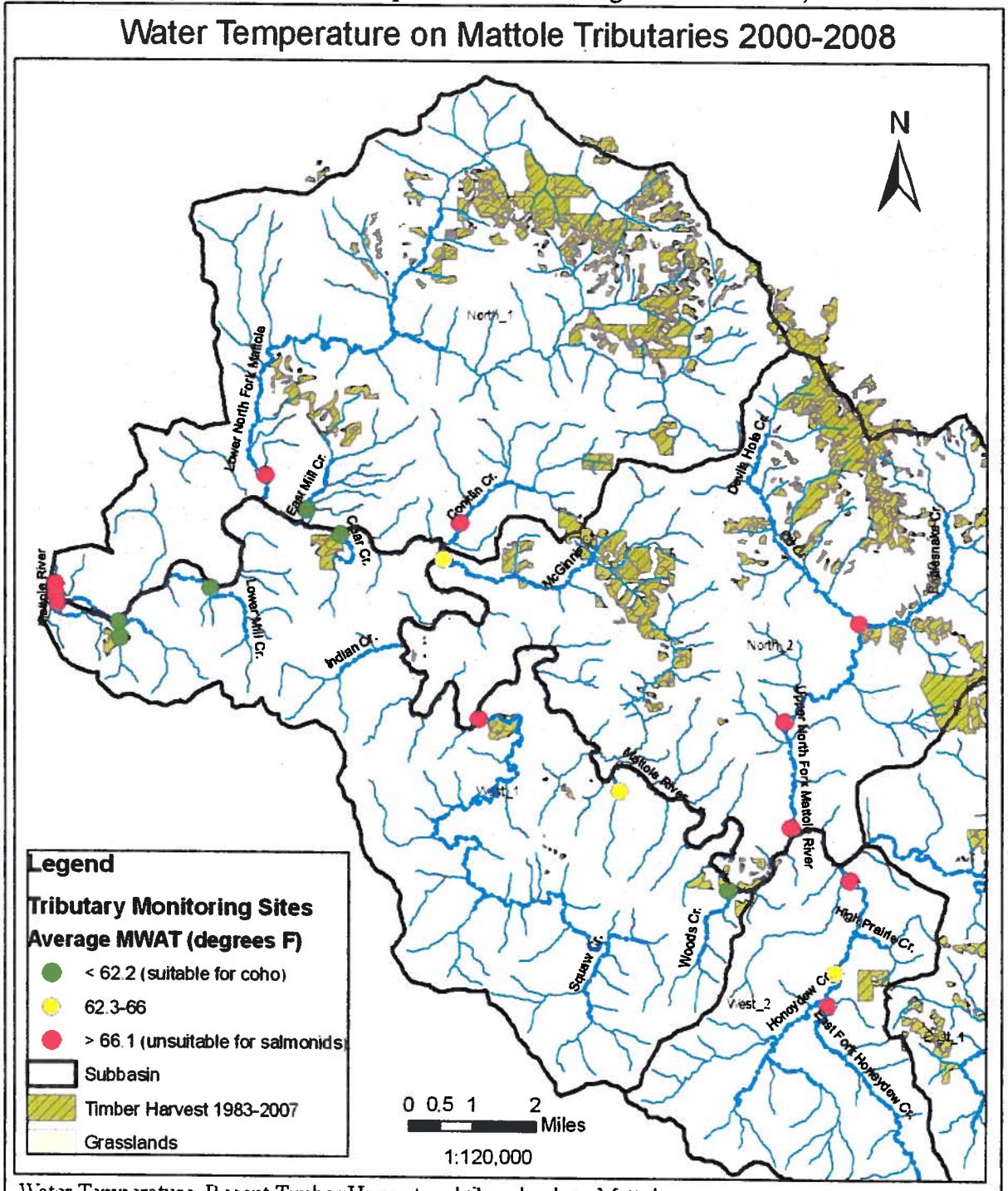
Based on the relationship between timber harvest history and data for streams with elevated water temperatures, there does not appear to be a strong link between recent timber harvest and elevated water temperatures in the Mattole watershed. All of the occurrences of elevated water temperatures were in locations where excessive sediment from the 1965 flood event and pre-FPR logging significantly altered stream channel morphology, not where recent logging has removed forest canopy.

Welsh et al (2005) did report a difference in mean MWMT values for watercourses in old-growth versus second-growth forests of less than 1°C (see Data and Assumptions above), however it was not clear if this difference was statistically significant. Furthermore, the differences in vegetation types were confounded because old-growth forests were located in predominantly higher elevation, more north-facing and smaller drainage area locations than second growth forests – all factors that Welsh reported had a significant relationship on water and air temperatures.

Welsh et al. (2005) explored the relationship between maximum summer stream temperatures and a variety of biotic and abiotic factors. The best model to predict stream temperature included the following variables: Aspect, drainage area of watershed and extent of grasslands. South facing drainages, increasing drainage area and increasing grassland extent were all predicted to result in increased water temperatures. The results from Welsh et al. (2005) corroborate the finding in the TMDL and NCWAP reports that lower reaches of tributaries, which necessarily had larger drainage areas, had elevated water temperatures, particularly if the watershed had extensive grasslands. Welsh et al. (2005) made the assertion that timber harvest and grasslands were comparable in terms of elevating water temperatures.[4] Based on this assertion Welsh et al. (2005) concluded:

[4] Grasslands may be similar to clearcuts immediately after harvest in terms of solar heat loading to the ground surface, but clearcuts recover to a fully forested condition within 10-15 years and have riparian buffers along stream channels, neither of which occurs in grasslands. Furthermore, Welsh et al (2005) stated that "late seral forest have been replaced by early seral forest and mixed grasslands" which is correct regarding early seral forest, but mixed grasslands have actually declined in extent by 40% since the 1940's, not increased (MRC Grasslands restoration article 2/09/10).

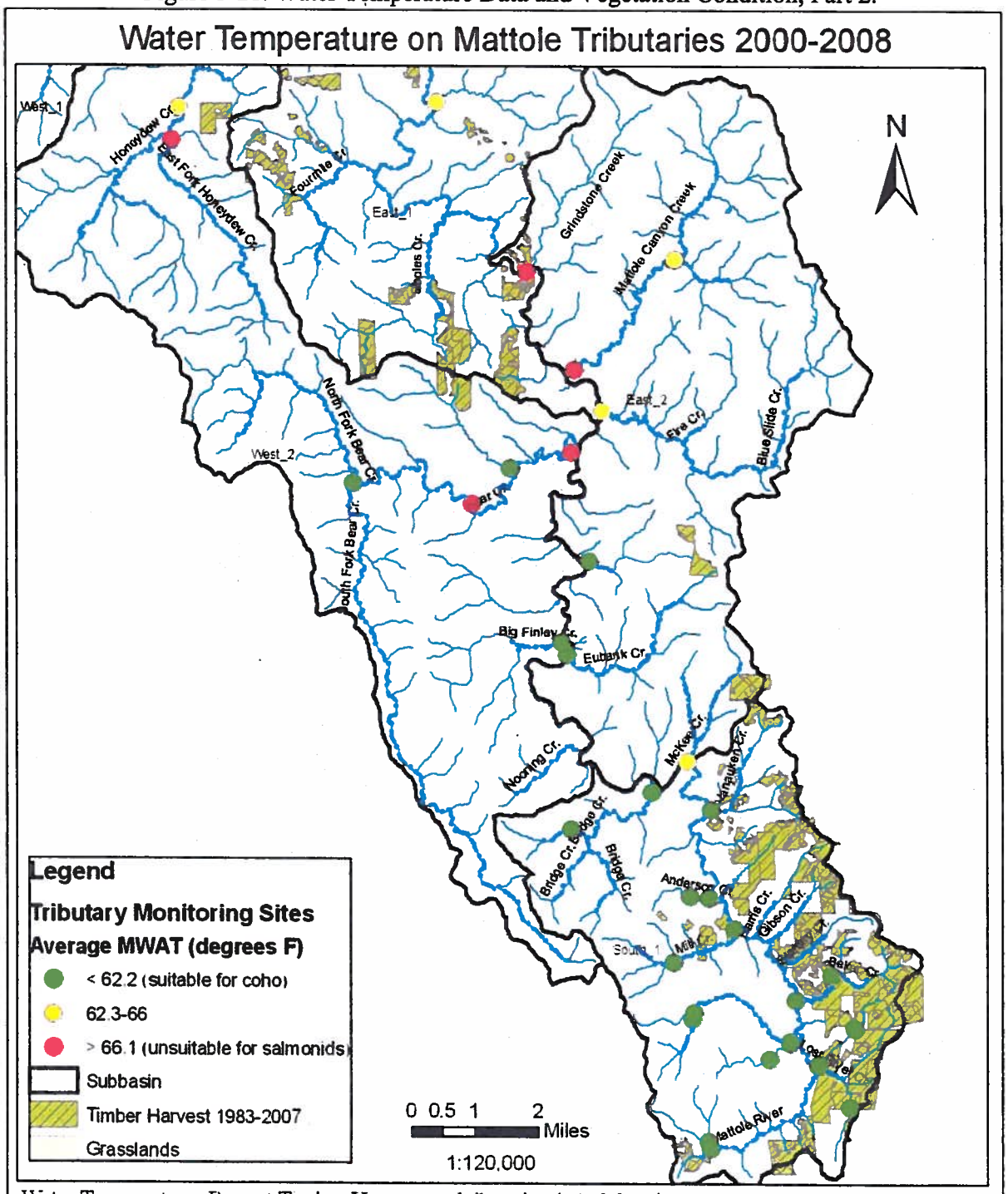
Figure 3-20. Water Temperature Data and Vegetation Condition, Part 1.



Water Temperature, Recent Timber Harvest and Grasslands in Mattole
Map 1 of 2

Data Source: Mattole Salmon Group Temperature Data, CalFire THP data

Figure 3-21. Water Temperature Data and Vegetation Condition, Part 2.



Water Temperature. Recent Timber Harvest and Grasslands in Mattole
Map 2 of 2

Data Source: Mattole Salmon Group Temperature Data. CalFire THP data

> *Results of this analysis indicated that when non-forest or grassland exceeds 10%, south-facing catchments in the Mattole >200 ha, and north-facing catchments >400 ha, will yield stream temperatures that exceed the limits for coho salmon.*

Harvest rates for the Program and Alternatives are low enough that maximum percent canopy reduction (non-forest) does not exceed 4% for any of the Alternatives or subbasins (Table 3-59 in Peak Flow section). Furthermore, the Program does not include any silvicultural options that have the effect of creating "non-forest", particularly over stream channels (see discussion below). Welsh et al. (2005) did not attempt to correlate the impacts of partial harvests within second growth forests to water temperature data.

The Mattole TMDL includes the following statement:

> *The California Forest Practice Rules allow for reduction of stream canopy, as much as 50 percent in some cases. Although stream canopy and effective shade are different measures of riparian characteristics, effective shade is dependent on stream canopy, thus large reductions of stream canopy result in large reductions in effective shade in most cases.*

Under the proposed Program, "large reductions of stream canopy" would not be possible on any Class I or II stream. The minimum canopy cover requirement for Class II-S streams is 70%, while it is 80% for Class I and II-L streams- outside of the no-cut buffers (see Chapter 2 for additional details of WLPZ protections of the Program). For Alternative I (Status Quo), the recently amended ASP rules (FPR 916.9, 936.9, and 956.9), prohibit 50% reductions in canopy closure on Class I and II-L streams but still permit it on Class II-S streams in the inner zone, which varies from 50 feet with <10% slope to 85 feet with slopes >50% (along with a core zone of 15 feet (except for slopes <10%), where virtually no timber operations are permitted).

An additional protective measure incorporated into the ASP rules (which applies to all Alternatives) addresses the issue of low-gradient reaches with unstable stream channels, which is where water temperatures were observed to be excessive in the Mattole. The protective measure establishes channel migration zones (CMZs) in unstable channel reaches where timber harvest is prohibited and riparian buffers are measured outward from these CMZs. Additionally, there are special protection measures for Class I watercourses with flood prone areas.

The unstable reaches of lower mainstem tributaries were the locations where the TMDL shade modeling results indicated that the greatest difference between current shade levels and potential effective shade levels existed (NCRWQCB 2002). In these reaches under the Program all of the unstable CMZs would be off limits to harvest, the first 75 feet out from the CMZ would also be no-cut, then another 25 feet would be a 80% canopy cover retention zone (depending on slope), the next 50 feet would be a single tree selection zone only (no openings >0.25 acre) which has a canopy cover of approximately 70%+ (see Vegetation section), and outside of this 150 foot zone next to Class I streams canopy cover could go as low as 40-60% under the All-Aged Prescription, but could also just be an extension of the single tree selection zone with canopy covers of 70%+.

Beyond the minimums of no-cut buffers and canopy retention requirements, the prescriptions available within the Program, if followed over the long term, lead towards stands that contain larger diameter, older and taller trees with a higher proportion of conifers compared to stands harvested under the Status Quo (see Section 3.14). Taller trees (particularly conifers) are a key component of re-attaining the effective shade targets described in the TMDL (NCRWQCB 2002).

In addition to effective site-specific canopy cover requirements, the data in Table 3-59 indicate that subbasin wide canopy cover reductions for the Program are predicted to be minimal (1-2%) due to the low rates of harvest and reliance on selection silviculture, thus further decreasing the likelihood of significant water temperature increases.

Finally, the net sediment reductions predicted for the Program in 5 of 7 subbasins will slowly improve temperature conditions in low gradient reaches where sediment deposition exerts a strong influence on water temperatures.

Sediment Yield

Implementation of the Program and the Alternatives were predicted to result in decreased net sediment yields over the 50 year analytical time period for five of the seven subbasins. For the Mattole watershed as a whole, the estimated net sediment reduction ranged from 1.2 to 1.9 million tons of sediment over the 50-year time frame, for the Status Quo and Program, respectively (Table 3-57). Although the "sediment savings" were large in an absolute sense at approximately one million tons, the net sediment yield values were mostly non-significant compared to the high natural/background rates, at less than five percent of the natural erosion rate for the entire Mattole watershed; except in the Eastern subbasins, where road upgrades associated with timber harvest were projected to decrease sediment yields by 6-24% of the natural erosion rate, which may be significantly beneficial and detectable in the stream channel. However, if Bedrossian and Custis (2002) are correct in their detailed assertion that the TMDL in fact underestimated natural rates of erosion, then the predicted decreases in sediment yield due to Program activities may not be ~5% as previously stated, but in the range of a 1-2% relative to background loading.

The reason that projected timber harvests for all Alternatives were estimated to result in a net decrease in sediment yield was because fixing roads was estimated to have a bigger effect on the sediment budget than conducting new timber harvest (Figure 3-23). This is because the vast majority of roads in the Mattole watershed were dirt-surfaced roads originally constructed in the 1950-1970 time period that have not been upgraded to modern standards and were estimated to produce 3,660 tons/mi^2/year or 72% of the management related sediment yield of Mattole watershed (NCRWQCB 2002). And the estimates contained within the TMDL — that upgrading these roads would reduce sediment yield by 85-90% — indicate that implementing road upgrades would be a very effective way to reduce net sediment yield to the Mattole.

Furthermore, according to the TMDL, 84% of the approximately 3,310-mile road network was abandoned (NCRWQCB 2002). There is no regulatory requirement or incentive for landowners to upgrade/decommission abandoned roads (or even actively used) roads unless they choose to harvest timber. Upgrading roads and fixing legacy sediment sources are required for every type of timber harvest permit under the Forest Practice Rules and the RWQCB requirements (Waivers or General Waste Discharge Report) (all Alternatives). Some landowners may voluntarily upgrade their road

network to improve drivability (e.g., grade the road) but few will commit the resources required to meet current road upgrade and sediment control standards required under a harvest plan. The Good Roads Clear Creeks (GRCC) program of the Mattole Restoration Council has been successful in conducting road upgrade projects on private lands, but they are limited by availability of grant funding and willing landowners.

The West 1 and West 2 subbasins were estimated to have the highest rates of erosion due to timber harvest (Table 3-53 and 3-54). In these subbasins it was estimated that implementing any of the Alternatives would result in a net increase in sediment yield, rather than a net decrease as was predicted for the other subbasins (Table 3-52). These results indicate that road upgrades and fixing legacy sediment sources alone may not be sufficient to completely offset sediment yields from new harvest and road building in the West subbasins. However, the net increase in sediment yield as a percentage of the natural sediment yield was less than 3% in all cases and would likely be undetectable in the stream channel, and again, if Bedrossian and Custis (2002) are correct, the increase in sediment yield relative to background loading may in fact be much less than 3%.

In summary, the TMDL for the Mattole Watershed represents the best available information regarding sediment yield and land management practices in the Mattole Watershed (NCRWQCB 2002). The data and assumptions contained in the TMDL were used to predict the potential impacts of implementing the Program and Alternatives on sediment yield in the Mattole. This modeling of future sediment yield indicated that the Program and all Alternatives would result in a net reduction to the Mattole watershed; with the Program decreasing sediment yield by the greatest amount compared to the other Alternatives. However, confidence in sediment yield determinations is moderate due the questionable accuracy of the TMDL sediment budget values. No confidence intervals or statements were included in the TMDL, which indicate the relative or absolute accuracy of sediment yield estimates. There is a discussion of the "Margin of Safety" and a statement that, "The margin of safety can be incorporated through conservative assumptions used to develop the TMDL, or added as an explicit separate component of the TMDL (EPA 1991). In this TMDL, we employed conservative assumptions…"

Table-3-50
Net Sediment Yield by Subbasin for Each Alternative

Subbasin	Net Sediment Yield (tons/50 years)*				Natural SY (tons/50 yrs)**	Net Sediment Yield (% of Natural)			
	Program	Alt 1	Alt 2	Alt 3		Program	Alt 1	Alt 2	Alt 3
East 1	-910,177	-506,015	-729,608	-576,595	3,786,750	-24.04%	-13.36%	-19.27%	-15.23%
East 2	-599,932	-212,556	-575,640	-363,348	3,640,802	-16.48%	-5.84%	-15.81%	-9.98%
North 1	-335,495	-248,397	-215,648	-261,798	12,098,250	-2.77%	-2.05%	-1.78%	-2.16%
North 2	-244,593	-263,232	-124,414	-215,305	10,125,000	-2.42%	-2.60%	-1.23%	-2.13%
South 1	-17,640	-28,042	-9,055	-16,949	2,439,696	-0.72%	-1.15%	-0.37%	-0.69%
West 1	131,739	33,512	137,214	60,575	4,964,011	2.65%	0.68%	2.76%	1.22%
West 2	96,189	22,325	88,376	48,771	6,136,739	1.57%	0.36%	1.44%	0.79%
Total	**-1,879,909**	**-1,202,404**	**-1,428,775**	**-1,324,650**	**43,191,248**	**-4.35%**	**-2.78%**	**-3.31%**	**-3.07%**

*For a complete description of the methods and assumptions used to estimate sediment yield values described in this table, see Appendix D.

** Natural sediment yield values were calculated by summing the sediment yield values for the categories of "Natural Mass Wasting" and "Stream Bank Erosion" contained in the TMDL and multiplying them by the subbasin size and 50 year time frame of the analytical period. As of 2002 the Natural sediment loading represented only 36% of the total sediment budget of the watershed, the rest originated from management related sources.

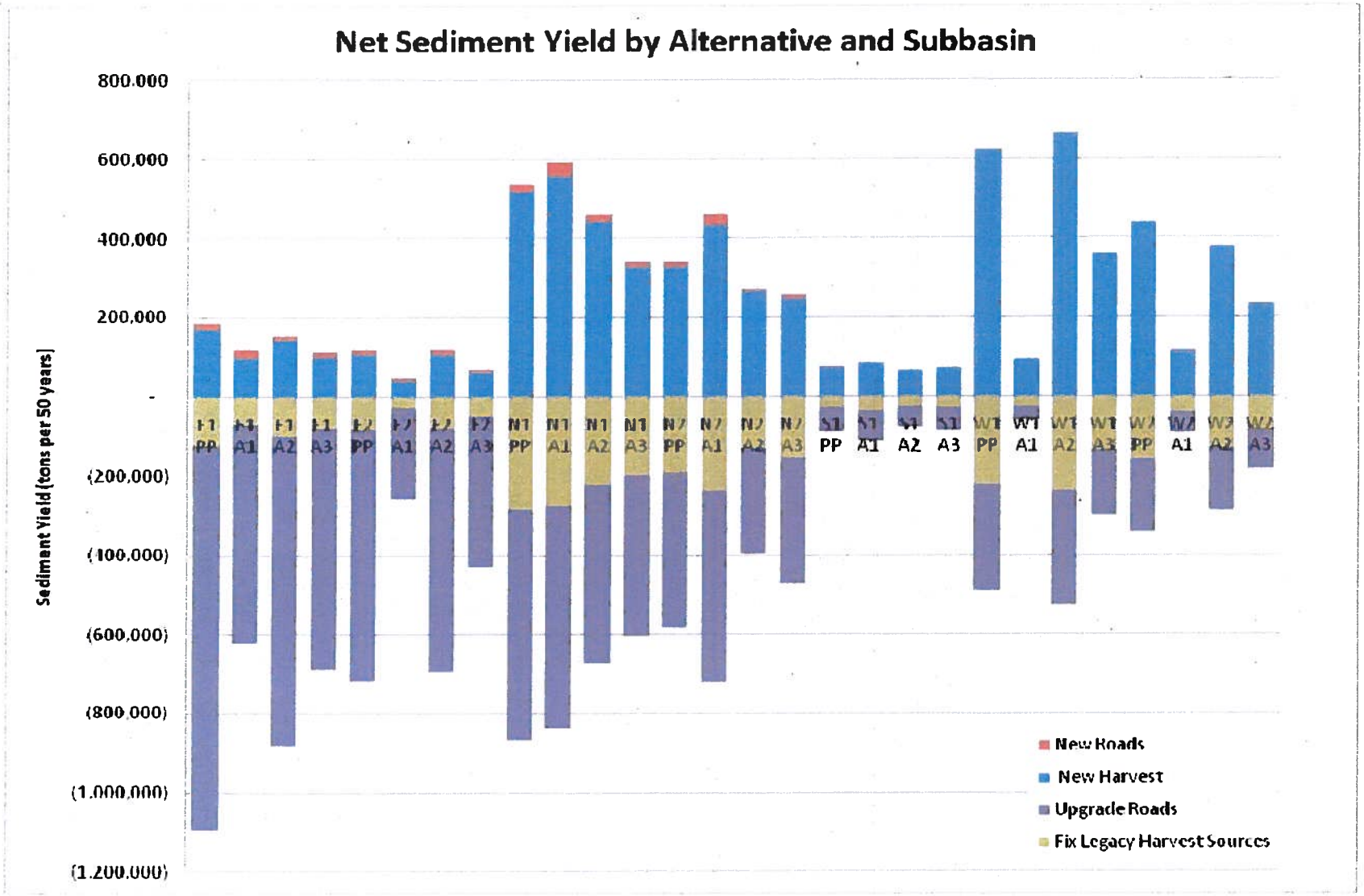


Figure 3-22. Relative contribution of each general sediment budget category to total sediment yield over the 50 year analytical period for each Alternative (Proposed Program =PP, Alternative I=A1, etc.) and subbasin (East 1 =E1, North 1= N1, etc.).

Turbidity

Annual rates of harvest over the 50-year analytical period did not exceed, or even approach 1.5% Clear Cut Equivalent area for any of the subbasins in either the Program or Alternatives (Table 3-51). Klein et al. (2008) concluded that chronic turbidity values were likely to significantly impact anadromous salmonids if average annual harvest rates exceeded 1.5%. For the study basins with harvest rates in excess of 1.5%, Klein et al. (2008) calculated that water quality standards for turbidity (20% above background) were also likely to be violated. However, for harvest rates of 0.05-1.02% the relationship was not clear; only three of the five study basins exhibited turbidity values that were more than 20% above the group of study basins which had no recent harvest (presumed to equal background).

Table 3-51
Average Annual Rate of Harvest*

Subbasin	Watershed Area	Program	Alt 1	Alt 2	Alt 3
East 1	25,885	0.31%	0.18%	0.25%	0.19%
East 2	24,921	0.21%	0.08%	0.20%	0.12%
North 1	34,413	0.32%	0.34%	0.28%	0.20%
North 2	29,135	0.24%	0.31%	0.19%	0.18%
South 1	17,643	0.10%	0.19%	0.09%	0.10%
West 1	25,829	0.19%	0.03%	0.21%	0.11%
West 2	31,931	0.11%	0.03%	0.10%	0.06%

*The average annual rate of harvest was calculated based on the methods described in Klein et al. (2008) using adjustment factors for each silvicultural type, i.e. CCE. The rate of harvest was calculated as the average value over the 50-year analytical period based on harvest scenarios described in section 3.1.

In addition to low annual harvest rates for all Alternatives, the Program and Alternatives II and III include specific measures that exceed requirements in the FPRs and are intended to prevent the delivery of turbid water to the watercourse from harvest areas (summarized in section 3.16.2 and described in detail in Chapter 2) such as increased WLPZ widths and canopy cover requirements, limitations on ground-based operations on steep slopes, prohibiting harvest on slopes >65% near stream channels, etc.

Chemical Contamination

The primary sources of chemical contamination of the watercourse due to forestry activities would be related to heavy equipment usage or application of forest chemicals. Application of herbicides is prohibited within the Program and Alternatives II and III (see Chapter 2). The Forest Practice Rules prohibit servicing of equipment in locations, "where servicing will allow grease, oil, or fuel to pass into lakes or watercourses" FPR 914.5, 934.5 and 945.5.

Peak Flows

The highest average annual percent canopy reduction value for any of the Alternatives or subbasins was 2.53% under Alternative I in the North_1 subbasin (Table 3-52); the peak canopy cover reduction value during any year of the 50 year analytical period also occurred in North 1 under Alternative I and was 3.77%. These values were far below the 20-40% canopy reduction values cited by Grant et al (2008) as necessary to cause a detectable increase in peak flows at the subbasin scale. However, it may be possible for peak flows to be increased in small (<250 ac) first order watersheds, at least under Alternative 1, because it would be possible to remove >20-40% of the canopy cover in a single year using clearcut silviculture- which is prohibited under the Program and Alternative III and would be difficult to accomplish under Alternative II given the large no-cut buffers on all stream classes. In small watersheds where forest harvest may affect peak flows, the response is typically only detectable for small (< 10 year recurrence interval events), early season events; not for the larger, mid-winter peak flows (>10 year RI) that alter streamchannel morphology, move most of the suspended sediment load and are typically thought of as "floods" by the public (Ziemer 1998). Very small watersheds are governed by hillslope process, which are sensitive to forest practices, whereas stormflow response of larger watersheds (e.g. subbasin scale) are governed by the geomorphology of the channel network (channel storage, floodplain storage, etc.) which is less likely to be affected by forest practices (Ziemer 1998). Therefore, implementation of the Program or any of the Alternatives is unlikely to cause a detectable increase in peak flows at the subbasin scale or of large, floodflows at any scale.

Table 3-52
Average and Peak Annual Canopy Reduction Levels

Subbasin	Average Annual Canopy Reduction Level (%)				Peak Annual Canopy Reduction Level (%)			
	Program	Alt 1	Alt 2	Alt 3	Program	Alt 1	Alt 2	Alt 3
East 1	2.01%	1.32%	1.90%	1.21%	3.49%	2.16%	3.02%	2.12%
East 2	1.27%	0.52%	1.42%	0.76%	2.14%	0.90%	2.35%	1.34%
North 1	2.11%	**2.53%**	2.02%	1.34%	3.44%	**3.77%**	3.30%	2.09%
North 2	1.58%	2.30%	1.40%	1.19%	2.42%	3.24%	2.09%	1.74%
South 1	0.64%	1.56%	0.65%	0.62%	1.16%	3.57%	1.07%	1.09%
West 1	1.26%	0.21%	1.49%	0.73%	2.10%	0.49%	2.46%	1.27%
West 2	0.72%	0.21%	0.69%	0.38%	1.26%	0.34%	1.16%	0.66%

3.16.7 Indirect Impacts of Implementing the Program/Alternatives-Water Quality

All likely impacts to water quality or quantity were discussed in the Direct Impacts section above.

3.16.8 Determination of Significance-Water Quality

Table 3-53 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-53
Summary Of Impacts[1/]
To Water Quality
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

The Program is expected to create a less than significant adverse impact to Water Quality Resources because the stream buffers exceed even the ASP rules in Forest Practice Rules and should therefore prevent any significant increase in stream water temperature and prevent any disturbance near the stream channel. The Program is expected to cause a net decrease in sediment yield to the Mattole River that exceeds any of the other Alternatives. Significant impacts to turbidity or peak flows are not expected to occur due to implementing the Program because the total canopy removal will be minimal due to the prohibition on clearcut silviculture and overall low intensity of harvest expected. The Forest Practice Rules will be sufficient to prevent significant effects due to chemical contamination.

Alternative I is expected to create a less than significant adverse impact to Water Quality Resources becasue the ASP rules in Forest Practice Rules have been found to prevent significant effect to aquatic habitat or water quality (BOF 2009). Alternative I is expected to cause a net decrease in sediment yield to the Mattole River, though less than the Program. Significant impacts to turbidity or peak flows are not expected to occur due to the overall low intensity of harvest expected, however the risk of effecting peak flows in small watersheds is higher in this Alternative than under the Program or Alternative III because clearcut silviculture is permitted. The Forest Practice Rules will be sufficient to prevent significant effects due to chemical contamination.

Alternative II is expected to create a less than significant adverse impact to Water Quality Resources because the stream buffers exceed the Program buffers and even the ASP rules in Forest Practice Rules and should therefore prevent any significant increase in stream water temperature and prevent any disturbance near the stream channel. Alternative II is expected to cause a net decrease in sediment yield to the Mattole River, though less than the Program. Significant impacts to turbidity or peak flows are not expected to occur due to the overall low intensity of harvest expected, however the risk of effecting peak flows in small watersheds is higher in this Alternative than under the Program or Alternative III because clearcut silviculture is permitted. The Forest Practice Rules will be sufficient to prevent significant effects due to chemical contamination.

Alternative III is expected to create a less than significant adverse impact to Water Quality Resources because the stream buffers exceed even the ASP rules in Forest Practice Rules and

should therefore prevent any significant increase in stream water temperature and prevent any disturbance near the stream channel. Alternative III is expected to cause a net decrease in sediment yield to the Mattole River, though less than the Program. Significant impacts to turbidity or peak flows are not expected to occur due to implementing the Program because the total canopy removal will be minimal due to the prohibition on clearcut silviculture and overall low intensity of harvest expected. The Forest Practice Rules will be sufficient to prevent significant effects due to chemical contamination.

3.16.9 Similar Impacts Described Elsewhere-Water Quality

The impacts of the Program and Alternatives on water quality and quantity are relied upon for the interpretation of likely impacts to aquatic habitat described in Chapter 3.4.

3.16.10 Mitigation Measures for the Proposed Program-Water Quality

No impacts on Water Quality will arise from implementing the Program so no mitigations are required.

3.16.11 Literature Cited-Water Quality

Bedrossian, T.L. and K. Custis. 2002. Review of July 2002 EPA Analysis of Impacts of Timberland Management on Water Quality. Memorandum dated November 22, 2002 and sent to Mr. Ross Johnson, California Department of Forestry and Fire Protection. California Geological Survey. Sacramento, CA. 23 p.

Beschta, R.L. et.al. 1995. Cumulative Impacts of Forest Practices in Oregon: Literature and Synthesis. Prepared for the Oregon Department of Forestry. Salem, Oregon.

Birkinshaw, S.J., J.C. Bathurst, A. Iroume, and H. P:alacios. 2010. The effect of forest cover on peak flow and sediment discharge—an integrated field and modeling study in central-southern Chile. Hydrological Processes DOI: 10.1002/hyo.7900. 14 p.

Cafferata, P. and J. Munn. 2006. Modified Completion Report Monitoring Program. Monitoring Study Group California State Board of Forestry and Fire Protection, Sacramento California.

Cafferata, P. and T. Spittler. 1998. Logging impacts of the 1970's vs. the 1990's in the Caspar Creek Watershed. USDA Forest Service Gen. Tech. Rep. PSW-GTR-168.

CAL FIRE. 2007. RECIRCULATED DRAFT Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan Alternative G. Prepared by the California Department of Forestry and Fire Protection, Sacramento, CA.

Elliot, W.J. and S. Miller. 2002. Estimating Erosion Impacts from Implementing the National Fire Plan. ASAE Meeting Paper No. 02-5011. St. Joseph, Michigan: ASAE.

Grant, Gordon E.; Lewis, Sarah L.; Swanson, Frederick J.; Cissel, John H.; McDonnell, Jeffrey J. 2008. Impacts of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.

Grant, G.E. and A.L. Wolff. 1991. Long-Term Patterns of Sediment Transport After Timber Harvest, Western Cascade Mountains, Oregon, USA. Sediment and Stream Water Quality in a Changing Environment: Trends and Explanation. Proceedings of the Vienna Symposium, August 1991, IAHS Publ. No. 203, 1991.

Grant, G., W. Megahan, and R. Thomas. 1999. A re-evaluation of peak flows: do forest roads and harvesting cause floods? Paper presented at the 1999 NCASI West Coast Regional Meeting, Portland, OR. National Council for Air and Stream Improvement. P. 5

Gucinski, H., M.J. Furniss, R.R. Ziemer, M.H. Brookes. 2001. Forest roads: A synthesis of scientific information. Gen. Tech. Rep. PNW-GTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.

Hatchet, B., M. Grismer and M. Hogan. 2004. Impacts of Mechanical Mastication on Soil Compaction and Runoff in the Lake Tahoe Basin. Integrated Environmental Restoration Services, Inc.

Hope, D. 2008. Personal Communication at Mattole Restoration Council Technical Advisory Committee Meeting. Eureka, California.

Keppeler, E.T., J. Lewis, and T.E. Lisle. 2003. Impacts of forest management on streamflow, sediment yield, and erosion, Caspar Creek Experimental Watersheds. In: Renard, Kenneth G.; McElroy, Stephen A.; Gburek, William J.; Canfield, H. Evan; Scott, Russell L., eds. First Interagency Conference on Research in the Watersheds, October 27-30, 2003. U.S. Department of Agriculture, Agricultural Research Service; 77-82. Available at: http://www.fs.fed.us/psw/publications/keppeler/Keppeler_Lewis_Lisle_ICRW.pdf

Klein, R.D, W.J. Trush and M. Buffleben. 2008. Watershed condition, turbidity, and implications for anadromous salmonids in the north coatal California streams. Report to North Coast Regional Water Quality Control Board, Santa Rosa, CA.

Larson, K.R. and R.C. Sidle. 1980. Erosion and sedimentation data catalog of the Pacific Northwest. *In* R6-WM-050-1981. USDA Forest Service Pacific Northwest Region. Portland, Oregon 64.p

Lewis, J. (1998). Evaluating the impacts of logging activities on erosion and suspended sediment transport in the Caspar Creek watersheds. Conference on coastal watersheds: the Caspar Creek Story, Albany, CA, Pacific Southwest Research Station. PSW-GTR-168

MacDonald, L.H., D. Coe and S. Litschert. 2004. Assessing cumulative watershed impacts in the central Sierra Nevada: Hillslope measurements and catchment scale modeling. USDA Forest Service General Technical Report. PSW-GTR-193

MacDonald, L.H. and J.D. Stednick. 2003. Forests and Water: a state-of-the-art review for Colorado. Colorado Water Resources Research Institute Rep. No. 196, Fort Collins, CO: Colorado State University, 65 p.

Martin, D. 2009. Forest Road Runoff Disconnection Survey of Private Timberlands inWashington. *Unpublished report.* Washington Forest Protection Association 724 Columbia Street NW, Suite 250 Olympia, WA.

Mattole Restoration Council. 2001. Report to the California Department of Forestry (CAL FIRE) Digitization of Forest Harvest History maps from Elements of Recovery. Petrolia, California.

Mattole River and Range Partnership. 2010. Draft Mattole Coho Recovery Strategy. Petrolia, California.

McGurk, B.J. and D.R. Fong. 1995. Equivalent Roaded Area as a measure of cumulative effect of logging. Environmental Management, 19(4), 609-621

Megahan, W.F., J.G. King. 2004. Erosion, sedimentation and cumulative impacts in the Northern Rocky Mountains, In: Ice, G.G., J.D. Stednick (eds.) A Century of Forest and Widland Watershed Lessons. Bethesda, MD: Society of American Foresters, Chapter 9, 201-222

Menning, K.M., D.C. Erman, K.N. Johnson and J. Sessions. 1996. Modeling aquatic and riparian systems, assessing cumulative watershed impacts and limiting watershed disturbance. Sierra Nevada Ecosystem Project: Final report to Congress, Addendum. Davis: University of California, Centers for Water and Wildland Resources. pp. 33-50

Moser, E. 2007. Personal Communication. USFS Hydrologist TEAMS member, Oregon.

Mount, J. 1995. California rivers and streams: the conflict between fluvial process and land use. Berkeley: University of California Press.

MRRP (Mattole River and Range Partnership: Mattole Restoration Council, Mattole Salmon Group, and Sanctuary Forest) 2009. Mattole Integrated Coastal Watershed Management Plan: Foresight 2020. Petrolia, Calif. 190 pp.

Murphy, M.L. 1995. Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska- requirements for protection and restoration. Decision Analysis Series No. 7. National Oceanographic and Atmospheric Administration. Silver Springs, MD.

North Coast Regional Water Quality Control Board. 2002. Mattole River watershed Technical Support Document for Sediment and Temperature. North Coast Regional Water Quality Control Board, Santa Rosa, California.

North Coast Regional Water Quality Control Board. 2009. Order No. R1-2009-0038 Categorical Waiver of Waste Discharge Requirements For Discharges Related to Timber Harvest Activities on Non-Federal Lands in the North Coast Region.

Pacific Lumber Company (PALCO). 2004. Report of Waste Discharge Elk River. *Submitted to the North Coast Regional Water Quality Control Board.* Scotia, California.

Pacific Watershed Associates. 1998. Sediment Source Investigation and Sediment Reduction Plan for the Bear Creek Watershed, Humboldt County, California. prepared for the Pacific Lumber Company Scotia, California. Pacific Watershed Associates, Arcata, California. April, 1998.

O'Louglin, C.L. 1974. A study of tree root strength deterioration following clearfelling. Canadian Journal of Forest Research. 4:107-113

Reid, L.M. and T. Dunne, 1996. Rapid evaluation of sediment budgets. Reiskirchen: Germany, Catena Verlag (GeoEcology paperback). 164 p.

Reid, L.M. 2010. Understanding and evaluating cumulative watershed impacts. Pgs. 277-298 in: W.J. Elliot, and L.J. Audin (editors), CWE for fuels management in the Western U.S. USDA Forest Service RMRS-GTR-231. Available online at: http://www.fs.fed.us/rm/pubs/rmrs_gtr231/rmrs_gtr231_277_298.pdf

Regional Water Quality Control Board. 2001. ACTION PLAN FOR THE GARCIA RIVER WATERSHED SEDIMENT TMDL. http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/garcia_river/

Rice and Lewis. 1991. Estimating Erosion Risks Associated with Logging and Forest Roads in Northwestern California. Water Resources Bulletin vol. 27 no. 5. American Water Resources Association.

Robichaud, P.R., L.H. MacDonald and R.B. Foltz. 2007. Fuel Management and Erosion. Cumulative Watershed Impacts of Fuels Management: A Western Synthesis. RMRS....

Robichaud, P.R., J.L. Beyers and D.G. Neary. 2000. Evaluating the effectiveness of post fire rehabilitation treatments. USDA Forest Service General Technical Report. RMRS-GTR-63. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p.

Robison, E.G., K. Mills, J.T. Paul, L. Dent, and A. Skaugset. 1999. Oregon Department of Forestry 1996 Storm Impacts Monitoring Project: Final Report. Forest Practices Technical Report # 4. Oregon Department of Forestry, Salem, Oregon. 141 pp.

Simpson, G. 2006. Mattole River Watershed Analysis Mass, Wasting Assessment, Signatory Review Team Draft Report. SHN Consulting Engineers and Geologists, Eureka California.

Spence, B.C., G.A. Lomnicky, R.M. Huges, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. Mantech Environmental Research Services Corp., Corvallis, OR.

Stednick, J.D. 1996. Monitoring the impacts of timber harvest on annual water yield. Journal of Hydrology. Vol. 176(79-95)

Stillwater Sciences. 2007. Landslide hazard in the Elk River Basin, Humboldt County, California. Prepared for the North Coast Regional Water Quality Control Board by Stillwater Science, Arcata, California.

Tiedemann, A. R., and D. A. Higgins. 1989. Impacts of management strategies on water resources. In: T. M. Quigley, H. R. Sanderson, and A. R. Tiedemann, Managing interior Northwest rangelands: The Oregon Range Evaluation Project. USDA Forest Serv. Gen. Tech. Rep. PNW-GTR-238. p. 56-91.

USDA Forest Service. 1988. Chapter 20 – Cumulative Off-Site Watershed Impacts Analysis. Soil and Water Conservation Handbook. USDA Forest Service Region 5

USDA and USDI. 1994. Record of decision for amendments to forest service and bureau of land management planning documents within the range of the northern spotted owl. April 1994.

USDA Forest Service. 2003. Herger-Feinstein Quincy Library Group Final Supplemental Environmental Impact Statement. USDA Forest Service, Plumas National Forest. Quincy, California

USDA Forest Service. 2005. Final Supplemental Environmental Impact Statement: Empire Fuels Management Project. USDA Forest Service, Plumas National Forest. Quincy, California

USDA Forest Service. 2007. Environmental Assessment, North Fork of the San Jacinto Healthy Forest Project. San Jacinto Ranger District, San Bernadino National Forest. Riverside County, California.

US Environmental Protection Agency. 2007. Mad River Total Maximum Daily Loads for Sediment and Turbidity. US Environmental Protection Agency, Region IX. San Francisco, California.

US EPA. 1993. Grazing Management Measures, section E. *in* Guidance specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. EPA 840-B-92-002, January 1993.

Welsh, H.H., G.R. Hodgson and N.E. Karraker. Influences of the vegetation mosaic on riparian and stream environments in a mixed forest-grassland landscape in "Mediterranean" northwestern

Ziemer, R.R. 1998. Flooding and Stormflows. Conference on coastal watersheds: the Caspar Creek Story, Albany, CA, Pacific Southwest Research Station. PSW-GTR-168

3.17 Impacts of Program/Alternative Implementation on Wildfire

This section summarizes the impacts of implementing the Proposed Program and Alternatives on wildfire severity and wildfire extent. Implementing the Proposed Program or the Alternatives responds to several of the goals of the Mattole Forest Futures Program including:

1. Reduce the danger of catastrophic fire
2. Manage existing stands, rather than "clearcut and start over"
3. Retain legacy trees that are large and old, to provide stand structural diversity

3.17.1 Environmental Setting - Wildfire

The assessment area for assessing the resiliency to wildfire as a result of implementing the Program's practices is the Program area itself.

The situation with respect to wildfire in the Mattole basin has been well described in various documents including MRC's 2009 Fire Monograph # 1 which accompanies the Mattole Integrated Coastal Watershed Management Plan. Excerpts from that Monograph are used here to describe the wildfire setting for the Program and Alternatives to the Program.

> *"The ecosystems and landscapes in the Mattole have formed and adapted with natural disturbances, Fire is an importance disturbance for many of the ecosystems found in the Mattole including mixed conifer, oak woodland, and grassland. Lightning fires occur naturally in the Mattole and Native American traditionally cared for their resources and the land by setting frequent small fires. The historic frequency of fire ignition by humans and lightning maintained an overall lighter fuel load and there fires very rarely burned with the intensity and force to destroy an entire forest as is seen in some cases today. In addition to the indigenous use of fire there was widespread intentional burning by early settlers in the Mattole watershed. Between 1875 and 1897, fires were set to maintain grasslands for livestock grazing, enlarging pastures and clearing land. From 1880 to 1952 many large fires were documented in local newspapers."*
>
> *Today fewer acres burn annually in the Mattole than burned in the historical fire regime. Heavy fuel loads generated from decades of fire suppression allow small fires that would otherwise burn through the understory to reach into the tree tops destroying whole trees and swaths of forest. The behavior of fire is dictated by three crucial components: weather, topography and fuel load. Out of the three, fuel load is the only component that humans can significantly modify on a scale that will affect the behavior of wildfires.*
>
> *In the past decade there have been several large wildfires in the watershed. The Honeydew Fire of 2003 burned 13,778 acres and cost 13.6 million dollars in suppression costs. Most of the fires over the last 50 years have started from lightning strikes in drought conditions. On June 20th, 2008 lightning strikes started a complex of over 56 fires in Humboldt and Del Norte counties including a fire that burned just over 1,000 acres on Paradise Ridge, northeast of Shelter Cove. Although the Paradise Ridge fire burned a large area, it stayed low to the ground with little to no crown fire due to recent fuel load reduction projects by both the MRC and the BLM.*
>
> *The Mattole Watershed has five volunteer fire departments, including; Petrolia, Honeydew, Telegraph, Whitethorn and Whale Gulch. Briceland, Shelter Cove and Ferndale Volunteer Fire*

Departments also respond to incidents in the Mattole Watershed. There are several agency fire stations in the valley including a CA FIRE Thorn Junction and Honeydew Stations and a BLM King Range Station."

The unpublished 2007 Southern Humboldt Fire Safe Plan (SHFSP) describes fire weather conditions in Southern Humboldt, which encompasses much of the Mattole and is excerpted below:

"According to the Humboldt Del Norte 2005 Fire Management Plan, the weather systems that are associated with large fires in the Humboldt Del Norte Unit and that affect fire behavior are associated with "Three major synoptic weather systems. They are the Pacific High (post-frontal), the Great Basin High and the Subtropical High Aloft pattern. These patterns can be expected to occur 50-55 days in the summer months, with the greatest number of days occurring in July, August or September.

"Data presented elsewhere in this fire plan shows that the vast majority of the 57 year average of 837 acres that burns from escaped fires, occurs in September, which is consistent with the general severe fire weather patterns noted above."

The 2005 Humboldt Del Norte Fire Plan shows that most wildland fires in the Program area were caused either by debris burning, heavy equipment, or vehicles. However, most of the big fires in the Mattole over the last 50 years have been started by lightning in severe fire weather conditions, usually in September where days were hot, fuel moisture content was low, and winds were from the northeast. Table GBFR-4 from the Fire Plan shows the distribution of acreage burned within the Humboldt Del Norte Fire Management Plan confirming the fact that September is the worst month for fire behavior.

TABLE GBFR-4
PERIOD OF YEAR FOR ESCAPED FIRES

Month	*Acres Burned/Year*	*Percent*
July	*83*	*9.9%*
August	*183*	*21.9%*
September	*541*	*64.6%*

Both the SHFSP and the MRC Fire Monograph describe CAL FIRE fire threat levels with varying degrees of specificity. Fire threat is a combination of expected fire frequency with potential fire behavior to create 4 threat classes, ranging from low to very high. As Figure 3- 24 below shows, much of the Mattole watershed and hence much of the Program area is rated as very high fire threat.

The MRC Fire Monograph describes fire frequency and contains maps of fire perimeters within the King Range, neither of which are repeated here. The most recent (4/5/2009) CAL FIRE FRAP fire perimeter map (Figure 3-25) shows the following location and timing of fires west of Highway 101, which includes the Program area. An area larger than the Mattole was selected in order to show perimeters of fires that may have originated outside of the basin, but expanded into the Program area.

Figure 3-23
Fire Threat in Mattole and Surrounding Areas

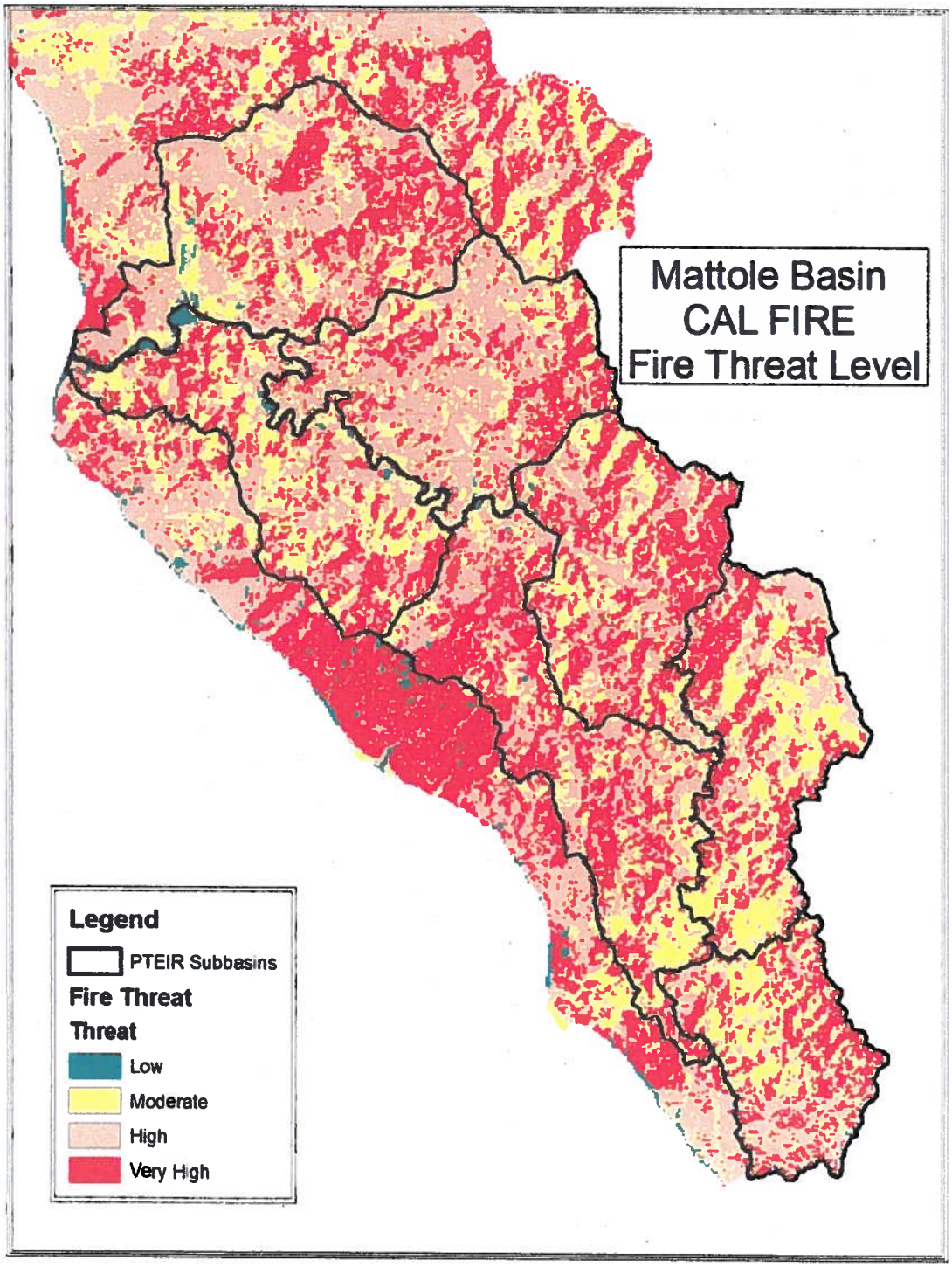
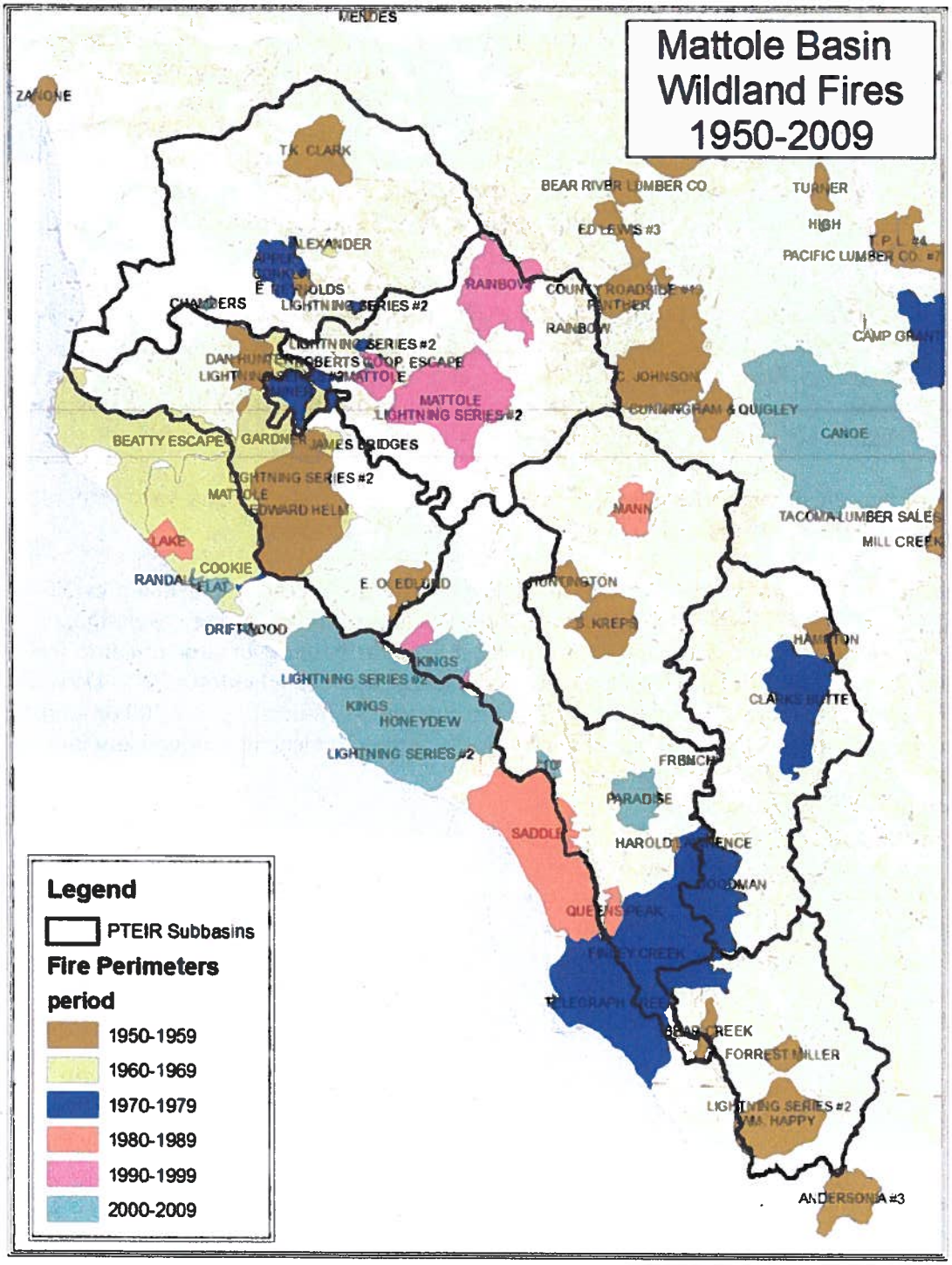


Figure 3-24
Wildland Fires In Or Near Program Area, 1950-2009



3.17.2 Regulatory Setting - Wildfire

The regulatory setting for the analysis of the impacts to the environment from implementation of the Program has already been partly summarized in Chapter 1.9, Role Of Local Governments In The PTEIR. Local fire plans such as the Upper and Lower Mattole Fire Plans which were created by the Upper and Lower Mattole Fire Safe Councils do not contain binding regulations that must be adhered to in the Program. The Humboldt County Master Fire Protection Plan concludes that for the Mattole Valley, a high priority finding is that the County, "*Develop a biomass utilization program to develop commercially-viable markets for fuel reduction project wood byproducts and residue such as slash, small diameter logs, foliage, wood chips, etc.*" Again, the MFPP does not contain binding regulations related to practices proposed in the Program.

None of the elements of the forthcoming (or existing) Humboldt County General Plan would "regulate" practices proposed in the Program, save for the single recommendation to:

- Encourage the use of prescribed burning as a management tool for hazardous fuels reduction, timber management purposes, livestock production, and enhancement of wildlife habitat.

Most of the general plan recommendations and enforceable standards relate to development throughout the County and not to practices proposed in the Program.

The two most prominent "regulations" that relate to wildfire (fuel reduction and prevention) are PRC 4291 and 4293. PRC 4291 mandates removal of all brush, flammable vegetation, or combustible growth that is located within 100 feet from the building or structure or to the property line. CAL FIRE and local fire protection district personnel enforce PRC 4291. PRC 4293 requires clearance of 4 feet around any transmission line operating at 2,400 or more volts, 6 ft around any line operating at 72,000 or more volts, and 10 ft clearance around any line operating at 110,000 or more volts.

With respect to wildland fire, CAL FIRE and the local volunteer fire departments are the responsible agencies for responding to wildfire on private lands within the Program area. While the BLM King Range is not within the Program area (by definition), its location within the watershed and adjacent to the Program area is important from a wildfire standpoint. BLM is the responsible agency responding to wildfires on BLM lands. CAL FIRE or BLM are the agencies responsible for wildfire and arson investigation, while the Humboldt County (or Mendocino County) District Attorney's are responsible for prosecuting arson.

In addition to the regulatory requirements described above, as well as the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2 – Program description. As a result, Program participants would be further regulated by the Program's restrictions including:

- slash shall not exceed 36" in height across 90% of the harvest area

3.17.3 Significance Criteria - Wildfire

Appendix G of the CEQA Guidelines contains only one significance criteria relating to wildfire:

The Program and Alternatives would create a significant effect if treatments:

a) Expose people or structures to the risk of loss, injury or death involving wildfires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

3.17.4 Determination Threshold - Wildfire

Wildfire severity is usually measured by the percent mortality of the resulting burned vegetation. Wildfire extent is usually measured as the number of acres burned by severity class. Wildfire frequency is the number of wildfires occurring in a bioregion in any year. The Program and Alternatives will have a significant adverse effect if treatments ultimately result in an:

a) Increase of 50% or more in tree mortality between 2011 and 2060:

3.17.5 Data and Assumptions - Wildfire

The analysis that follows is based on the data and assumptions described below as well as those in Chapter 3.1, which summarizes the extent and intensity of the Program's practices, as well as those of the Alternatives. Among other factors, the Program's practices include treating all activity created slash so that it lays less than 36" above the ground. For Alternative I, no slash treatment was simulated; since in most cases, landowners do no slash clean up, other than what is required by the FPR's along "public" roads. No special slash treatment was proposed in Alternative II and thus its fire behavior is modeled assuming no slash treatment. Alternative three, the fuel hazard alternative requires treating all slash so that it is within 18" of the ground.

Wildland fire perimeter data from the CAL FIRE FRAP website noted above was queried to determine the acres burned by time period and by subbasin, resulting in Table 3-54.

Table 3-54
Acres Burned By Time Period And Subbasin Since 1950

	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	Fire Total
East_1	2,043			797			2,839
East_2	451		4,912			13	5,376
North_1	1,886	100	1,377		1	55	3,419
North_2	62	1,294	1,759		7,402		10,518
South_1	3,212		1,011				4,223
West_1	8,859	9,104	371			7	18,341
West_2	367		5,091	364	1,231	2,903	9,956
Grand Total	16,880	10,499	14,521	1,161	8,634	2,977	54,672

Over the last 60 years, the West_1 subbasin has had the most acreage burned as a proportion of the total acreage in the subbasin (71%). No other basin comes close in the proportion that has burned over the last 60 years. The acreage burned in the West_1 subbasin includes a substantial proportion that reburned earlier burns, such that not all of the approximately 18,341 acres that have burned in the subbasin are original acres. North_2 and West_2 had the next highest proportion burned over the past 60 years at 36% and 31% respectively. In contrast, North_1 and East_1 have the smallest proportion of total acreage burned over the last 60 years at 11% and 10% respectively. No single fire has burned more than 5,000 acres in a single subbasin in the last 60 years.

The Humboldt Del Norte Unit Fire Plan stated there were 293 fires in Humboldt, Del Norte and western Trinity County in 2004 of which 247 fires were on lands directly protected by CAL FIRE. In 2004, lightning caused only 0.4% of all fires in the Unit area. Human caused fires are by far the greatest ignition source, with escaped debris fires being the leading cause (19.9%), followed by fires caused by vehicles (14.9%) and arson (9.5%). During the period 1950-2001, there were an annual average of 0.35 large (300+ acres) wildfires in the King Range, (BLM, 2004) the majority of which were started during extreme drought periods and/or periods with heavy dry lightning concentrations, and often under northeast to east wind conditions. Based on data from 1995-2004, over 98% of all ignitions within the Humboldt Del Norte Unit area were successfully controlled.

Historic Fire Trends In Program Area

Fire frequency and intervals have not been scientifically studied within the planning area. Research on the adjacent Six Rivers National Forest (Adams and Sawyer 1980) indicates that fire return intervals in the old-growth Douglas-fir forests prior to settlement were on the order of 8-15 years between fires, and that most of these fires were of low intensity. Taylor and Skinner (1998) found median fire return intervals on the middle portion of the Six Rivers National Forest of 14.5 years for the presettlement period (1626 to1849), 12.5 for the settlement period (1850-1904), and 21.5 for the suppression period (1905 to 1992). These fires functioned to maintain more open forest stands by killing young trees. Also, frequent fires on the forest margins tended to maintain the relative distribution and abundance of forest/grassland and forest scrubland ecotones. The BLM King Range Management Plan and EIR indicate a fire return interval of eight to nine years from the Point Reyes National Seashore, which they use as the fire return interval for the King Range National Conservation Area.

Current Fire Trends on West Coast

Recent research by Westerling (Westerling, et. al., 2006) shows that large wildfire activity in the western US increased suddenly and dramatically in the mid-1980s with higher large wildfire frequency, long wildfire duration and longer wildfire seasons. Westerling points out that there has been extensive discussion within the fire management and scientific communities as to the reason for the sudden increase with some researchers focusing on land-use history and others pointing to climate changes. Based on his research, wildfires burning in forested areas since 1986 burned at nearly four times the average frequency between 1970 and 1986 and burned 6.5 times more acreage than the earlier period. A statistical analysis showed that 66% of the

variation in the annual incidence of fires was due to temperature variation between the 1970-1986 period and the 1987-2003 period.

The length of the wildfire season has also been increasing since the mid 1980s. Westerling (2006) shows that the season length increased by 78 days comparing 1970-1986 and 1987-2003 data. Westerling showed that 48% of the increase was due to earlier ignitions and 52% was due to later control dates. Westerling's data also show that the latest ignition dates increased by 15 days between the two periods. Finally, the average time between discovery and control for a wildfire increased from 7.5 days in 1970-1986 to 37.1 days between 1987 and 2003.

Westerling concludes by stating that:

> *"Historical wildfire observations exhibit an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short (average of one week) duration to one with much more frequent and longer-burning (five weeks) fires. This transition was marked by a shift toward unusually warm springs, longer summer dry seasons, drier vegetation (which provoked more and longer burning large wildfires), and longer fire seasons. Reduced winter precipitation and an early spring snowmelt played a role in this shift."*
>
> *"These results have important regional and global implications. Whether the changes observed in western hydro-climate and wildfire are the result of greenhouse gas induced global warming, or only an unusual natural fluctuation, is presently unclear. Regardless of past trends, virtually all climate model projections indicate that warmer springs and summers will occur over the region in coming decades. These trends will reinforce the tendency toward early spring snowmelt and longer fire seasons. This will accentuate conditions favorable to the occurrence of large wildfires, amplifying the vulnerability the region has experienced since the mid-1980s. The Intergovernmental Panel on Climate Change's consensus range of 1.5C to 5.8 °C projected global surface temperature warming by the end of the 21st Century is considerably larger than the recent warming of less than 0.9 °C observed in spring and summer during recent decades over the western region.*

Large fires appear to be increasing and the number of ignitions is also increasing, both in the western US and in the Program area. Most fires in the Program area are human caused, and as expected most occur in the hot summer months of July, August and September. Unless there is a significant increase in fire fighting forces within the Program area, the trend over time (without accounting for global warming) will be more ignitions and with no change in ignition success, more acres burned, which will put more and more people and capital assets at risk.

Future Fire Trends Due to Climate Change

There is little disagreement that global warming is occurring and that average temperatures are increasing. However, localizing these predictions to California, let alone the Program area is difficult. Making the task even more difficult is that climate change models have to be linked to localized weather data, terrain information, vegetation distribution, ignition potential and fire

fighting capability in order to predict any type of meaningful change in acreage burned due to climate change.

Lenihan (2005) summarizes recent climate change work specific to California as a whole using Global Circulation Models (GCM's) in work he completed for the National Academy of Sciences. Lenihan used two of the more popular GCM's appropriate for California, the Hadley and the Parallel GCM's. Lenihan's work showed that while there is general agreement among these two climate models about rising California temperatures, they differed with respect to precipitation; the more sensitive model (Hadley) predicted a drier climate whereas the other GCM predicted more rainfall.

Both models resulted in more fire by the end of the 100-year simulation, though the character of the predicted fire regimes differed markedly. The Parallel model showed that with a hotter drier climate due to global warming, fires would occur more frequently and more area would burn annually. This scenario favored the expansion of grasslands. The Hadley model predicted a warmer and wetter climate over time, which resulted in increased plant growth and an initial *decrease* in fire activity. However, over time this model also showed an increase in wildland fire acreage burned due to the build-up of fuels, which coincided with the occasional hot dry summer.

Work in Oregon (University of Oregon, 2007) by the Climate Leadership Initiative of the Institute for a Sustainable Environment predicted that for the Pacific Northwest, average annual temperatures were projected to increase by 2 degrees Fahrenheit by the 2020s and 3 degrees by the 2040s, compared to averages for 1970-1999. However, the Institute's work did not predict a future wetter climate for the PNW that is consistent with the California GCM work. Also, the Institute's work is consistent with Westerling's analysis of the 1986-2003 period in that the predictions for snow pack were to melt earlier in the spring, which extended the fire season. The Institute concludes that in the Pacific Northwest:

> *"If the same patterns and statistical relationships between temperature, precipitation, and wildfire from the 20th century continue to hold in the 21st century, an "average year" in the 2020s will be associated with a 50 percent increase in the number of acres burned relative to an average year in the 20th century, and an average year in the 2040s will be associated with a 100 percent increase in the number of acres burned relative to an average year in the 20th century."*

Confounding the above data is more recent work completed by Westerling in 2006 (Westerling and Bryant, 2006) for the California Climate Change Center. In this work, Westerling used two different GCM's, the PCM and the GFDL to model fire behavior in California under two different scenarios. Westerling predicted that for northern California only, changes by the end of the century would range from 15-90% more acres burned than at present, depending on the model and scenario chosen. Consistent with Lenihan, Westerling found that models that predict a hotter, wetter climate over time (wetter in the winter, and hotter and drier in the summer) resulted in fire trends that produce opposite impacts in fuel-limited versus energy-limited fire regimes with decreased fire risk in fuel-limited systems such as sage brush and grassland types, and increased fire risk in energy-limited systems such as northern California forest lands. Westerling noted that none of the GCM analysis of fire behavior to date has incorporated Santa Ana wind and wind

events. However, Westerling noted that preliminary analysis of GCM's shows that the frequency of Santa Ana events in early fall may actually decrease by the end of the century.

The most important work to date, and the one most applicable to northern California is work by Fried, et. al. in 2004 titled The Impact Of Climate Change On Wildfire Severity: A Regional Forecast For Northern California. Fried summarizes the fire behavior outcomes for California as predicted by the various GCM's as follows: climate change scenarios based on the GFDL GCM produced the greatest increase in wildfire severity and those based on the Hadley model produce the smallest increases. Fried uses an intermediate model (GISS), which is closer to Hadley than to GFDL, to predict changes in California climate, which were localized to three specific CAL FIRE ranger units, one of which is the Humboldt-Del Norte unit. The GISS model showed warmer but less windy, more humid and heavier precipitation conditions in the Humboldt ranger unit over the next 100 years.

Fried's work is notable not only because it was localized to the Humboldt ranger unit, but also because it uses the change in initial attack success/failure as the predictive value for future wildland fire behavior. Fried notes that for the state as a whole, initial attack failures (escapes) are rare; between 1961 and 1997 only 0.03-0.5% of all ignitions resulted in escapes (Humboldt Ranger Unit plan data shows an initial attack failure rate of 2% based on data between 1995 and 2004). Initial attack success/failure is heavily influenced by such factors as fire preparedness, terrain, slope, vegetation, fire ignition history, etc., features not accounted for in much of the early 2000-2004 work.

Fried shows that under the GISS GCM and accounting for the specific conditions in the Humboldt Ranger Unit area, spread rates did not change over time in forest fuels and decreased slightly in grassland fuels. Fried notes, "It appears that GCM predictions of slower winds and higher humidity in Humboldt offset the impacts of higher temperatures on fire spread rates." Fried's work also showed that the GISS GCM predicted increased frequency (e.g. escapes) of grass fires and moderate increases in brush fires in the other two ranger units. Fried cautions that the work to date often disregards various feedbacks and thus the predictions of fire behavior/spread/frequency are minimum predictions. Most of the work to date has not accounted for future change in plant distribution due to global warming (e.g. spread of grasslands, movement of forests into higher elevations, etc.). In addition GCM models generally have only predicted surface fire behavior, which can lead to an underestimate of fire severity in forests. However, extreme weather conditions (which are generally when most escapes occur) can convert surface fires into crown fires. As a result, Fried states, GCM models may grossly underestimate actual fire spread rates and underestimate the frequency of escapes.

In a 2006 update to his 2004 work, Fried conducted further work for the California Climate Change Center and extended his analysis of wildland fire frequency and change in initial attack success/failure due to global warming. Fried's 2006 work focused solely on the Amador-El Dorado CAL FIRE Unit. For the 2006 work, Fried used more sophisticated models of initial attack than were available in 2004 and new downscaling techniques to link outputs from GCM's to historical data from local weather stations. Both of these improvements were designed to address the overarching question of how global climate change affects extreme fire weather in

California and thus the number of contained and escaped fires. Fried's 2006 work also used the same two GCM's used in Westerling and Bryant's 2006 work (GFDL and PCM).

Fried's 2006 work assessing the change in wildland fire frequency and initial attack success due to global climate change on the Amador El Dorado Ranger Unit has important conclusions that relate to potential wildland fire frequency in the Program area. First, global climate change produced an increase in escaped fire, particularly in brushland fuels. Second, escaped fire predictions due to global climate change is sensitive to the choice of GCM. Projections of climate variables that display strong relationship to fire conditions and spread such as wind speed and 10-hour fuel moisture were more important than previously explored. Fried's (2006) most important conclusion however, is that at least for the Amador El Dorado unit, the magnitude of climate change induced changes in wildland fire severity was generally less than prior work, including Fried's own 2004 work in the same ranger unit. This conclusion is based on the more sophisticated downscaling of how wind speed is treated when linking the GCM output to local historical weather data. Fried cautions that the local weather link to the GCM results in more conservative estimates of the number of escaped fires, however the local weather link tends to obscure the larger scale dynamics represented by regional weather conditions and thus may underestimate the impacts of climate change on wind fields and thus on escaped fire behavior and rate of spread. Finally, Fried notes that a modest increase of staffing at each ranger unit might effectively maintain the initial attack success/failure rate even with, 1) an earlier start to the fire season, 2) a longer fire season and 3) more ignitions.

Conclusions About The Role of Global Climate Change on Wildland Fire Behavior in the Program Area.

Predictions about wildland fire behavior in the Program area over the next 100 years due to global climate change vary since such predictions are highly sensitive to the assumptions made including the choice of GCM. Amazingly, give the large-scale nature of GCM's, there are at least two studies, which focus on northern California, including Fried's 2004 study, which focused on the Humboldt Del Norte Ranger Unit. Fried's 2004 work suggests only a minor change in the number of escaped fires due to global climate change, however Fried's 2004 work used a GCM not used by other researchers. Other work by Fried, and Westerling and Bryant, both in 2006, used the GFDL and PCM GCM's – both of which predicted increases in wildland fire behavior and change in the number of escaped fires due to global climate change. Both pieces of work predicted global climate change would likely result in more escaped fires in grassland and brushland types, and only a minor increase in forestland fire types. Fried's 2006 work also noted that there would probably be a slight reduction in wind speed due to global climate change. However, with a longer fire season, more ignitions due to more people in the Program area and with most escaped fires occurring during severe fire weather conditions, it can be concluded that there is likely to be a greater number of escaped fires during the next 100 years due to climate change than would be the case without climate change.

Modeling Fire Behavior Under Program and Alternatives Practices

Besides determining the possible likelihood that any particular subbasin might burn based on past history, the treated vegetation in the Program and in the alternatives was subjected to a

simulated fire under two weather conditions. To do so, all of the plot data was run through the USFS FVS Fire and Fuel Effects program with fire impacts simulated every year by modeling both moderate fire weather conditions and severe fire weather conditions. To create fire impacts, the FVS keyword SIMFIRE was used with the severe fire weather conditions modified to simulate September fire weather conditions in the Program area. Data were run at the vegetation strata level. That is, plots were grouped according to their WHR type, then the Program's harvest and slash practices were simulated at the vegetation level to calculate flame lengths and percent basal area mortality through time. Once the vegetation time series flame length and percent basal area mortality were calculated, these were combined at the subbasin level by weighting the data by the proportion of vegetation in each subbasin. As a result, the subbasin specific and time series specific flame lengths and mortality patterns associated with the Program and with each of the alternatives can be compared at the subbasin level through time.

For the Program, the All-aged and Program selection prescriptions require re-entry at vegetation-specific intervals, which was simulated by harvest in FVS. Immediately after simulation of harvest, FVS was instructed to "treat" the slash resulting from operations, as well as "plant" conifers to assist in regeneration. The slash treatment in FVS for the Program and Alternative III were simulated by forcing FVS to "remove" a certain percentage of branches from down trees, since FVS has no specific "slash treatment" keyword sequence. For Alternative I and II, no slash treatment was specified.

3.17.6 Direct Impacts Common From Implementing the Program/Alternatives on Wildfire

Likelihood of Burning

Given the above data and assumptions, the Program's footprint is less likely to be located in an area with a high likelihood of wildfire than chance would dictate. While the West_1 subbasin represents only 14% of the entire Mattole basin, this one basin accounts for over 34% of the area burned in the last 60 years. Conversely, the proportion of the Program's footprint within the West_1 subbasin represents only 4% of all Program treatments. Table 3-55 below shows the percent of acres burned by wildfire by subbasin as well as the % of Program footprint treatments by subbasin.

Table 3-55
Acres Burned By Subbasin And Acres Of Program Footprint By Subbasin

Subbasin	Acres burned 1950-2009	Percent of total acres burned	Acres of footprint 2011-2060	Footprint as Percent of Subbasin
East_1	2,839	5%	2,655	10%
East_2	5,376	10%	1,669	7%
North_1	3,419	6%	4,307	13%
North_2	10,518	19%	2,935	10%
South_1	4,223	8%	631	4%
West_1	18,341	34%	1,746	7%
West_2	9,956	18%	1,095	3%
Grand Total	54,672		15,038	

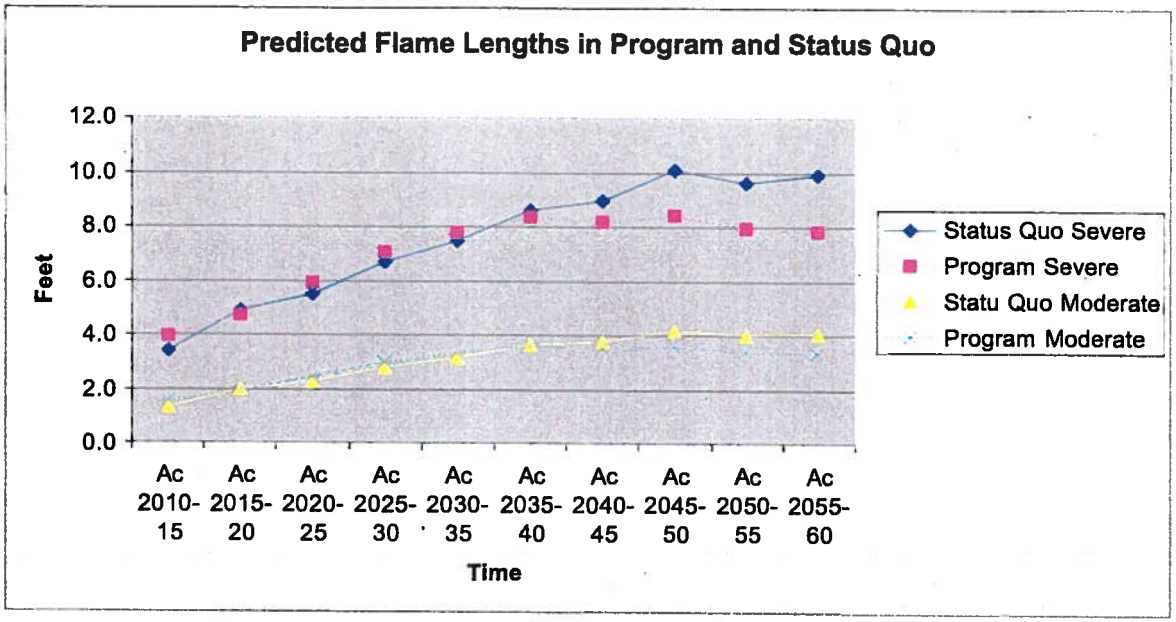
Generally, the Program's footprint tends to lie mostly in subbasins that experienced the least amount of wildfire in the last 60 years. As noted above, West_1 had 34% of the total acres burned over the last 60 years while it only has 4% of the footprint. Conversely, the three subbasins with the highest proportion of footprint, take place in subbasins with 6%, 5% and 19% of the total acreage burned over the last 60 years. Generally the Program's footprint is located in those portions of the Mattole basin that have the least amount of wildfire.

Flame Length

Based on the FVS modeled output for the Program and Status Quo, there are relatively minor differences between predicted flame lengths in moderate fire weather conditions over time as shown in Figure 3-25 below. Predicted flame lengths rise from around 1 ft. today to around 3.8' in the Program and 4.0' for the Status Quo, both in 2060. The difference in predicted flame length during severe fire weather conditions is more pronounced. Both the Program and the Status Quo have similar flame lengths between 2010 and 2035, however the pattern diverges with predicted flame lengths for the Program declining over time thereafter, while predicted flame lengths for the Status Quo continue to climb over time until 2060. Moderate fire weather conditions assume 70-degree temperatures, fall vegetation growth patterns and 6 MPH winds. Severe fire weather conditions assume 20 MPH winds.

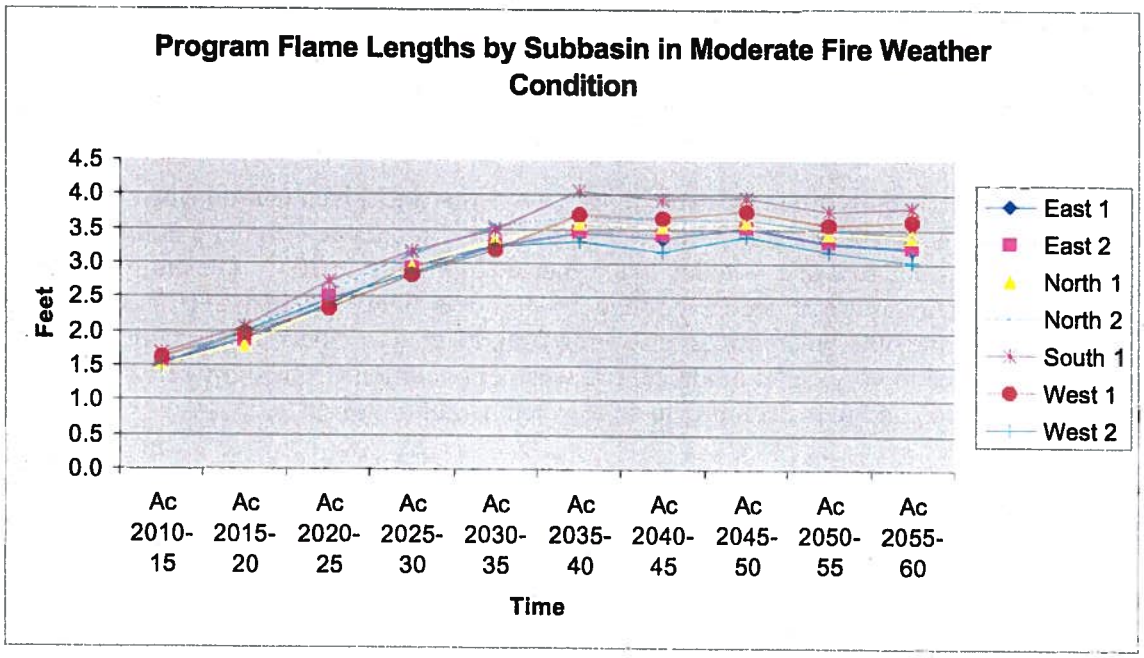
Generally, most forest stands in the Mattole experience severe mortality from wildfire when burning in severe fire weather conditions. Even treatments designed explicitly to reduce impacts from wildland fire are not normally designed to affect fire behavior during severe fire weather conditions. During such conditions, wildfires can produce burning material that can be "thrown" by the wind as far as 1/4 mile in front of the fire, making even such treatments as fire breaks ineffective. For comparison purposes, information below is shown for both moderate and severe fire weather conditions, but generally only the moderate fire weather conditions are analyzed, since severe fire weather conditions tend to result in substantial mortality no matter the treatment or the vegetation type.

Figure 3-25



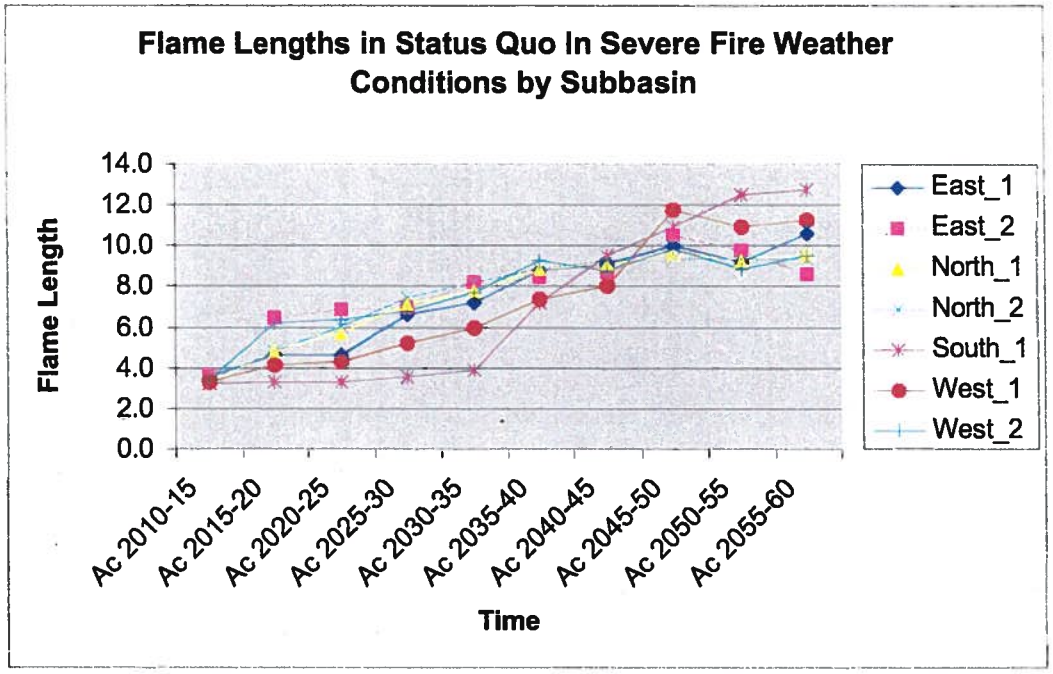
There is little difference in the projected flame lengths during moderate fire weather conditions between the basins in the Program as shown below in Figure 3-26. The treated area of South_1 under the Program has slightly higher projected flame lengths by 2060 than the treated area of West_2 (about 3.0' versus 4.0').

Figure 3-26



Predicted flame lengths under severe fire weather conditions are much higher than under moderate fire weather conditions and vary more between subbasins in the Status Quo as Figure 3-27 below shows:

Figure 3-27



Under severe fire weather conditions, the South_1 basin is projected to have substantially shorter flame lengths in the Status Quo than the other subbasins since no harvest is projected to occur during the first 25 years of the Program, then after harvesting does begin, the South_1 subbasin has the highest flame lengths at 12' or more by 2060. West_1 appears to have a slightly different projected trajectory of flame lengths over time compared to the other subbasins; generally it starts out lower than the rest of the subbasins and then climbs above the other subbasins other than the South_1 subbasin.

Alternative II flame lengths are in the same range as Alternative I given the same prescriptions and slash treatments. Flame lengths in this alternative under moderate weather conditions are projected to vary from a low of 1.4' today to a projected high of 4' in 2045. Generally in this alternative, flame lengths are projected to range 2.4-3.8' over time. Alternative III has lower flame lengths than the other alternatives benefiting from its goal to reduce fire hazard. Flame lengths are projected to vary under moderate fire weather conditions from a low of 1.4' today to a high of 2.6' in 2045 and then declining to a projected height of 2.3' in 2055.

Flame length is only one measure of predicted behavior during a wildfire. Large trees can often withstand longer flame lengths than smaller trees. Recent research by Stephens, et al. 2009 at five sites in the Western US including one site in the Klamath Mountains, shows that various combinations of treatments (mechanical and prescribed fire) can reduce fire severity (in terms of percent mortality) even at the 97.5 percentile fire weather condition. A comparison of the percent mortality expected from projected wildfires burning in two weather conditions for the Program and Status Quo is shown in Figure 3-28 below.

Projected mortality to stands treated by the Program's practices, during moderate fire weather conditions, is relatively low at around 20% for the Program, but increases dramatically for the Status Quo from 19% in 2010 to 50% by 2060. Percent mortality in severe fire weather conditions is generally lower for the Program than for the Status Quo, particularly after the first round of harvests are completed by the Program by 2025-30. Thereafter predicted mortality to residual stands after simulated wildfire burning in severe weather conditions is nearly 90% in 2060 for the Status Quo while it's "only" 65% in the Program. See Table 3-56 below.

Figure 3-28

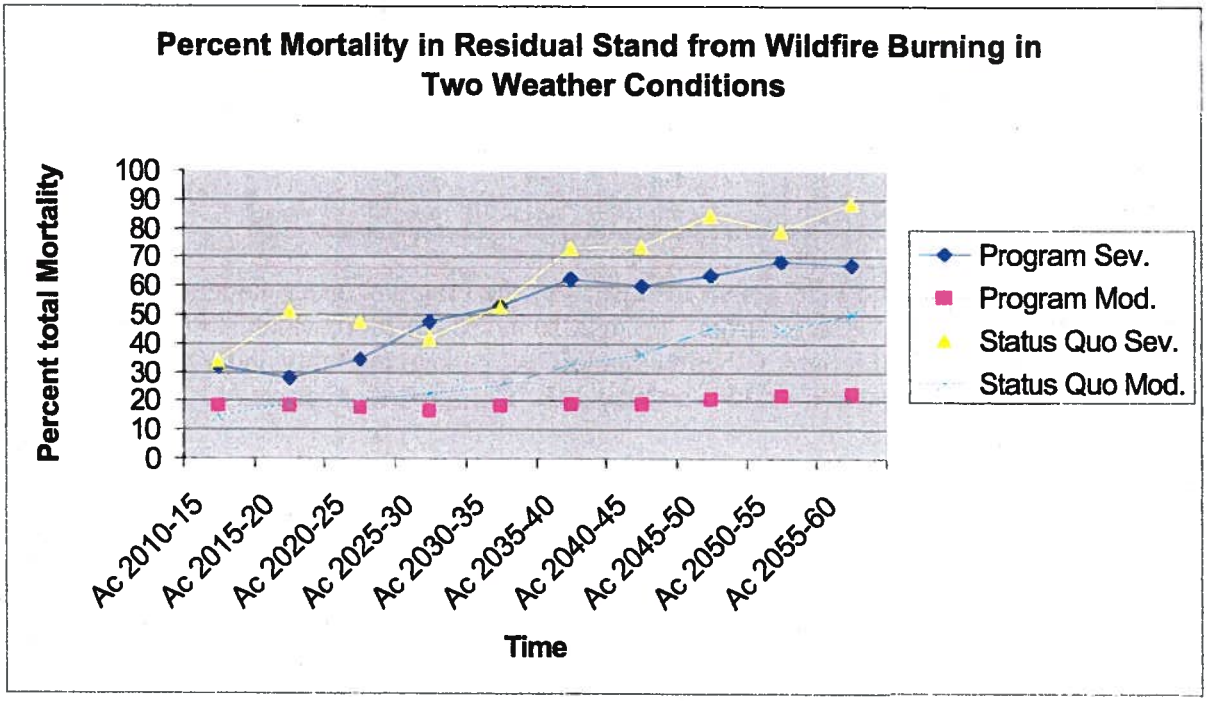


Table 3-56 below shows the projected mortality for both the Status Quo and the Program under both weather conditions.

Differences in predicted mortality between the Program and the Status Quo are partly due to Program requirements that require that slash be treated so that it is no more than 36" above the ground versus no slash treatment expected for the Status Quo. A more important difference is that under the Program, trees get larger and many of the small hardwoods are removed over time compared to the Status Quo where new harvests are always creating even-aged stands (e.g. plantations) with small trees with lots of slash.

Table 3-56
Projected Percent Mortality Over Time In Two Weather Conditions For Program And Status Quo

Time Period	Severe		Moderate	
	Program	Status Quo	Program	Status Quo
	Percent Mortality to Trees After Wildfire			
2010-15	32%	36%	19%	15%
2015-20	28%	47%	19%	19%
2020-25	34%	43%	18%	21%
2025-30	48%	42%	17%	23%
2030-35	53%	48%	18%	26%
2035-40	63%	62%	19%	33%
2040-45	60%	71%	19%	36%
2045-50	64%	84%	21%	45%
2050-55	69%	83%	22%	44%
2055-60	67%	90%	23%	50%

Over time, the trend in mortality for stands treated by the Program, under moderate fire weather conditions is projected to increase from 19% in 2010 to 23% in 2060, which is a less than significant impact for the Program. For the Status Quo, percent mortality under moderate weather conditions increases from 15% in 2010 to 50% in 2060, an increase of 233%.

At the subbasin level, predicted mortality for the Program in moderate fire conditions varies in 2010 over a very small range between 18-19% and by 2060 varies between 20% in West_2 to a high of 26% in North_2. North_1 is the next highest at 24% predicted mortality in 2060. For the Status Quo, the range of predicted mortality in moderate fire weather conditions varies over a small range of between 14-16% in 2010, but varies over a large range in 2060, from 35% in East_2 to 75% in South_1.

Predicted mortality for Alternative II varies from a low of 15.4% today to a high of 48% in 2050 under moderate fire weather conditions. Under severe fire weather conditions, mortality ranges from a low of 16.1% today to a high of 89% mortality in 2060. For Alternative III, percent mortality is predicted to range from a low of 19.3% today dropping to 16% in 2060, while under severe fire weather conditions mortality in this Alternative would range from a low of 30% today to a high of 53% in 2060.

3.17.7 Indirect Impacts of Implementing the Program/Alternatives on Wildfire

Indirect impacts of implementing the Program or Alternatives include both beneficial impacts and adverse impacts as a result of implementing the Program.

One of the most important indirect impacts is the potential for prescribed fires, particularly broadcast burns, to escape control. Few such incidents occur, notwithstanding several very high profile escaped fires such as the Lewiston fire in Northern California in 2002, Cerro Grande Fire in New Mexico in 2001, etc. Graham, McCaffrey and Jain concluded in their 2004 report that the risk of prescribed fire escaping is "*extremely*" low given the number of prescribed burns

which take place each year. Escapes can occur if weather predictions are ignored, or are inaccurate, if data is misinterpreted or wrongly analyzed, if fuel loading is underestimated or if lighting or holding crews do not follow the prescribed burn plan. The impacts of escaped prescribed fire include more watershed area is burned than planned, there may be catastrophic impacts to improvements such as homes, barns, fences, crops, etc. and additional fire suppression resources are often needed to put out the resulting escaped fire.

Positive indirect impacts due to fewer acres burned at high mortality rates can include increased firefighter safety and potentially fewer catastrophic losses to human life and property. Fewer acres severely burned could also potentially reduce impacts to air quality and to water quality.

3.17.8 Determination of Significance - Wildfire

Implementation of the Program would not result in a 50% increase in tree mortality of treated acres during moderate fire weather conditions. As a result, implementation of the Program would not expose people or structures to a significant risk of loss, injury or death involving wildfires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands and thus will have a less than significant adverse impact to the environment.

Implementation of Alternative I or Alternative II could result in a 50% or more increase to tree mortality, which could result in this Alternative exposing people or structures to a significant risk of loss, injury or death involving wildfires resulting in the potential for Alternatives I or II to have a significant adverse impact to the environment.

Implementation of Alternative III could result in a reduction in tree mortality over time resulting in a negligible to moderate benefit to the environment. As a result, implementation of Alternative III would not expose people or structures to a significant risk of loss, injury or death involving wildfires. Thus, implementation of Alternative III will have a less than significant impact to the environment.

3.17.9 Similar Impacts From Wildfire Described Elsewhere

Impacts from wildfire and prescribed fire on air quality and greenhouse gas emissions are described in chapter 3.4 and 3.6, respectively.

3.17.10 Mitigation Measures for the Proposed Program -Wildfire

No significant impacts will arise from implementing the Program so no mitigations are required.

3.17.11 Literature Cited - Wildfire

Adams, S., and O.J. Sawyer. 1980. "Past fire incidence in mixed evergreen forests of northwestern California." Unpublished document, California State University Humboldt, on file at Six Rivers National Forest Supervisors Office, Eureka, CA. 22pp

CAL FIRE, 2005. Humboldt Del Norte Unit 2005 Fire Management Plan. Prepared by California Department of Forestry and Fire Protection, Fortuna, CA.

Graham, Russell T., Sarah McCaffrey, and Theresa Jain, 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. USDA Forest Service Rocky Mountain Forest and Range Experiment Station General Technical Report, GTR-120

Fried J.S., Margaret S. Torn, and Evan Mills. 2004. The Impact Of Climate Change On Wildfire Severity: A Regional Forecast For Northern California. Climate Change, 64, 169-191. 2004

Fried, J.S., 2005. Fanning The Flames: Climate Change Stacks Odds Against Fire Suppression. PNW Science findings, issue 74, July 2005

Fried, et. al. 2006. Predicting The Effect Of Climate Change On Wildfire Severity And Outcomes In California: Preliminary Analysis A Report From: California Climate Change Center. March 2006 CEC-500-2005-196-SF.

Lenihand, J. 2005. Climate Change And California: Potential Implications For Vegetation, Carbon, And Fire. PNW Science Findings, issue 75, August 2005, issue devoted to climate change and fire.

Stephens, Scott L, Jason J. Moghaddas, Carl Edminister, Carl E Fielder, Sally Haase, Michael Harrington, Jon E. Keeley, Eric E. Knapp, James D McIver, Kerry Metlen, Carl N. Skinner and Andrew Youngblood, 2009. Fire treatment impacts on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications 19(2), 2009.

Taylor, A.H. and C.N. Skinner. 1998. "Fire history and landscape dynamics in a late-successional reserve, Klamath Mountains, California, USA." Pennsylvania State University. Forest Ecology and Management 111(1998)285-301

University of Oregon, 2007. Economic Impacts of Global Climate Change on Forest Resources in Oregon. A preliminary Analysis. Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, 2007.

Westerling, Anthony and Benjamin Bryant. 2006. Climate Change And Wildfire In And Around California: Fire Modeling And Loss Modeling. A Report From: California Climate Change Center February 2006, CEC-500-2006-190-SF

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, T. W. Swetnam. 2006. Warming and Earlier Spring Increases Western U.S. Forest Wildfire Activity, Science Express, July 2006.

3.18 Impacts of Program/Alternative Implementation on Wildlife/Terrestrial Species

This section summarizes the impacts to wildlife resources due to implementing either the Proposed Program or any of the alternatives.

3.18.1 Environmental Setting - Wildlife

The assessment area for assessing the direct impacts from implementing the Program's practices on wildlife is the Program area itself, although some impacts are reported on a subbasin level.

Threatened, Endangered and Special Status Species

Section 2.0.8 provides a generalized list of habitats within the Mattole basin, classified by the Wildlife Habitat Relationship system, and a list of potential wildlife species that occur in those habitat types. Sections 2.0.8 and Table 2-12 also list Threatened and Endangered (T&E) species and other special-status species that have been located in or have potential to exist in the basin. The following section describes the habitat requirements of the terrestrial special-status species that might be found in the Program area along with a determination as to whether their habitats are likely to actually occur in harvest areas or be affected by forest management activities as proposed and described for the Program or alternatives within the Program area.

- Accipiter cooperii – Coopers hawk – DFG species of special concern
  Seldom found in areas without dense tree stands or patchy woodland habitat. Nests in deciduous trees in crotches 3-23 m (10-80 ft), but usually 6-15 m (20-50 ft), above the ground. Also nests in conifers on horizontal branches, in the main crotch, often just below the lowest live limbs. Nest is a stick platform lined with bark. Usually nests in second-growth conifer stands, or in deciduous riparian areas, usually near streams. Hunts in broken woodland and habitat edges; catches prey in air, on ground, and in vegetation. Not found in CNDDB search, possibly in Program area. Generally, the timbered stands of the Program area do not include suitable habitat for the Coopers hawk. However, it likely occurs in suitable areas near by potential Program treatment areas. It could also nest in protected watercourses within or adjacent to managed areas.

- Accipiter gentiles – northern goshawk – Fed and DFG species of special concern
  Breeds in ponderosa pine, black oak, riparian deciduous, mixed conifer, and Jeffrey pine habitats. Prefers, but not restricted to, riparian habitats. The northern goshawk prefers older or middle aged closed canopy forests for nesting, but will hunt in patchy woodland habitat. Desimone (1997) found that 60% of occupied nest sites were in old, closed canopied forests (>15 trees/ha >=53 cm (21") dbh, >50% canopy cover), 26% were in mid-aged, closed forest (23-53 cm dbh, <15 trees/ha >53 cm (21"), >50% canopy closure). The goshawk hunts small to medium sized animals and birds, and is found from sea level to subalpine forests. Although its preferred nesting areas are not common within the Program area it is likely found in more well-developed forests nearby the Program area. Goshawks frequently reuse the same nest for many years. The nest is built of sticks in a tree next to the trunk. The goshawk will return to the same nesting and hunting area year after year (Peregrine fund 2010). Goshawks were observed in the

headwaters of the Mattole, which led to one of the preserved forests being known as Goshawk Grove.

- Accipiter striatus – Sharp shinned hawk – DFG species of special concern
  Breeds in ponderosa pine, black oak, riparian deciduous, mixed conifer, and Jeffrey pine habitats. Prefers, but not restricted to, riparian habitats. North facing slopes with plucking perches are critical requirements. Roosts in intermediate to high-canopy forest. Nests in dense, even-aged, single-layered forest canopy. Winters in woodlands. Usually nests in dense, pole and small-tree stands of conifers that are cool, moist, well shaded, with little ground cover, near water. Nest is a platform or cup in dense foliage against trunk, or in main crotch of tree, usually 2-24 m (6-80 ft) above ground. Not likely in Program area due to habitat requirements, not found in CNDDB search.

- Aquila chrysaetos – Golden eagle – DFG species of special concern, BOF sensitive species.
- Habitat typically rolling foothills, mountain areas, sage-juniper flats, desert. Needs open terrain for hunting including grasslands, deserts, savannahs, and early successional stages of forest and shrub habitats. Secluded cliffs with overhanging ledges and large trees used for cover. Nests on cliffs of all heights and in large trees in open areas. Alternative nest sites are maintained, and old nests are reused. Builds large platform nest, often 3 m (10 ft) across and 1 m (3 ft) high, of sticks, twigs, and greenery. Rugged, open habitats with canyons and escarpments used most frequently for nesting. According to the CBDDB there have been Golden eagle detections in the N. Fk Mattole on HRC lands. Also found at Devil's Creek southwest of Rainbow Peak and East Branch N. Fk Mattole near Buckeye Mountain, as reported by the Humboldt Redwood Company wildlife staff (B Motroni pers. comm. 2/11).

- Ardea alba – great egret – BOF sensitive species
  Feeds and rests in fresh, and saline emergent wetlands, along the margins of estuaries, lakes, and slow-moving streams, on mudflats and salt ponds, and in irrigated croplands and pastures. Nests in large trees, and roosts in trees. Feeds in shallow water and along shores of estuaries, lakes, ditches, and slow-moving streams, in salt ponds and mudflats, and in irrigated croplands and pastures. Eats mainly fishes, amphibians, snakes, snails, crustaceans, insects, and small animals. Requires groves of trees suitable for nesting and roosting, relatively isolated from human activities, near aquatic foraging areas. Not likely in Program area due to habitat requirements, except perhaps in extreme western portions of North_1 and West_1 subbasins.

- Ardea herodias – Great blue heron – BOF sensitive species
  Found in shallow estuaries and fresh and saline emergent wetlands. Less common along riverine and rocky marine shores, in croplands, pastures, and in mountains above foothills. Perches and roosts in secluded tall trees. Also perches on kelp beds offshore. Usually nests in colonies in tops of secluded large snags or live trees, usually among the tallest available; rarely nests on ground, rock ledges, sea cliffs, mats of tules, or shrubs. For nesting, prefers secluded groves of tall trees near shallow-water feeding areas, but

feeding area may be up to 16 km (10 mi) distant. Not likely in Program area except for extreme western portion of North_1 and West_1 subbasins. Not recorded in CNDDB.

- Arborimus albipies – white footed tree vole – State species of special concern, candidate for Fed list
  In California, known only from Humboldt and Del Norte Counties. This scarce resident of humid coastal forests is found in redwood, Douglas fir, and riparian forests. Builds a nest on the ground, under stumps, logs, or rocks. Finds cover in dense vegetation near streams. Found in mature, coastal forests, preferring the vicinity of small, clear streams, with dense alder and other deciduous trees and shrubs. Occupies the habitat from ground surface to canopy, feeding in all layers. Often are found near logs and in brush when on the ground. Not in CNDDB, but possible in Program area.

- Arborimus pomo – red tree vole – DFG species of special concern
  The red tree vole occurs largely in old growth forests and is a primary food source for the Northern spotted owl. It is likely to occur within the Program area, but due to the predominance of second growth forests in the Program area, in lesser numbers than in its preferred habitat of old growth. More or less restricted to the fog belt. Reported to be rare to uncommon throughout its range, but the difficulty of locating nests and capturing individuals makes abundance hard to assess. Occurs in old growth and other forests, mainly Douglas fir, redwood, and montane hardwood-conifer habitats. Needles and twigs are gathered primarily during the night, and may be consumed where found, or brought to the nest. Needle resin ducts are removed. The remaining part is eaten, and the resin ducts may be used to line the nest cup. Males nest most frequently in a tree nest constructed of fir needles, or, less frequently, in shallow burrows at the base of fir trees, beneath litter. Females seem to spend most of their lives in trees, constructing large, domed nursery nests of Douglas-fir needles, constructed in trees, preferably tall trees, from 2-45 m (6-150 ft) above the ground. Nest may be situated on whorl of limbs against trunk, or at outer limits of branches. In young second-growth Douglas fir, the broken tops of trees frequently are used. Not reported in CNDDB, but likely in Program area.

- Bonasa umbellus – ruffed grouse – DFG species of special concern
  The ruffed grouse prefers a mosaic of habitats and utilizes thickets of deciduous trees for summer and fall cover. These are common across the Program area but unlikely to be included within harvest units. However, it utilizes adjacent conifer stands (which could be included in harvest units) for winter shelter and escape cover. Uncommon local resident of valley foothill riparian and surrounding conifer forests at low to middle elevations in northwestern California. Reported distribution in recent decades from extreme northern Del Norte Co. south to extreme southern Humboldt Co., and westward to northern Trinity Co. and southwestern Siskiyou Co. Uses thickets of alder, maple, hawthorn, birch, and other deciduous trees for summer and fall cover, and adjacent conifer stands, which are used for winter shelter and escape cover. Requires a mosaic of habitats: riparian stands with young and old deciduous trees, brushy areas interspersed with herbaceous inclusions, and conifer stands, for cover. Not reported in CNDDB, but likely in Program area.

- Brachyramphus marmoratus - Marbled murrelet – Federally listed as threatened, State listed as endangered
  In summer, forages close to shore (within 500 m 1640 ft) in shallow water, usually less than 30 m (95 ft) deep. In nonbreeding season, often forages farther from shore. Forages by diving and pursuing small fish, its main food. When not feeding, probably spends day on surface of shallow coastal waters close to shore. Roosts in dense, mature forests of redwood and Douglas fir. In the summer depends for nesting sites on old-growth forests within 50 miles of the coast; nests on large diameter (6" or greater) branches in old-growth conifers. In California, probably prefers to nest in tall trees; with eggs laid in an indentation of moss and lichen. One detection in KRNCA in 1995, most likely not in Program area due to habitat requiring trees with branches 6" in diameter with larger overstory trees dominating nest site trees.

- Chaetura vauxi – Vaux's swift – Fed listed as threatened, DFG species of special concern
  The Vaux's swift utilizes conifer stands, so it likely to occur within the Program area. Its most critical habitat requirement is a nest site in a large, hollow tree, preferably a tall, burned-out snag. Prefers redwood and Douglas fir habitats with nest sites in large hollow trees and snags, especially tall, burned-out stubs. Feeds exclusively on flying insects taken in long, continuous foraging flights. Feeds high in the air over most terrains and habitats; also feeds commonly at lower levels in forest openings, above burns, and especially above rivers. The most important habitat requirement appears to be an appropriate nest site in a large, hollow tree. Apparently mostly migrates to wintering grounds in Mexico and Central America, but a few winter-over irregularly in coastal lowlands of southern California. Occurs in KRNCA but has not been sighted in Program area.

- Contopus cooperi – Olive sided flycatcher – Fed and DFG species of special concern
  The olive-sided flycatcher prefers montane conifer forests where tall trees overlook canyons, meadows, and lakes or other open terrain. This type of habitat is no doubt present but not common within the heavily timbered and intermittently steep Program area. Uncommon to common summer resident in a wide variety of forest and woodland habitats. Preferred nesting habitats include mixed conifer, montane hardwood-conifer, Douglas fir, redwood, red fir, and lodgepole pine. Requires large, tall trees, usually conifers, for nesting and roosting sites; also lofty perches, typically the dead tips or uppermost branches of the tallest trees in vicinity, for singing posts and hunting perches. Nest is an open cup of grasses, mosses, lichens, rootlets, and pine needles; usually placed in a conifer 2-20 m (5-70 ft) above ground, well out on a horizontal limb. Extent and density of forest habitat is less important than the amount of air space that can be scanned from its highest perches. The olive-sided flycatcher occurs, but is somewhat uncommon, within the nearby KRNCA. Possibly in Program area.

- Corynorhinus towsendii – Townsends big eared bat – Not Fed listed, DFG species of special concern
  Roosting sites are the most important limiting resource. Requires caves, mines, tunnels, buildings, or other human-made structures for roosting. Small moths are the principal food; beetles and a variety of soft-bodied insects also are taken. Several populations

located east of Program area. Not in CNDDB, potentially in suitable roosting habitat in the Program area.

- Dendroica occidentalis – Hermit warbler – Fed species of special concern, not state listed
  The hermit warbler prefers mature conifer stands with open to dense canopies. It also utilizes woodlands and conifer plantations with dense canopies during some portions of the year. Breeds in mature ponderosa pine, montane hardwood-conifer, mixed conifer, Douglas fir, redwood, red fir, and Jeffrey pine habitats. Frequents mature stands of conifers with open to dense canopy for breeding. Uses mature conifers, woodlands, and plantations with similar canopy in other seasons. Gleans insects and spiders from foliage in middle to upper canopy. Common in the KRNCA and likely in the Program area. Not in CNDDB.

- Empidonax difficilis – Pacific slope flycatcher - Fed species of special concern, not state listed
  The Pacific slope flycatcher's breeding habitat is provided by shady alder and willow thickets and other riparian habitats. The Pacific slope flycatcher is a widespread, fairly common summer resident in warm moist woodlands, including valley foothill and montane riparian, coastal and blue oak woodlands, and montane hardwood-conifer habitats. Also uses closed-cone pine-cypress, ponderosa pine, Douglas fir, Sierra mixed conifer, and redwood habitats, and others. Breeds in the south in moist canyon bottoms from the coast to lower reaches of mountain ranges west of the deserts. Occurs in similar moist woodland and forest habitats to the north on the coast and on lower western slopes of the Sierra Nevada, Cascades, and on other interior mountain ranges. Breeding habitat provided by shady alder and willow thickets and similar riparian growth in oak woodlands, redwood, and ponderosa pine forests, and others. In migration not so closely tied to riparian areas, but still prefers shaded woodlands. Nest often built near water in crotch of tree, on cliff ledge, in old building, or on other human made structure, usually in shade 0-9 m (0-30 ft) above ground. In KRNCA and likely in Program area.

- Empidonax trailii brewsteri – Little willow flycatcher – Fed species of special concern, state listed as endangered
  The little willow flycatcher likely occurs within the Program area, but is limited to willow thickets, which occur mostly within riparian areas. Generally speaking, because of the riparian protection measures included in the FPR's, disturbance to this habitat is considered unlikely during timber operations. Most often occurs in broad, open river valleys or large mountain meadows with lush growth of shrubby willows. Dense willow thickets are required for nesting and roosting. Low, exposed branches are used for singing posts and hunting perches. Open, cup nest is placed in an upright fork of willow or other shrub, or occasionally on a horizontal limb, at height of 0.5 to 3.0 m (1.5 to 10 ft). Nesting site usually near languid stream, standing water or seep. Arrives from Central and South American wintering grounds in May and June. Departs in August; transients noted through mid-September. Occurs irregularly in the KRNCA, unknown as to whether in Program area – habitat not in operational portions of Program.

- Falco peregrinus – Peregrine falcon – Not listed by Fed, state listed as endangered
  Breeds mostly in woodland, forest, and coastal habitats. Riparian areas and coastal and inland wetlands are important habitats yearlong, especially in nonbreeding seasons. Breeds near wetlands, lakes, rivers, or other water on high cliffs, banks, dunes, mounds. Preferred nesting sites include inaccessible cliffs on rocky outcrops and in river gorges. Nest is a scrape on a depression or ledge in an open site. Located nearby in Shelter Cove, possibly in Program area.

- Haliaeetus leucocephalus – bald eagle – Feds delisted June, 2007, state listed as endangered
  The bald eagle requires large bodies of water with abundant fish and adjacent snags or other perches. Although the Mattole River once provided abundant fish it no longer does. Currently bald eagle habitat within the Program area is likely limited to the extreme westerly sections of the North_1 and West_1 subbasins. Requires large bodies of water or free-flowing rivers with abundant fish and adjacent snags or other perches. Perches high in large, stoutly limbed trees, on snags or broken-topped trees, or on rocks near water. Roosts communally in winter in dense, sheltered, remote conifer stands. Nests in large, old growth, or dominant live tree with open branchwork, especially ponderosa pine. Nests most frequently in stands with less than 40% canopy, but usually some foliage shading the nest. Often chooses largest tree in a stand on which to build stick platform nest. Nest located 16-61 m (50-200 ft) above ground, usually below tree crown. Species of tree apparently not so important as height and size. Nest usually located near a permanent water source. Detected at mouth of Mattole in spring 2002 and near Saddle Mountain trailhead in 2001.

- Martes pennanti pacificus – Pacific fisher (sensitive), Federal candidate for listing, DFG species of special concern
  Uses cavities in large trees, snags, logs, rock areas, or shelters provided by slash or brush piles. Dense, mature stands of trees also provide cover, especially in winter. Fishers den in a variety of protected cavities, brush piles, logs, or under an upturned tree. Hollow logs, trees, and snags are especially important. Suitable habitat for fishers consists of large areas of mature, dense forest stands with snags and greater than 50% canopy closure. Fishers, which were not historically common in the redwood region, have now become quite common in these second growth habitats with highly altered shrub structure (Grinnell et al. 1937, Klug 1996, Slauson and Zielinski 2004). No detections in KRNCA, not recorded in CNDDB in Mattole, however habitat likely exists in the Program area.

- Martes americana humboldtensis – Humboldt marten -Federal sensitive species, DFG species of special concern
  The Humboldt marten, like its cousin the fisher, prefers large areas of relatively intact mature forest, and its continued presence in an area can depend on the presence and abundance of habitat elements essential to its needs, such as large woody debris, particularly hollow logs, large trees with woodpecker holes, and snags, all of which are utilized for denning habitat. Sierra Pacific Industries conducted a study on a pine marten population in California in 2001 and concluded that judicious management of scientifically sound forest management techniques could maintain populations without

the need for reserves or set asides (Self and Kerns 2001). In 1996 a small population of Humboldt marten was rediscovered on Six Rivers National Forest in Del Norte County. It prompted surveys in the following years of the known Humboldt marten range from roughly the Oregon border into northern Sonoma County and east to the Mendocino County border (Driscoll 2010). Biologists developed a population estimate for the marten based on what they found. All told, there may be no more than 100 animals remaining, probably all in a small group spanning about 165 square miles in Del Norte, Siskiyou and Humboldt counties. After this evaluation, the Environmental Protection Information Center and the Center for Biological Diversity petitioned USFWS to protect the Humboldt marten under the federal Endangered Species Act, stating that *"a species so close to the brink needs not only protection but a comprehensive plan for recovery, which will take significant resources."* However, no listing has yet resulted from this petition. The USFWS in a study of the Humboldt fisher noted that continued loss of marten habitat to clear-cutting and severe wildfires is the greatest threat to their existence. So-called fuels reduction projects -- which often aim to remove brush from forest stands to reduce the threat of fire – can also have negative effects on martens (Driscoll 2010). The marten is strongly associated with mature coniferous forests characterized by closed canopies, large trees, many snags, and abundant downed woody material and leaves that provide cover for the rodents upon which they prey. However, in California, M. a. humboldtensis historically occurred along the northwestern coast from the Oregon-California border south to Sonoma County from sea level to 3,000 feet, primarily within the temperate redwood zone (BLM 2004). Surveys have not established the presence of martens in the Gilham Butte area or in the King Range (MMC and MRC 2005, BLM 2004). Not in CNDDB records for the Mattole, may be locally extirpated, but repeated anecdotal sightings by numerous individuals from across the landscape of the Mattole provide some evidence of their possible presence.

- Pandion haliaetus – Osprey –DFG species of special concern, BOF sensitive species
  Associated strictly with large, fish-bearing waters, primarily in ponderosa pine through mixed conifer habitats. Uses rivers, lakes, reservoirs, bays, estuaries, and surf zones. Swoops from flight, hovers, or perches to catch fish near surface of water. Uses large trees, snags, and dead-topped trees in open forest habitats for cover and nesting. Nests on platform of sticks at the top of large snags, dead-topped trees, on cliffs, or on human made structures. Nest may be as much as 71 m (250 ft) above ground. Not in CNDDB records for the Mattole, possible but unlikely in Program area, except perhaps North_1 and West_1 subbasins.

- Progne subis – Purple martin – DFG species of special concern
  The purple martin often nests in tall, old, isolated trees or snags in open forest or woodland. It is often found in old growth, multi-layered open forest and woodland with snags that are used for breeding. Occurs in coniferous habitats, including closed-cone pine-cypress, ponderosa pine, Douglas fir, and redwood. Found in a variety of open habitats during migration, including grassland, wet meadow, and fresh emergent wetland, usually near water. Woodlands and low-elevation coniferous forest of Douglas-fir, ponderosa pine, and Monterey pine provide cover. Often nests in tall, old trees near a body of water. Commonly nests in old woodpecker cavities, sometimes in human-made

structures: in nesting box, under bridge, in culvert. Nest often located in a tall, old, isolated tree or snag in open forest or woodland. Frequents old growth, multi-layered, open forest and woodland with snags in breeding season. Forages over riparian areas, forest, and woodland. Found in a variety of open habitats in migration. Not documented in CNDDB. Possibly in Program area.

- Strix occidentalis caurina – Northern spotted owl – Fed listed as threatened, BOF sensitive species
  Resides in dense, old growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats, from sea level up to approximately 2300 m (0-7600 ft). Feeds in forest habitats upon a variety of small mammals, including flying squirrels, woodrats, mice and voles, and a few rabbits. Also eats small birds, bats, and large arthropods. Usually searches from a perch and swoops or pounces on prey in vegetation or on the ground. May cache excess food. Uses dense, multi-layered canopy cover for roost seclusion. Roost selection appears to be related closely to thermoregulatory needs; intolerant of high temperatures. Roosts in dense overhead canopy on north-facing slopes in summer. Usually nests in tree or snag cavity, or in broken top of large tree. Less frequently nests in large mistletoe clump, abandoned raptor or raven nest, in cave or crevice, on cliff or ground. Mature, multi-layered forest stands are required for breeding. Nest usually placed 9-55 m (30-180 ft) above the ground. Evidently relatively common across the basin, as described below.

  Over the years NSO's have been found at 47 different known locations. Eleven pairs of spotted owls have been recorded from BLM lands, 5 pairs from non-industrial private land, and 23 pairs from industrially managed forests. The higher number found on industrially managed forests is likely due to survey intensity and not necessarily due to habitat quality. Three "singles" have been found on BLM lands, 4 on private non-industrial lands, and 1 on industrially managed timberlands. Occurs in Program area.

Table 3-58 below summarizes the relative likelihood of one of the special-status species described above being present in the Program area, along with a brief description of the reason for the determination.

Table 3 – 58
Likelihood Occurrence of Special-Status Species within the Program Area

Scientific Name	Common Name	Likelihood of Occurrence in Program Area	Reason for Determination
Accipiter cooperi	Coopers hawk	Likely	Suitable habitat
Accipiter gentiles	Northern goshawk	Uncommon	Found in Program area.
Accipiter striatus	Sharp shinned hawk	Not likely	Lack of suitable habitat
Aquila chrysaetos	Golden eagle	Present	Found in Program area
Ardea alba	Great egret	Common in suitable habitat	Habitat limited to riparian and adjacent areas
Arborimus albipes	White footed tree vole	Likely	Suitable habitat
Arborimus pomo	Red tree vole	Likely	Suitable habitat
Ardea herodias	Great blue heron	Common in suitable habitat	Habitat limited to riparian and adjacent areas
Bonasa umbellus	Ruffled grouse	Likely	Suitable habitat
Brachyramphus marmoratus	Marbled murrelet	Not likely	Lack of Suitable Habitat
Chaetura vauxi	Vaux's swift	Likely	Suitable habitat
Contopus cooperi	Olive sided flycatcher	Possible	Uncommon visitor
Corynorhinus townsendii	Townsends big eared bat	Possible	Requires cavelike habitat
Dendroica occidentalis	Hermit warbler	Likely	Suitable habitat
Empidonax difficilis	Pacific slope flycatcher	Likely	Suitable habitat
Empidonax traillii brewsteri	Little willow flycatcher	Possible in willow thickets	Not in operational portions of Program Area
Falco peregrinus	Peregrine falco	Possible	Limited habitat
Haliaeetus leucocephalus	Bald eagle	Possible in West_1, North_1	Habitat limited to small portions of two subbasins
Pandion haliaetus	Osprey	Possible in West_1, North_1	Habitat limited to small portions of two subbasins
Progne subis	Purple martin	Likely	Suitable habitat
Martes pennanti pacificus	Pacific fisher	Possible	Limited habitat, no known occurrence
Martes americana humboldtensis	Humboldt marten	Possible	Anecdotal evidence
Strix occidentalis caurina	Northern spotted owl	Occurs in Program area	Lack of surveys limit knowledge of population

Habitat Elements Important for Wildlife Species

Snag/den characteristics

Timber management in the 1950s-1990's actively removed snags for safety and fuels reduction purposes as well as removing large trees that were dying or fading and if left standing could have turned into snags. Dens, whether in large overstory trees or in logs on the ground, were similarly affected by normal practices of the time.

Not much is currently known about snag frequencies or den numbers in the Program area, as these conditions are often very specific to a particular place. (While data on snags and den trees are theoretically available from the FIA plots, there are only 12 FIA plots in the Mattole. The effort required to retrieve such data is not considered proportionate to its usefulness, as it could not reasonably be expanded to characterize snag and den abundance or quality at the basin level, much less at the strata level.)

Road density

Road density has been intensively researched in the basin and documented in NCWAP and other studies. Chapter 2.0.4 discusses road density and the various calculations of road density within the subbasins of the Program area. Depending on source of information, road density varies from a low of 2.3-3.0 miles per square mile (NCWAP and ICE respectively) in the North_1 and 2 subbasins to a high of between 7.0-9.0 in the South_1 subbasin. NCWAP puts the approximate average road density for all of the basins at about 4.7 mi./sq. mile while ICE puts the number more in the range of 6 mi./sq. mile. The higher figure is considered closer to the actual density as it is notoriously difficult to determine road density solely by air photo interpretation.

Road density affects wildlife because it breaks up migration routes, can lead to motor vehicle vs. wildlife accidents and lowers thermal cover. However, since the vast majority of the road system in the Program area is in private ownership, average daily use rates are comparatively low. Use rates on the main public roads were estimated at 800 trips per day, with the majority during the period of 7 AM to 10PM. The vast majority of the roads within the Program area are likely have zero trips per day because they are not traversable by 2WD or even 4WD vehicles unless cleared of brush and down material.

Large down woody debris

As is the case with snags and dens, not much is known about the extent of large woody debris (LWD), as it is usually specific to a particular location. During the 1950's to 1990's LWD was not likely excessively manipulated (e.g., tractor piled and burned or broadcast burned), however much of the material was probably inadvertently destroyed during logging. As stands increase in size and age, LWD is expected to increase through natural accumulation.

Multistory canopy

Within the Program area, younger stands of mixed conifers and hardwoods (MCH3D) and nearly pure conifer stands (DFR3D) tend to be single-storied. DFR5D stands, which at 5,780 acres, or 8% of the Program area, typically are comprised of a single conifer overstory that makes up about 90% of the stand stocking, with a sparse understory. DFR4 stands, which comprise 33% of the Program area, are about 50% single storied and 50% multistoried; the multistoried portion frequently manifesting as an overstory of sparse to dense conifers above an understory of dense hardwood. The remainder of the stands, which are largely MCH4D and MHW4D types, contain distinct canopy layers. In the MHC types there are often three layers: an overstory of sparse conifers, a mid-story layer of dense larger hardwoods and occasional fir, over an understory of suppressed and intermediate sparse to dense hardwoods.

Hardwood cover

Based on the CALVEG WHR types and the plot data describing the Program area, over 56% of the Program area is dominated by hardwoods, principally stands comprised of dense medium size tanoak with very few conifers, to fewer stands with a mix of large hardwoods (tanoak, madrone and bay) and a smaller proportion of conifers. Across the hardwood-dominated types, hardwoods rarely comprise less than 180 sq. ft. of basal area per acre compared to stocking of less than 100 sq. ft. of conifers/acre. Even in the Douglas-fir types, hardwoods comprise a substantial component of all types except for the DFR5D type where hardwoods are relatively sparse.

Late seral forest characteristics

The one WHR vegetation type with substantial acreage in the basin that currently could potentially qualify as a late seral stand according to the FPR definition is DFR5D, which averages 297 sq. ft. of conifers/acre and 5 sq. ft. of hardwoods/acre and comprises about 8% of the Program area. There are also some polygons that were classified as MHC5D, but an analysis of the inventory data showed this to be an overestimation of the size class in general, making most of these stands too small in average diameter to qualify as late seral, which must be 24"+ average dbh. In addition, the vast majority of stands classified as either DFR5D or MHC5D are much smaller than 20 acres (minimum size in the FPR's to qualify as functional late seral stands).

Regardless of the current lack of late seral stands in the watershed, there will be a significant amount of late seral habitat either grown without management or created through management over the planning horizon of the program.

Late seral habitat continuity

Continuity of late seral habitat is currently very low. Late seral stands are widely dispersed and only 20 such stands within the Program area are 20 acres in size or larger. About 100 of the 5M and 5D stands within the Program area are 10 acres or larger in size. The average polygon size

for stands mapped as 5M or 5D is 2.8 acres; the vast majority are likely artifacts of GIS processing, as over 67% of stands in the Program area are less than 2 acres in size.

3.18.2 Regulatory Setting - Wildlife

The federal Endangered Species Act [ESA; 50 Code of Federal Regulations (CFR) Part 17] requires the Secretaries of Commerce and Interior to list species as threatened or endangered pursuant to procedures established in the Act. Section 7 of the Endangered Species Act directs that Federal agencies use their regulatory authority to conserve threatened and endangered species and, in consultation with the U.S. Fish & Wildlife Service and NOAA's National Marine Fisheries Service, that the approval agencies ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Section 7 applies to such actions as Federal approval of private activities through the issuance of Federal permits, licenses, or other actions.

The Act prohibits "take" of listed species, including modifying habitat conditions in a way that would adversely affect the species. The Act does authorize the "incidental take" of species (and habitat) pursuant to the consultation process required by Section 7. The primary requirement in the Section 7 consultation process is that the activities proposed to the federal action agency not "jeopardize" the continued existence of listed species.

The California Endangered Species Act (CESA; Fish and Game Code §2050 et seq.) prohibits the unauthorized "take" of birds, mammals, fish, amphibians, reptiles, and plants that are listed as threatened or endangered by the State of California. CESA also includes prohibitions on take for species listed under the Act, and includes "incidental take permit" authority for the Department of Fish & Game pursuant to otherwise lawful activity, pursuant to § 2081 of CESA. The requirements for achieving an Incidental Take Permit pursuant to these regulations are intentionally very similar to those promulgated under the Federal act. Impacts to listed species are to be avoided or otherwise mitigated to the greatest extent feasible, and the proposed activity may not jeopardize the continued existence of the listed species.

The state and federal Endangered Species Acts protect the individual plants or animals of species designated as "rare" (state only), "threatened," or "endangered." Both acts protect "critical habitat" of listed wildlife species. However, while the Federal ESA also protects the habitats of listed animal species it does not protect plant habitat against removal or disruption. Under CESA For example state candidate species are given consideration while federal candidates are not; but federally listed plants are protected under CESA when a there is a nexus with the permitting process of Section 7.

The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712, July 3, 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986 and 1989) applies to any operations under the Program that could affect migratory birds. The Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.

Unless permitted by regulations, the Act provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Subject to limitations in the Act, the Secretary of the Interior may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting or exporting of any migratory bird, part, nest or egg will be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits and migratory flight patterns.

The Act makes it unlawful to: ship, transport or carry from one state, territory or district to another, or through a foreign country, any bird, part, nest or egg that was captured, killed, taken, shipped, transported or carried contrary to the laws from where it was obtained; import from Canada any bird, part, nest or egg obtained contrary to the laws of the province from which it was obtained as per § 705 (http://alaska.fws.gov/ambcc/ambcc/treaty_act.htm).

Both bald and golden eagles occur within the Program area. The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) was passed in 1940. The Act is designed to protect populations of bald and golden eagles from humans.

According to the U.S. Fish and Wildlife Service, the general function of the Act is to make it illegal for anyone to "take" bald eagles without a special permit. The act of "taking" bald eagles refers to the birds themselves, any part of the birds, the birds' nests and their eggs. "Taking" a bald eagle or any of its parts refers to more than just capturing a bald eagle; according to the Fish and Wildlife Service, it also includes shooting, shooting at, poisoning, disturbing in any way, hurting, upsetting the breeding of, killing and trapping bald eagles.

The Bald and Golden Eagle Protection Act has undergone some amendments since it was enacted in 1940. According to the U.S. Fish and Wildlife Service, a significant amendment was one in 1978 that permits the Secretary of the Interior to allow the taking or removal of eagle nests that are getting in the way of development of resources or recovery operations. According to the Bald Eagle Protection Act, the Secretary of the Interior can permit religious, scientific, zoological and exhibition use of the birds, especially if it somehow protects their populations. Another amendment added in 1994 explains a policy about the use of eagle feathers in the Native American Culture.

The penalty for disobeying the Bald and Golden Eagle Protection act is severe. Individuals can face a fine of up to $100,000, and businesses can get a fine of $200,000. The U.S. Fish and Wildlife Service notes that violators can be sent to prison for up to a year. Subsequent violations draw even steeper penalties.

In 2007, bald eagle populations grew enough for them to be removed from the Endangered Species List. This population increase can be attributed to conservation efforts by the American public. Even though they are no longer on the Endangered Species List,bald eagles are still protected by the Act. (http://www.ehow.com/about_6116801_bald-golden-eagle-protection-act.html).

Other laws and regulations that relate to the Program's practices on listed wildlife species are those contained in the California Forest Practices Act and the CA Forest Practice Rules. The FPR's contain multiple sections with explicit language related to practices that might impact listed species and are not enumerated here. Instead, several of the more important FPR's are cited below as examples to show the breadth of the rules as they relate to timber operations.

> *898.2: Special conditions requiring disapproval of a plan, indicates that a "taking" of listed species is grounds for disapproving a plan.*
> *Technical rule Addendum # 2 requires a substantial discussion of listed species, while a THP is required to document the presence of listed plant as well as wildlife species.*
> *Article 9, Wildlife Protection Practices, (FPR's 919.1 through 919.15) comprises 7 pages of regulations that relate to forestry practices impacts on wildlife.*
> *919.9 and 919.10 both regulate how RPF's must deal with spotted owls and spotted owl habitat while 919.11 regulates practices that might affect marbled murrelet habitat.*
> *1092.21(d) lists the special conditions requiring disapproval of a PTHP, which includes whether the plan as filed would have a significant adverse effect to listed species.*

(The complete set of rules (California Forest Practice Rules 2011) is available in electronic searchable format from CAL FIRE. The California Forest Practices Act also contains numerous sections describing requirements regulating environmental impacts to wildlife, including Sections 4512, 4513, 4551, 4551.5 and 4593.)

In addition to the regulatory requirements described above and the standard FPR's, participants in the Program would be required to abide by the practices described in Chapter 2 – Program Description. Goals of the Program include specific measures that are designed to enhance terrestrial wildlife habitat and include::

- Silvicultural treatments may only utilize partial-cut and uneven-aged prescriptions, which also include limitations on canopy cover and other wildlife protection measures;
- Snags must be left in every harvest unit except for snags posing safety problems;
- Wider and enhanced Watercourse and Lake Protection Zones (WLPZs) for Class I and II streams, and Equipment Limitation Zones (ELZs) for Class III streams (as per the Program and Alternative II) are designed to enhance wildlife habitat and recruitment of down woody material beyond standard FPR requirements;
- No old-growth trees (established prior to 1850 and of a certain size) are allowed to be cut;
- Existing late seral stands must be managed to maintain and enhance late seral conditions;
- Further limitations are required on harvest in Class I and II WLPZs beyond those in the FPR's; and
- Plan proponents must adhere to Water Board waiver requirements specific to the Program.

3.18.3 Significance Criteria - Wildlife

Based on the CEQA Guidelines, a project would have a significant impact on wildlife if it would

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the DFG or USFWS;

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan.

Based on other applicable wildlife protection laws, a project would have a significant biological impact if it would

- Harass, harm, wound, or kill any federally threatened or endangered species (FESA);
- Modify or degrade habitat to the degree that it significantly impairs essential behavioral patterns of any federally threatened or endangered species (FESA);
- Violate any regulation pertaining to any federally threatened or endangered species (FESA);
- Kill any state threatened or endangered species (CESA);
- Poison, wound, kill, molest, or disturb a bald or golden eagle (BEA);
- Disturb a bald or golden eagle nest (BEA);
- Wound or kill any native bird, from the egg stage onward (MBTA); or
- Substantially adversely affect an existing fish or wildlife resource (CFGC).

3.18.4 Determination Threshold - Wildlife

The following thresholds were used to determine whether a substantial adverse effect to wildlife resources would result from implementation of vegetation treatments under the Program or any of the alternatives:

The Proposed Program (or alternative) would be considered to have a significantly negative effect on wildlife if it:

a) Violates any state or federal wildlife protection law; or
b) Contributes directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native species or subspecies at the state level.

Although item b) above says that viability of species would be evaluated at the state level, this is not consistent with the significance criteria developed for the Program. Assessment of the Program's impacts to viablility of wildlife population at the state level would be very difficult if not impossible to demonstrate and not a viable measure to assess effect; therefore all impacts to species are evaluated at the Program area level, or at an even smaller scale, (e.g., by subwatershed), in this EIR. This scale of evaluation is consistent with the monitoring strategy for the Program.

3.18.5 Data and Assumptions - Wildlife

The following discussion applies only to the landbase predicted to be treated by the Program or alternatives (using the methodology described in Section 2.1.6), not to other timberlands within the Mattole basin that are not projected to be treated under the Program (or alternatives) over the 50-year analysis period (e.g., non-commercial timber stands). The data and assumptions described below are calculated to apply only to impacts from treatments and areas included within harvest unit boundaries, rather than, for instance, the maturation of untreated stands over time. Impacts that consider both treated and untreated stands are analyzed in Chapter 4, Cumulative Impacts.

Program Goals and their Impacts on Terrestrial Wildlife Species

Several of the primary goals of the Mattole Forest Futures Project (Section 1.3) have direct implications on terrestrial wildlife related to predicted changes in the structure and composition of forest stands as these stands are managed under prescriptions authorized by the Program. The goals that affect wildlife directly are listed below and numbered for easy reference in the following discussion.

1. Encourage the development of mature to late successional stands
2. Maintain or improve wildlife habitat, particularly by developing late-seral habitat for listed species
3. Increase the average size of trees so that timber stands become more commercially and ecologically valuable over time
4. Improve stocking of Group A species so that long-term sustainable timber management becomes more economically feasible
5. Manage existing stands, rather than "clearcut and start over"
6. Retain legacy trees that are large and old, to provide stand structural diversity
7. Maintain or improve the health and structure of riparian stands

Goals 1-3, 6, and 7 are largely addressed by retaining existing elements of the forest stand while it is being managed under Program treatments. Section 2.1.2 illustrates several applicable retention requirements, including restricting harvest within the largest 1/3 of conifer trees (by diameter class) in each harvest unit, requiring that future harvests maintain increasingly higher conifer basal area as they are re-entered over time, retaining in every entry all snags that are not safety hazards, retaining wildlife trees within harvest openings over 1 acre in size, maintaining and enhancing late seral conditions, and prohibiting harvest of old growth trees. Most of these goals have maintaining or enhancing wildlife habitat as a primary objective.

Goal 4 is essentially economic in nature and is designed to change the composition of stands so they become more commercially viable over time. Goal 5 is protective of existing stands and works to improve their conditions gradually rather than employ more intensive treatments designed to maximize immediate income and improve conifer stocking as quickly as possible. Although not driven by habitat considerations, goals 4 and 5 nonetheless have important implications for wildlife.

Wildlife Habitat Relationship Vegetative Typing System

As shown in Section 3.14.5, the application of silvicultural treatments that work toward the goals noted above impacts the vegetation types to which they are applied. The illustrations in this section demonstrate (via computer modeling) the likely changes in vegetation types over time as the Program and/or Alternatives are implemented. These impacts are relatively minor early in the analysis period; but over time their impacts are substantial, and are critical to the wildlife species that utilize these stands for shelter, feeding, and reproduction.

The stand types shown in the illustrations below are directly related to terrestrial wildlife, as they are included in the Wildlife Habitat Relationship (WHR) vegetation typing system developed by Mayer and Laudenslayer (1988), and can therefore be analyzed to model management-related impacts on the species that utilize these vegetation types. Although individual animals and local populations are no doubt affected by silvicultural treatments applied under the Program or Alternatives (see analysis of Indirect Impacts 3.18.7), the long-term trends in impacts to species populations can be linked to the changes (if any) in the WHR types over time. *(This observation notwithstanding, as noted in Sections 3.18.2-4, special-status species are afforded legal protection against "take", including harm to individual animals or degradation of critical habitat.)*

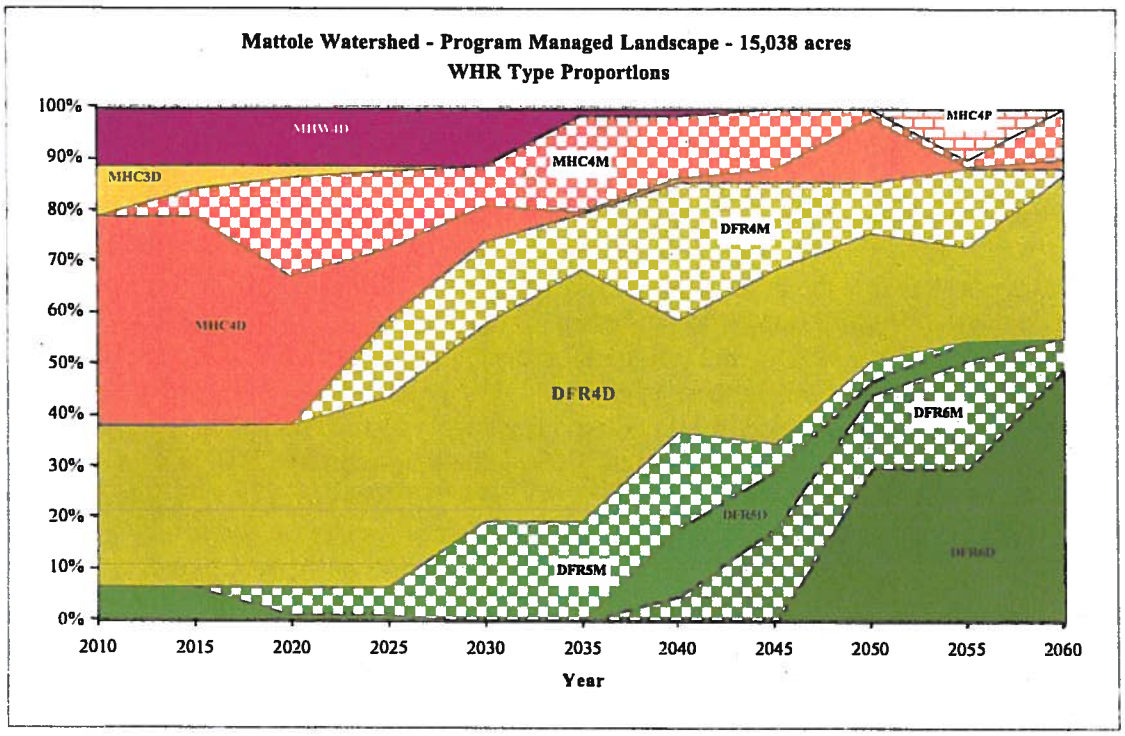
Using the examples below, we can compare the changes in WHR types across the Mattole watershed as Program activities are modeled to occur over the next 50 years, against the three alternatives, as shown in the following figures. Before considering the illustrations (initially presented in Section 3.14) it may be helpful to briefly review the major elements of the alternatives.

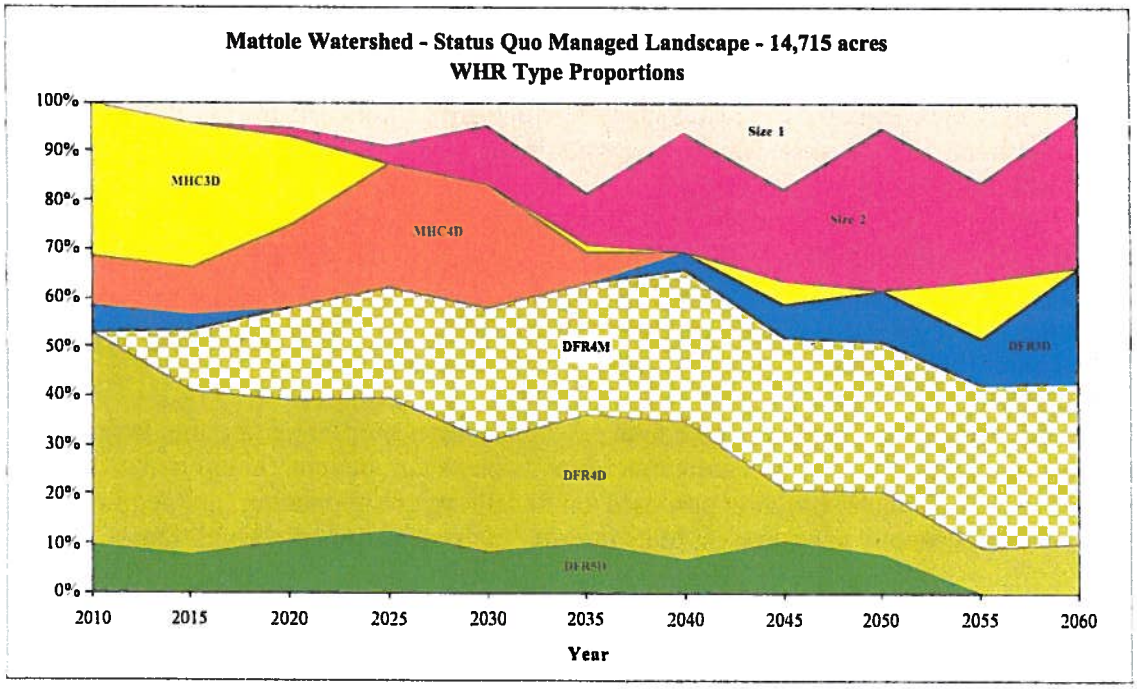
Alternative I: Continuance of the Status Quo, in which silvicultural treatments are modeled to occur using standard FPR prescriptions and without the option of filing PTHPs as available under the Mattole Forest Futures Project;

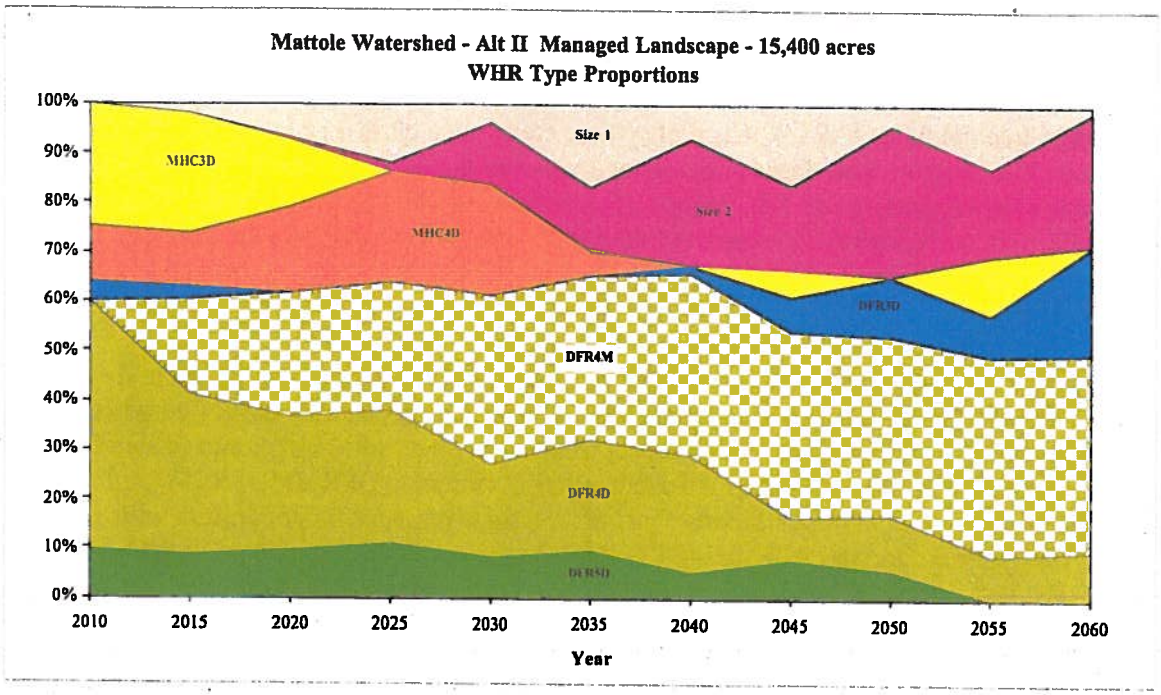
Alternative II: Broader Buffers While Allowing Even-Aged Management, which attempts to increase protection of wildlife and water quality by widening no-harvest buffers along watercourses and prohibiting harvest on areas delineated as "Very High" landslide hazard, but allows more intensive harvest on the available acres;

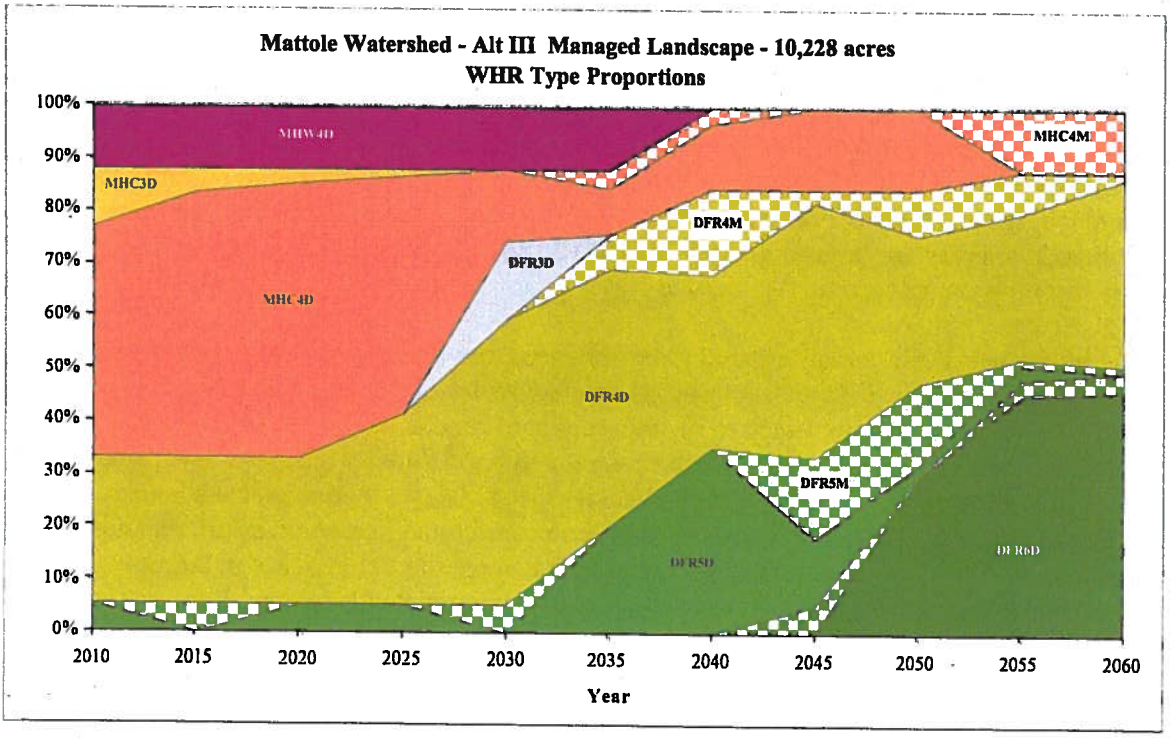
Alternative III: The Fire and Fuels Alternative, which applies more intensive fuel treatments compared to the Program and other alternatives and allows commercial thinning in some stream protection zones for fuels reduction purposes, but disallows group openings and requires retention of 60% canopy in all harvest units in order to maximize shaded conditions.

Figure 3-29: Comparing the Development of WHR Classes in the Program Area Under the Program and its Alternatives









Examination of the above figures allows one to infer an obvious trend: under the Program: there is an increase of WHR types dominated by conifers (largely Douglas-fir) of larger size classes (the bars shown in shades of green with the notation DFR), and a decrease of WHR types dominated by hardwoods (shown in various other colors and denoted as MHC in the legend).

These trends are related to the goals and practices of the Program as described above. Of particular note is the increase under the Program of conifer stands of size classes 5 and 6 (e.g., DFR6D, which means a two-storied, Douglas-fir-dominated stand with stocking over 60% and an average tree diameter =>24"). Currently there are no size class 6 stands within the Program landscape, but Program practices are designed to lead to the development of such stands, consistent with Program goals 1-3. Stands of size class 5 and 6 are considered to be in a late seral condition, and under the Program are required to be managed so as to maintain them in this condition – while continuing to harvest larger and more valuable trees from the stands as they develop over time.

Conversely, under the status quo (Alt 1) no size class 5 and 6 stands are predicted to develop over the next 50 years, as commercially valuable conifers are repeatedly harvested when markets are favorable, consistent with past and current trends. Another noticeable trend in stands managed under the status quo is an increase in smaller conifers (DFR1D, DFR1M, and DFR3D), as typical commercial harvest on relatively short rotations replaces older conifers with younger ones. Both the Program and Alternative I show decreases in WHR types dominated by larger hardwoods, such as the MHC4D (mixed hardwood-conifer, averaging 12-23" dbh, densely stocked) type shown in orange, which is more or less eliminated over the analysis period. *(It is important to remember that this analysis applies only to managed stands, and not the landscape as a whole, which continues to support thousands of acres of well developed hardwood-dominated stands — see Chapter 4).*

Examination of the figures for Alternatives II and III indicates similarities between the Program and Alternative III (albeit on a much smaller landbase for Alt. III), and between Alternative I, continuance of the status quo, and Alternative II. These correlations are related to the similarities in silvicultural treatments. The Program and Alternative III employ only the uneven-aged management strategies described in Chapter 2 for the Program (with some relatively small variations); whereas the status quo and Alternative II employ standard FPR prescriptions (with a few restrictions on unit size in Alternative II).

These trends between alternatives tend to be similar across the seven Mattole subbasins, although there is one outlier: the South_1 subbasin, shown below for the Program and Alternative I, where industrial timberlands are expected to be intensely harvested and regenerated under the status quo as previously cut-over stands mature enough to support another harvest entry, peaking around year 2038. The modeled treatments under the status quo tend to create a landscape with a dominance of stands of smaller size classes of both conifer and hardwood-conifer stands; while implementation of the Program is projected to lead to a substantial increase in larger, well-developed conifer stands and a decrease in hardwood-conifer stands (although the hardwood-conifer stands that remain tend to be larger and more well-developed than under the status quo). *(As per the introduction to this section, it is important to note the wide difference in acreage treated in the subbasin between the Program (618 ac) and Alternative I (1,717 ac), due to expected increased harvest on industrial holdings under the status quo, which are never expected to be treated under the Program.)*

Using the figures below, we can predict impacts to terrestrial wildlife species that are correlated with changes to WHR vegetation types in the near and longer terms. As an example, in the

South_1 subbasin, it can be assumed that over the 50-year analysis period wildlife species that are adapted to and/or require older, well-developed and more mature forest conditions over their life cycles would find more favorable habitat across the 618 acres expected to be treated under implementation of the Program; whereas under the status quo, species adapted to early successional stands would find an abundance of habitat. The populations of common, non-listed wildlife species noted in Section 1.8.1 and also discussed in Section 3.18.7 would therefore tend to rise and fall along with the abundance of habitats upon which they depend. The more fragile status of T&E and other listed species requires a species-by-species analysis, which is included below.

3.18.6 Direct Impacts From Implementing the Program/Alternatives - Wildlife

Impacts to Special-Status Species from Program and Alternatives

The species noted in Table 3-58 above as unlikely to occur within the Mattole basin are mostly not analyzed below. However, their presence would still be ascertained during the PTHP process as per FPR protocol.

Coopers Hawk: Over the 50-year analysis period neither the Program nor any of the alternatives, including the status quo, are likely to have a significant adverse impact to the Coopers hawk. Vegetative patchiness created by timber harvest could provide some temporary foraging habitat, especially if near to patchy woodlands. Even-aged management predicted for 30%, or 4,415 acres, of Alternative I (status quo) could have a slight beneficial impact by creating more foraging areas by creating openings in what are currently closed canopy stands. The Program and Alternative III could have a slight beneficial impact by helping enhance nesting areas through larger and more intact stream buffers than is required by the FPR's. Alternative II could have a slight beneficial impact due to its expanded WLPZs along with its provision for even-aged management.

Figure 3-30

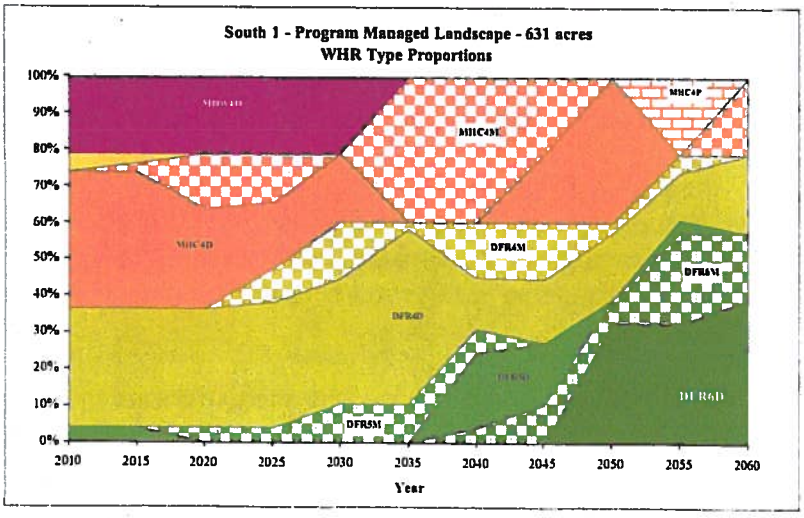
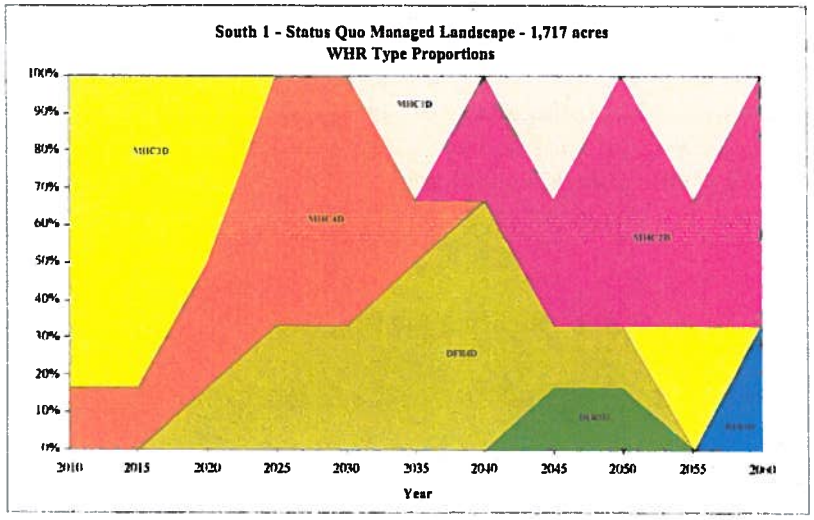


Figure 3-31



Northern Goshawk: .Over the 50-year analysis period neither the Program nor any of the alternatives, including the status quo, are likely to have a significant adverse affect on the Northern goshawk. The closed canopy older forests preferred by this species are not common within the Program area. Timber harvest under the Program or any of the alternatives could have an slight adverse impact to the goshawk as mid-aged, closed canopy forests are opened-up by harvest; but such harvest would also create more foraging areas. The Program, Alternative II and Alternative III could have a beneficial effect to the goshawk through establishment of larger and more intact stream buffers than is required by the FPR's, which would provide the well-deveoped closed-canopy forests preferred by this species.

Golden Eagle: Over the 50-year analysis period neither the Program nor any of the alternatives are likely to have a significant adverse impact to the golden eagle. The golden eagle mostly utilizes open prairie for foraging and secluded cliffs for nesting, neither of which are likely to be included in timber harvest units. State protocol requires identification of suitable golden eagle habitat in or near timber operation areas, and if present surveys are required.

Great Egret: Neither the Program nor any of the alternatives are likely to have a significant adverse impact on the great egret because its habitat, immediately adjacent to water bodies, is unlikely to be included in any Program or alternative treatment area. State protocol requires identification of suitable egret habitat in or near timber operation areas, and if present surveys are required.

Great Blue Heron: Neither the Program nor any of the alternatives are likely to have a significant adverse impact on the great blue heron. Its habitat, along wetlands, estuaries, and slow-moving streams, is unlikely to be included in any Program or alternative treatment area. FPR protocol requires identification of suitable habitat in or near timber operation areas, and if present surveys are required.

White Footed Tree Vole: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the white footed tree vole. Over the 50-year analysis period, the Program and Alternative III could have a slight adverse impact to the white footed tree vole associated with periodic timber operations. Alternative II could have a beneficial impact to vole habitat through its creation of larger and less-manipulated WLPZs, given the preference of the vole for riparian habitats.

Red Tree Vole: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the red tree vole. Over the 50-year analysis period, implementation of the Program or Alternative III is predicted to have a moderately beneficial impact to the red tree vole, as stands are managed to produce larger trees and more well developed stands. Implementation of Alternatives I or II is predicted to have a slight adverse impact on the red tree vole because these alternatives lessen, rather than enhance, mature forest conditions over time within the analysis area.

Ruffed Grouse: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the ruffed grouse. Over the 50-year analysis period, implementation of the Program or Alternative III is predicted to have a moderately beneficial impact on the ruffed grouse, as stands are managed to produce more well-developed conifer stands. Implementation of Alternatives I or II is predicted to have a small but not significant adverse impact on the ruffed grouse because, although these alternatives maintain a mosaic of hardwood and conifer habitat across the managed landscape, their application tends to lessen, rather than enhance over time, mature forest conditions preferred by the ruffed grouse.

Marbled murrelet: Although the marbled murrelet is not likely to occur within the Program area due to lack of suitable nesting habitat, it is briefly discussed here because it could occur within the Program area during the 50-year analysis period if enough large trees with large branches that could form nesting platforms for the murrelet and surrounding well-developed forest stands are allowed or encouraged to develop within the period. The murrelet forages on the ocean but can nest as far as 50 miles inland, so most of the Program area has the potential to provide nesting habitat.

Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the marbled murrelet. Over the 50-year analysis period, implementation of the Program or Alternative III could have a moderately beneficial impact on the marbled murrelet, as larger trees and more well-developed conifer stands are encouraged under these alternatives. Implementation of Alternatives I or II is predicted to have a slight adverse impact on the marbled murrelet because the managed portions of the managed stands under these alternatives are unlikely to develop nesting habitat for the murrelet, due to an emphasis on even-aged management and removal of economically valuable, harvestable trees across the managed landscape.

In any case, the potential presence of this threatened species and its habitat must be assessed during the preparation of PTHPs under the Program or any of the alternatives.

Vaux's swift: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the Vaux's swift. Over the 50-year analysis period, the Program and Alternative III are expected to have a moderately beneficial impact on the Vaux's swift as these alternatives deliberately retain and/or allow more large trees to develop, and conserve slightly more snags than Alternative I or II. Alternatives I and II are likely to have a slight adverse impact on Vaux's swift due to their emphasis on short-rotation even-aged management with little emphasis on retention of large trees, more intensive management of uneven-aged prescription areas, and slightly more adverse impact to snags (which may be considered for commercial harvest under the FPR's but not the Program or Alternative III).

Olive-sided flycatcher: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the olive-sided flycatcher. Over the 50-year analysis period, the Program and Alternative III are likely to have a moderately beneficial impact on the olive-sided flycatcher, given the emphasis in the Program and Alternative III toward enhancing riparian protection and retention of important habitat elements, such as tall, large trees with potential dead tips for nesting and roosting sites. Alternatives I or II could have a slight adverse impact on the olive sided flycatcher compared to the Program and Alternative III to the high proportion of even-aged management and more intensive management of uneven-aged prescription areas.

Townsend's big-eared bat: Neither the Program nor any of the alternatives are expected to have a significant adverse impact on the Townsend's big-eared bat due to the fact that its roosting habitat is not likely to be affected by timber operations. As a DFG species of special concern, the presence and protection of likely bat roosting habitat would have to be assessed during the preparation of a THP or PTHP.

Hermit warbler: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the hermit warbler. Over the 50-year analysis period the Program and Alternative III are predicted to have a moderately beneficial impact on the hermit warbler, as stands are managed to produce larger trees and more well developed conifer stands. Implementation of Alternatives I or II is predicted to have a slight but not significant adverse impact on the hermit warbler because these alternatives lessen, rather than enhance, mature forest conditions over time.

Pacific slope flycatcher: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the Pacific coast flycatcher. Over the 50-year analysis period, implementation of the Program or Alternative II is predicted to have a moderately beneficial impact to the Pacific slope flycatcher because they protect and enhance larger and more intact WLPZs compared to the FPR's. Implementation of Alternative I is predicted to have a slight adverse but not significant impact on the flycatcher because it protects fewer acres of riparian habitat compared to the Program or other alternatives, and could negatively impact willow stands in Class III ELZs through logging operations (which are more restricted under the Program or Alternative II). Implementation of Alternative III, which allows thinning from below in stream buffers, could also have a slight adverse impact due to damage to habitat from logging operations, although areas within the stream migration zone (where willow thickets typically occur) are unlikely to be disturbed due to FPR protective measures (e.g., 15 foot no-cut buffers on the larger class II streamcourses).

Little Willow Flycatcher: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the little willow flycatcher. Over the 50-year analysis period implementation of the Program or Alternatives II and III could have a slight beneficial impact to the flycatcher as larger and more intact WLPZ's are established. Alternative I is likely to have no significant adverse impact to the willow habitat required by the little willow flycatcher, as the vast majority of this habitat would be protected under application of the FPR's.

Peregrine falcon: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the peregrine falcon because falcon nesting habitat on precipitous rocky cliffs are unlikely to be affected by timber operations. Over the 50-year analysis period, implementation of the Program or any of the alternatives falls under the state requirement that potential presence of habitat for state listed endangered species will be assessed during the preparation of PTHPs or THPs, and protection measures will be applied as required by law and regulation.

Bald Eagle: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the bald eagle because its habitat is unlikely to be included in any Program or alternative treatment area. FPR protocol requires identification of bald eagle habitat in or near timber operation areas and if present, surveys are required.

Osprey: Neither the Program nor any of the alternatives are likely to create a significant adverse impact to the osprey because its habitat is unlikely to be included in any Program or alternative treatment area. FPR protocol requires identification of suitable osprey habitat in or near timber operation areas and if present, surveys are required.

Purple martin: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the purple martin. Over the 50-year analysis period, implementation of the Program or Alternative III is predicted to have a beneficial impact to the purple martin as timber stands are managed to produce larger trees and more well-developed, mature stands. Implementation of Alternatives I or II is predicted to have a slight but not significant adverse impact on the Pacific fisher because these alternatives lessen, rather than enhance, mature forest conditions over time within the analysis period.

Pacific fisher: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the Pacific fisher. Over the 50-year analysis period, implementation of the Program or Alternative III is predicted to have a beneficial impact to the Pacific fisher as stands are managed to produce larger trees and more well developed conifer stands. Implementation of Alternative I or II is predicted to have a slight but not significant adverse impact on the Pacific fisher because these alternatives lessen rather than enhance mature forest conditions within the analysis period and are unlikely to create much additional denning habitat for fishers.

Humboldt marten: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the Humboldt marten. Whether Humboldt martens exist in the Program area has yet to be confirmed. However, they could reoccupy the area as forests mature. Over the 50-year analysis period, implementation of the Program and Alternative III is predicted

to have a moderately beneficial impact to the Humboldt marten as stands are managed to produce larger trees and more well developed conifer stands. Implementation of Alternatives I or II is predicted to have a slight but not significant adverse impact on the Humboldt marten because these alternatives lessen rather than enhance mature forest conditions within the analysis period and are unlikely to create much additional denning habitat for martens.

Northern spotted owl: Neither the Program nor any of the alternatives are likely to have a significant adverse impact to the Northern spotted owl. Over the 50-year analysis period, implementation of the Program or Alternatives is predicted to have a beneficial effect to the Northern spotted owl as stands are managed to become more mature and contain larger trees. Implementation of Alternatives I or II is predicted to have a slight adverse effect on the Northern spotted owl because these alternatives lessen, rather than enhance, the mature forest conditions required by spotted owls, over time.

Impacts to Critical Habitat Characteristics from Program and Alternatives

Snag/Den Characteristics

Boyland and Bunnell (2002) note that dead wood has many unique qualities that make it attractive as a place to forage, nest, and shelter. They note that in the Pacific Northwest, 69 vertebrate species commonly use cavities, and 47 species respond positively to down wood. Cavity users typically represent 25% to 30% of the terrestrial vertebrate fauna in forests of the region. Cavity excavators, upon which many other species depend for nesting habitat, select for trees with heart rot. Data indicates that 2 to 3 large snags per hectare, and 10 to 20 smaller snags per hectare are required to sustain cavity-nesting birds. Vaux's swift, one of the special-status species discussed above, selects standing, hollow snags with cavities large enough to be able to fly up and down inside the tree (Baldwin and Zaczkowski 1963).

More dead or dying wood than is required for nesting is needed to sustain all cavity-nesting species. By providing perching, foraging, and hawking sites, snags of all sizes tend to increase richness and abundance of birds other than cavity nesters (Dickson et al. 1983; Scott 1979).

Section 2.1.A.contains several references to requirement for snage retention specific to the PTEIR. For instance, 2.1.A.c. discusses additional retention requirements that are specific to group selection prescriptions under the PTEIR including retention of snags within group openings, and 2.1.A.D discusses retention of snags under the application of the all-aged prescription. Section 2.1.B.3 requires that all snags be retained within class III watercourse protection zones, a requirement specific to the Program.

Many sections of the California Forest Practice Rules address snags, and, to a lesser extent, den trees. Under Article 9, Wildlife Protection Practices, the FPR's address snag retention as below:

919.1, 939.1, 959.1 Snag Retention [All Districts]

Within the logging area all snags shall be retained to provide wildlife habitat except as follows:

(a) If required by the Director during the review of a THP, snags over 20 ft. in height and 16 in. dbh shall be felled in the following locations:

(1) Within 100 feet of main ridge tops that are suitable for fire suppression and delineated on a THP map.

(2) For hazard reduction within 100 feet of all public roads, permanent roads, seasonal roads, landings, and railroads.

(b) Where federal and state safety laws and regulations require the felling of snags.

(c) Within 100 feet of structures maintained for human habitation.

(d) Merchantable snags in any location as provided for in the plan, or

(e) Snags whose falling is required for insect or disease control.

(f) When proposed by the RPF; where it is explained and justified that there will not be a significant impact to wildlife habitat needs or there is a threat to human health or safety, including fire where the Director determines a high hazard exists.

Since any timber operation under the Program or any of the Alternatives must follow FPR provisions, and the Program and each of the alternatives allows for felling of snags when they pose a safety hazard, Section 919.1 of the FPR provides excellent guidance as to when snags are considered a safety hazard and must be removed. (It is presumed that snags whose felling is required for insect or disease control would be removed under the Program or any of the alternatives, as per (2)(3) above.)

The difference between Alternatives I and II on the one hand and the Program and Alternative III on the other, in terms of snag retention, is demonstrated in (2)(d) above, where the FPR's allow for removal of merchantable snags as long as that removal is provided for in the plan. Removal of merchantable snags would presumably occur under the status quo and Alternative II, where economics tends to be the main driver, but would be disallowed under a PTHP consistent with the Mattole Forest Futures Project, which governs the Program and Alternative III.

Den trees are defined in the FPR as partially live trees with elements of decay, which provide wildlife habitat. Although Appendix Technical Rule Addendum # 2 (CAL FIRE 2011) includes den trees as a "significant factor to consider" there is no further direction provided for protection of den trees. It can be assumed that an RPF would consider protecting a den tree under application of the status quo or Alternative II, but there appears to be no requirement to make any allowances to save them, unless the species in question is a special-status species. And, although the Mattole Forest Futures Project clearly places an emphasis on maintenance of wildlife habitat structures, neither the Program nor Alternatives 2 or 3 make specific provision for den tree protection. Therefore under the Program or alternatives, protection of den trees for special-status species could be expected to occur, but protection of den trees for other wildlife species would be at the option of the PTHP submitter and RPF.

Over the 50-year analysis period, implementation of the Program or Alternative III is predicted to have a moderately beneficial effect to snags and den trees as stands are managed to become more mature and contain larger trees, all old growth trees are protected from harvest, and recruitment of large woody debris and snags is implemented. Although neither the program nor Alternative III contain express provisions for protection of den trees, the emphasis on managing for larger trees over time and more mature forest conditions is likely to allow for more den trees to exist within managed forest stands than under the status quo or Alternative II. Alternatives I and II are predicted to have a Moderately Adverse effect on snags and den trees because commercial harvest of snags is allowed under the status quo as long as provisions for harvest area included in the harvest plan, and there is no requirement to identify or manage for den trees in the FPR's.

Road Density

As noted in the preceding discussion of road density, NCWAP estimates the approximate average road density for all of the basins at about 4.7 mi./sq. mile while ICE puts the number more in the range of 6 mi./sq. mile. The higher figure is likely more representative of the actual density as it is difficult to determine road density solely by air photo interpretation. The following analysis by subbasin will therefore use the ICE estimates to discuss impacts to terrestrial wildlife from Program or Alternative implementation. Table 3-59 below shows the

estimate of road density of mile per square mile as estimated by ICE, the "footprint" acres of harvest for each alternative, and estimate of the miles of road that could be opened (or if already opened, utilized during harvest activities) under the Program and Alternatives, over the 50-eyar analysis period.

Table 3-59
Road Densities and Program and Alternative Footprint by Subbasin

Subbasin	ICE Road Density (Miles/mile^2)	Footprint Harvest Acres by Program/Alternative (640 ac/sq. mi.)				Estimated Road Miles Used to Implement Program or Alternatives			
		Program	Alt 1	Alt 2	Alt 3	Prog.	Alt 1	Alt 2	Alt 3
East_1	6.0	2,655	1,839	2,725	1,592	24.9	17.2	24.1	15.0
East_2	6.0	1,669	704	2,083	1,001	15.6	6.6	18.1	9.4
North_1	3.0	4,307	5,330	3,973	3,027	20.2	30.0	18.6	14.2
North_2	3.0	2,935	4,292	2,441	2,377	13.8	20.1	11.4	11.1
South_1	9.1	631	715	653	611	9.0	10.2	8.7	8.7
West_1	6.2	1,746	261	2,295	1.018	17.0	2.5	20.8	0.0
West_2	6.2	1,095	345	1,230	602	10.6	3.3	10.9	5.8
Total		15,038	13,486	15,400	10,228	111.1	89.9	112.6	64.2

As shown in the table above, the road density in terms of miles used to implement the Program or alternatives over the 50-year analysis period is proportional to the footprint acres and the current road density in each subbasin. The Program and Alternative II, which have the largest footprint, utilize the most miles, followed by the status quo (Alt. 1); and Alternative III, which has the smallest footprint, utilizes about 40% fewer miles compared to the program.

The miles of road reported above does not necessarily represent roads that are being used most of the time; in fact many of these roads are private and currently closed, and would only be used for timber operations, after which they would be deliberately closed or would naturally close due to revegetation between harvest entries. Even the main paved roads in the basin report a low daily use rate, as noted earlier in this section. The TMDL assessment (NCRWQCB 2002) estimates that of the 3,310 identified miles of road in the Mattole basin, about 2,800 miles, or about 85%, are abandoned (See the Water Quality Section for discussion of roads). Given this disparity, a weighted road density analysis using weighted metrics sensitive to landscape conservation impacts, such as that developed by Irwin (2010) would enables a more precise examination of the impacts of roads on species than the traditional road density. Weightings allow characterization of the different impacts of roads and a modeling of how these impacts would be accumulated on the landscape.

Collision injuries to animals are expected to be fairly uncommon on most roads. Migration routes are likely to be affected to some extent, and can pose a barrier to some small animals such as salamanders (which are analyzed in Section 3.4). Decreases in thermal cover would tend to recover on temporary roads as they revegetate, but could be considered a long-term negative effect relative to road density. The North_1 and North_2 subbasins have the lowest road density, as they contain the highest proportion of industrial timberland and fewer small homesteads. These subbasins have lower residential populations and thus carry a lower daily traffic load except when industrial owners are conducting active management. Switalski (2006) reports on studies that indicate that much lower densities of roads than exist in the Mattole have a negative

effect on certain wildlife species. He concludes that large animals such as elk, wolves, grizzly bears, and lynx (which do not currently occur in the Program area) fail to thrive in areas with a higher density than 1 mile of road per square mile, clearly well below any condition in the basin. He notes that black bear *(Ursus americanus)* populations were shown to be inversely related to road density in the Adirondacks, New York (Brocke et al. 1988). This would indicate that the Mattole basin could support a higher population of black bears if road densities were reduced. He notes that road closure has been recommended to reduce black bear risk, and has been suggested to benefit rare forest carnivores.

Over the 50-year analysis period, implementation of the Program or any of the alternatives is predicted to have a slightly adverse but less than significant impact to wildlife associated with road density. This is because, although the road density in the basin is reportedly high, it is widely speculated that many of these roads are not actually open but are overgrown and impassible and therefore pose little of the travel obstacles or traffic danger of open and well-used roads.

However, during logging operations under the Program or alternatives currently closed roads will be opened and upgraded, and some presumably will be kept open for management purposes, especially under the Program or Alternative III, where repeated entries are made in order to practice selection silviculture. The Program is expected to have a moderately adverse impact on wildlife associated with increased road density as it opens the maximum amount of roads, as shown in the table above, consistent with instituting partial-cut or selection silviculture on all managed acres. Alternative II would also have a moderately adverse impact to wildlife associated with increased road density since it opens slightly more roads than the Program, although fewer roads would need to be kept open since Alternative II allows for even-aged management and many roads could be closed or allowed to revegetate following harvest. Alternative III also likely creates a moderately adverse impact to terrestrial wildlife related to road density, although this effect is less than the Program or other alternatives because the miles of road opened are substantially below that or the Program or Alternative II because Alternative III affects fewer acres. However, Alternative III implements only selection silviculture, and the roads opened will likely stay in that condition in order to conduct periodic harvest. Alternative I, the status quo, will produce no likely significant adverse effect to wildlife associated with road density, since, although it opens more roads for harvest than Alternative III more of the harvests are even-aged and are therefore likely not to be maintained in an open condition for repeated harvest entries.

Large Woody Debris

In The Hidden Forest (1999) John Luoma notes that: *"A rotting log contains a greater sheer mass of living tissue than the giant living tree ever did."* and *"An uprooted tree exposes bare mineral soil and adds to the topography of the forest floor. In the past, fallen logs were seen as harbors for all kinds of bad fungi that rot trees and all kinds of nasty insects that hurt trees...Whereas only 5% of a live tree might be living cells, as much as 20% of the weight of a rotting log can be composed of living tissue."* These quotes convey a current scientific viewpoint of the conservation of large woody debris (LWD) on the forest floor, and contrasts current attitudes toward LWD with past ones.

Bull (2002) in the abstract to a USDA General Technical Report, provides an articulate general summary of wildlife uses of coarse woody debris, excerpted below:

> *"Many species of birds, mammals, amphibians, and reptiles use coarse woody debris (i.e., standing and downed dead wood) for nesting, roosting, foraging, and shelter. Woodpeckers depend on decayed wood to excavate nest and roost cavities in standing trees. Secondary cavity nesters then claim the abandoned cavities for their nesting or roosting. Many of the woodpeckers and secondary cavity nesters use dead wood to forage on forest insects, including bark beetles and defoliators. Characteristics that affect the type and extent of vertebrate use of dead wood include the physical orientation, size, decay state, tree species, and overall abundance. Some species of heartwood decaying fungi create hollow chambers in living trees, which eventually die to become hollow, standing dead trees. Standing trees with hollow chambers are used by Vaux's swifts (Chaetura vauxi) for nesting and roosting, pileated woodpeckers (Dryocopus pileatus) for roosting, black bears (Ursus americanus) for overwintering, American martens (Martes americana) for denning and resting, and many other species of small mammals for shelter. Once the trees fall, many of the same species continue to use the hollow structures, except the avian species. Solid logs provide cover or travel lanes for small mammals. Accumulations of logs stacked on top of each other provide important habitat in the open spaces formed under the snow where martens and small mammals spend much of the winter. Large-diameter logs are used extensively by pileated woodpeckers and black bears for foraging on carpenter ants. Extensively decayed logs provide habitat for amphibians and reptiles."*

Past logging efforts likely made little attempt to actually dispose of coarse woody material, but also likely destroyed large amounts inadvertently. On industrial land within the basin this was likely the case for many decades, but when Pacific Lumber Company (now owned by Humboldt Redwood Company [HRC]) entered into a Habitat Conservation Plan (HCP), the HCP required the retention of snags, green retention trees, live cull trees, large hardwoods, and LWD, which has continued with HRC management, which took over the HCP. The only difference is that HRC is practicing unevenaged management, prohibiting clearcutting, and maintain old growth. Broadcast burning on PALCO and HRC lands has been limited in the Mattole during HCP operations (Maranto 2011).

In the 1980s, however, researchers such as Franklin, Maser, and Trappe recognized that not only was large woody debris (LWD) <u>not</u> wasted wood nor merely an impediment to conifer regeneration, but was a very important structural and functional component of the forest ecosystem (Franklin and others 1981, Maser and Trappe 1983, Maser and Sedell 1994). Much of the work done by Maser and others has focused on the value of LWD to streamcourses, both in terms of structural characteristics and nutrient cycling. But large logs and other debris are also important to terrestrial wildlife species (Fredrickson and Fredrickson 2001, Bartels et al 2010). An analysis of the impacts to LWD in regard to aquatic resources is included in Section 3.4.5 of this document.

Because neither the FPR's, the Program , nor any of the alternatives contain provisions for recruitment or treatment of large woody debris other than inside of watercourse protection zones, there are no clear criteria for analyzing the effects to terrestrial wildlife of the abundance or recruitment of LWD within treated areas. While LWD in a terrestrial setting has been identified as an important habitat element, as noted in the discussion above, there would appear no

recruitment of LWD within treated areas. While LWD in a terrestrial setting has been identified as an important habitat element, as noted in the discussion above, there would appear no reqirement for making a determination of the significance of impacts to this resources within the context of this document.

Multistory Canopy:

Board of Forestry Technical Addendum 2 (CA FPR's 2011) provides the following information on the values of a multistory canopy:

> *c. **Multistory canopy**: Upland multistoried canopies have a marked influence on the diversity and density of wildlife species utilizing the area. More productive timberland is generally of greater value and timber site capability should be considered as a factor in an assessment. The amount of upland multistoried canopy may be evaluated by estimating the percent of the stand composed of two or more tree layers on an average per acre basis. Near-water multistoried canopies in riparian zones that include conifer and hardwood tree species provide an important element of structural diversity to the habitat requirements of wildlife. Near-water multistoried canopy may be evaluated by estimating the percentage of ground covered by one or more vegetative canopy strata, with more emphasis placed on shrub species along Class III and IV streams (14 CCR 916.5, 936.5, or 956.5).*

The Program and Alternative III allow only partial-cut or selection silviculture. Selection silviculture is dependent for its successful practice on the creation and maintenance over time of a multistory canopy. Although designed for forests on the opposite side of the continent, the Nature Conservancy (2010), in a publication designed for small landowners, describes very well the benefits achieved by managing uneven-aged forests:

> *"Maintain or develop a balance of age classes, including a multi-story canopy and old, large-diameter trees. Old trees provide numerous services in these forests, such as wildlife habitat, seeds for forest regeneration, and large pools of nutrients and moisture. Management should aim to create an uneven-aged forest, emulating natural structural conditions. Even-aged management techniques should be used only to regenerate stands whose vigor and diversity has been degraded through successive high-grading, or to respond to stand-destroying fire, wind, ice, insect infestations, or disease outbreaks."*

Under the Program and Alternatives, managed timberland trends over time toward an accumulation of more mature, well-developed stands whose silviculture practices depend on the presence of viable, multiple canopy layers. On the other hand, Alternative II, although it includes larger and more intact stream buffers, allows even-aged management on 30% of its managed landbase and more intensive management of uneven-aged prescription areas on the remaining 70%. Alternative I, the status quo, includes the same silvicultural practices as Alternative II without the offsetting impacts of enhanced stream buffers. As can be seen in the charts tracking the changes in WHR vegetation types for these alternatives, under their application there is no recruitment of stands of larger trees (on managed timberland) but instead there is a continual increase in types with smaller average diameter. These stands are unlikely under the projected management scenarios to develop a multistory canopy.

Over the 50-year analysis period neither the Program nor any of the alternatives are expected to create a significant adverse impact to the abundance of multistoried canopy within managed forest areas. The Program and Alternative III are expected to have a slightly beneficial effect because silvicultural practices lead to creation of a multistoried canopy over time. Alternatives I and II are expected to have a slight adverse effect to development of a multistory canopy, as stand structures are continually simplified by the silvicultural practices specific to these alternatives.

Hardwood Cover:

The Board of Forestry Technical Rule Addendum No. 2 (CAL FIRE CA Forest Practice Rulebook 2011) provides the following evaluation of hardwood cover:

> ***e. Hardwood Cover:*** *Hardwoods provide an important element of habitat diversity in the coniferous forest and are utilized as a source of food and/or cover by a large proportion of the state's bird and mammal species. Productivity of deer and other species has been directly related to mast crops.*

According to this section of the FPR's, hardwood cover is considered a biological resource worthy of consideration in assessing the biological habitat condition of a proposed harvest plan. However, the general management thrust of the FPR's is to ensure that conifer stocking is not decreased nor that of hardwoods increased at the expense of conifers.

As noted many times above, the forests of the Mattole Basin are considered by many (Mattole Restoration Council 2009 [forest monograph]) to be "hardwood challenged": i.e., to contain a higher proportion of hardwoods than they did prior to the intense disturbances of the 20th century and heavily stocked with hardwoods of poor value when their sites would allow stocking wih higher value conifers. Many of the provisions of the Program, particularly the application of the all-aged prescription, are intended to reverse the trend toward hardwood dominance and increase the proportion of conifer stocking. (As noted earlier, attempts have been made in the Southern Humboldt region to develop commercial uses for the abundant hardwood resource, but these have to date had little positive effect.)

Indeed, the FPR's require that the submitter of a timber harvest plan state outright if their intent is to manage for Group B (largely hardwood) species. Section 912.7(d) of the FPR's requires that

> The percentage of the stocking requirements met with Group A species shall be no less than the percentage of the stand basal area they comprised before harvesting. The site occupancy provided by Group A species shall not be reduced relative to Group B species.

PTHPs tiered to this PTEIR must meet the above FPR requirement as certified by the plan submitter in the PTHP Checklist. The PTEIR contains many other provisions that place emphasis on establishment and maintenance of conifer stocking. Silvicultural practices that affect the areas of timber operation predicted for the Program and alternatives are designed to shift the conifer/hardwood ratio toward conifers.

However, given the emphasis of the FPR's on the maintenance of adequate hardwood stocking as shown above, if the current level of hardwood stocking were considered so valuable ecologically as to allow no diminution, implementation of the Program or any of the alternatives could be viewed as having an adverse effect to the hardwood resource.

Over the 50-year analysis period neither the Program nor any of the alternatives are expected to create a significant adverse impact to the abundance of hardwood stocking within the Program area. This is because the effects of Program silvicultural treatments are applied across a very limited acreage within the Program area and an abundance of hardwood cover would still exist after the Program or any of the alternatives was implemented.

Late Seral Forest Characteristics:

The Board of Forestry Technical Rule Addendum No. 2 (California Forest Practice Rulebook, 2011) provides the following advice on assessment and management for late seral forest characteristics:

> ***f. Late Seral (Mature) Forest Characteristics:*** *Determination of the presence or absence of mature and over-mature forest stands and their structural characteristics provides a basis from which to begin an assessment of the influence of management on associated wildlife. These characteristics include large trees as part of a multilayered canopy and the presence of large numbers of snags and downed logs that contribute to an increased level of stand decadence. Late seral stage forest amount may be evaluated by estimating the percentage of the land base within the project and the biological assessment area occupied by areas conforming to the following definitions: Forests not previously harvested should be at least 80 acres in size maintainto reduce the impacts of edge. This acreage is variable based on the degree of similarity in surrounding areas. The area should include a multilayered canopy, two or more tree species with several large coniferous trees per acre (smaller subdominant trees may be either conifers or hardwoods), large conifer snags, and an abundance of large woody debris. Previously harvested forests are in many possible stages of succession and may include remnant patches of late seral stage forest which generally conform to the definition of unharvested forests but do not meet the acreage criteria.*

As noted in 3.18.1 above, it is unlikely that more than 8% of the WHR vegetation types in the Program area could currently qualify as late seral under the FPR definition.

As stated numerous times in this PTEIR, stands with late seral characteristics can be managed to maintain or enhance such characteristics. The stated overall goal of the program is to nurture the development well-stocked older forests types that can be managed with light touch silviculture. Models for this type of forestry are relatively common in the North Coast region and include the Arcata City Forest and Blencowe Forestry in Ft. Bragg.

Many of the Program goals are aimed at enhancing the value of managed stands for wildlife and late seral habitat, by confining timber harvest practices to light-touch

methods. These goals are articulated throughout the PTEIR, and are generally more restrictive in Alternative III.

Alternative II, on the other hand, allows for relatively intense even-aged and FPR minimum silviculture across the managed portion of the landscape. These managed areas are unlikely to develop late seral characteristics, in fact the goal of this type of silviculture is often expressly not to develop late seral characteristics, because of the added restrictions imposed by the FPRs for management of late seral projects. On the other hand, Alternative II maintains the largest and most intact WLPZs, which over time would continue to develop late seral characteristics as these largely unmanaged areas mature.

Alternative I utilizes standard FPR silvicultural prescriptions. There is scope within the standard prescriptions to develop more mature forests over time as some of the local examples demonstrate, but for the purpose of analysis in the EIR the impacts of standard practices are evaluated at their most intense level in order not to underestimate the impacts. WLPZs under Alternative I are modeled as managed to the maximum intensity allowed by the FPR's. While the WLPZ rules in the FPR's are fairly restrictive, most WLPZs being managed under the FPR's are unlikely, over the 50-year analysis period, to develop an abundance of late seral characteristics or meet the 20-acre minimum to be classified as late seral stands.

Over the 50-year analysis period neither the Program nor any of the alternatives are expected to create a significant adverse impact to the abundance of late seral forest characteristics. Under the Program and Alternative III more well developed type 5 and 6 stands would be created and combined with the larger (than the FPR's) WLPZs, would add to the occupancy of late seral timber types over the Program area. Alternatives I and II are expected to create a slightly adverse impact to late seral forest characteristics due to their reliance on more intensive silvicultural practices, but this effect would be limited by the relatively small acreage on which they would be applied, and the relatively large area of unmanaged forest that would presumably continue to develop late seral characteristics. Under Alternatives I and II, WLPZs managed under FPR standards will likely develop some late seral characteristics over time.

Late Seral Habitat Continuity

Board of Forestry Technical Rule Addendum No. 2 to the FPR's (CAL FIRE 2011) provides the following advice on assessment and management for late seral habitat continuity:

> ***Late Seral Habitat Continuity****: Projects containing areas meeting the definitions for late seral stage characteristics must be evaluated for late seral habitat continuity. The fragmentation and resultant isolation of late seral habitat types is one of the most significant factors influencing the sustainability of wildlife populations not adapted to edge environments. This fragmentation may be evaluated by estimating the amount of the on-site project and the biological assessment area occupied by late seral stands greater than 80 acres in size*

(considering the mitigating influence of adjacent and similar habitat, if applicable) and less than one mile apart or connected by a corridor of similar habitat.

As noted earlier in this section, there are currently only 20 stands meeting the definition (including size) of late seral stands within the Program area. Continuity of late seral habitat is also very low, as these stands are widely dispersed.

Examination of the charts showing changes in WHR vegetation types over the analysis period for the Program and each of the alternatives indicates that the Program leads to creation and maintenance of more mature stands containing larger trees compared to any of the alternatives. Under implementation of the program more late seral stands would develop over time and doubtless improve the proximity of late seral stands. Alternative III has much the same effect as the Program but on a smaller footprint. Alternative II creates and maintains late seral conditions in larger and more protected WLPZs, but this effect is offset by the more intense practices allowed under this alternative across the managed portion of the landscape. Alternative I tends to increase early seral stands while leading to the diminution of more mature forest over time due to its emphasis on economic maximization of harvests.

Over the 50-year analysis period, neither the Program nor any of the alternatives are expected to create a significant adverse impact to the abundance of late seral habitat continuity. Under the Program, the well-developed type 5 and 6 stands increase from about 6% (960 acres) of the Program area to about 55% (8,270 acres) over 50 years. Combined with the larger (than the FPR's) WLPZs, these stands are likely to create large contiguous areas with late seral conditions. Alternative III is expected to create a similar beneficial effect to late seral habitat continuity although since it is applied to a smaller footprint, the benefits would likely be less striking. Alternatives1 and 2 are expected to create a moderately adverse effect to late seral habitat continuity due to their reliance on more intensive silvicultural practices, but which, because of the limited landbase to which they are projected to be applied, a still less than significantly adverse impact to late seral continuity across the Program area.

3.18.7 Indirect Impacts of Implementing the Program/Alternatives - Wildlife

Indirect impacts come into play after the immediate impacts of a treatment have dissipated and are a function of the desired forest condition and the regeneration process (MRB 2008). These impacts will vary over time as animals respond to seral changes in vegetation structure. Indirect impacts of treatment can be expected to diminish over time as treated stands approach pre-treatment conditions—while in areas where treatments substantially change conditions (e.g., clearing areas entirely of vegetation and replanting with different species), may not revert to the pre-treatment condition within the analysis period of the Program.

Short- and long-term impacts on a given species may differ, but it is impractical to try to define these terms consistently for species that vary greatly in life strategy and generation time or across vegetation types with varying rates of regeneration. As with any change in the environment, timber operations will benefit some species, harm others, and have no effect on the rest. In every case, removal of individual trees may result in localized displacement of wildlife species that

depend on particular trees or groups of trees for roosting, foraging, breeding, and movement corridors. In general, treatments that open up the canopy of forest stands can be expected to benefit the wildlife that evolved to thrive in such openings, and have a negative effect on species that prefer an intact canopy. Where there are ancillary objectives tied to the goals of the Program, such as fuel reduction and timber harvest, one also must consider the potential risk to wildlife of stand-replacing fire in the absence of fuel reduction.

Indirect impacts of timber operations on wildlife are related to changes in habitat conditions (including structure, vegetation composition, soil condition, and microclimate) resulting from treatment. These attributes are often independent of particular silvicultural treatments, since in all cases timber harvest requires removal of individual trees and the creation of openings where those trees stood. Slash must be treated to reduce fire hazard and to open up areas for regeneration. Haul roads must be improved or installed, used and maintained, and are usually decommissioned to some extent after use. Nevertheless, the greater the intensity of the sum of these activities, the greater the influence on the various wildlife habitat elements on the site. Additionally, many types of timber operations have not been studied enough (particularly in the vegetation types typical of the Mattole) for their long-term impacts to be objectively evaluated. For instance, the all-aged prescription has been developed specifically for the Program, and its impacts have yet to be demonstrated, much less studied.

Timber operations create a "disturbance event" within the forest stand where they occur, with long-lasting consequences. Timber harvest *per se*, however, is fairly analogous in its impacts to fire, windthrow, and other common events that create openings in local forests. The local wildlife populations contain many species that have evolved to survive such disturbances and to populate openings created by them.

Other impacts from timber operations are less "natural" or analogous to natural events, and are potentially more difficult for some wildlife populations to adapt to. Transportation of logs from stump to mill is concentrated near the operations site and disperses out into the harvest unit or onto the road system. Well-engineered and maintained skid and haul roads can keep impacts from operations to a minimum, while poorly designed and non-maintained roads can cause sediment-producing failures and other dramatic longer-term impacts. Road density in the Mattole is ostensibly if not functionally high but at a minimum would negatively impact the potential for reintroduction of species that have been extirpated from the basin, such as elk. Roosevelt elk have been successfully reintroduced to the southern part of the KRNCA and to Prairie Creek to the east. But for elk to be successfully reintroduced to the Program area some closing or decommissioning of roads would be likely be essential.

The silvicultural treatments proposed under the Program and Alternative III do not remove the entire timber stand; in fact the largest opening that can be created without any remaining structure is 1 acre, as openings up to the maximum of 2.5 acres must retain at least 15 sq ft basal area of residual trees for habitat diversity. Most managed areas will maintain a permanent overstory cover. Retention of trees within managed forest areas is designed to maintain particular wildlife habitat elements, such as defective trees that can be used as den trees or die and turn into snags. For instance, the Pacific fisher utilizes trees containing cavities ranging from 30 inches to 50+ inches in diameter for resting and nesting. On the Hoopa Valley Indian

Reservation, Pacific fishers have been documented as utilizing such trees that were retained in harvest units from which much of the tree cover was harvested (Higley 2011). To conserve biodiversity at forest stand scales, innovative silvicultural approaches (such as those in the Program and Alternative III) incorporate processes of natural stand development and patterns of natural disturbance that are responsible for habitat heterogeneity in natural forest stands (Hunter 1993; Franklin et al. 2002). Key structural legacies of original stands to which various biota have strong associations, including large live trees, snags, down wood, undisturbed layers of forest floor, and understory plant communities (Franklin et al. 1997; Palik et al. 2003) are retained within harvest units as well as within openings over 1 acre as per the goals of the Program and Alternative III. Dispersed retention of dominant or co-dominant trees as provided for in these alternatives may provide well-distributed sources of soil energy, future snags and down wood, habitat for late-successional species as well as mitigate microclimate or hydrological processes evenly throughout a stand (Hansen et al. 1995; Franklin et al. 1997). Retaining leave islands of old trees, snags, down wood, or deciduous trees in conifer stands would provide habitat for some low-mobility species, such as lichens, vascular plants, arthropods, mollusks, and amphibians (Neitlich and McCune 1997; Duncan 1999; Wessell 2005).

Michel and Winter (2008) note that the importance of structural complexity in forest ecosystems for ecosystem diversity has been widely acknowledged. Their study focuses particularly on the role of microhabitats as indicators of natural mature and natural old growth stands, e.g., broken tree top, bayonet top, crack or scar, bark loss, hollow chamber, stem cavity with decay, bark pocket with and without decay, bark bowl, burl, heavy resinosis, and bark burst. Retention and recruitment of legacy trees that will eventually display these stand elements is a goal of the Program and Alternative III. In any case, if habitat elements such as large defective trees are <u>not</u> retained within a particular harvest unit, it will be many decades before the opportunity to produce such trees on that site occurs again. Preserving the trees today at least allows for the potential for them to be utilized by wildlilfe species in the foreseeable future (Higley 2011).

Commercial thinnings (one of the approved Program silvicultural prescriptions) are normally applied to immature stands in order to stimulate the growth of the trees that are retained and increase the total yield of useful material from the stand (Smith 1962). Commercial thinnings are generally considered a step along the path to an even-aged regeneration harvest.

The silvicultural prescriptions allowed under the Program and Alternative III: single-tree selection, group selection, and the all-aged prescription, are variations of uneven-aged management. This type of management is designed to manage a multi-aged stand that is maintained on site indefinitely and which contains at least three well-defined age classes at all times (Smith 1962). However, when uneven-aged management is first applied to the young, dense forests of the Mattole, the initial harvest will often greatly resemble a thinning, as undesirable trees are removed and the future stand identified by the trees that are retained.

Thinning causes changes in habitats that can affect wildlife in various ways. Opening the canopy creates gaps that allow more sunlight to reach the ground, resulting in warmer, drier ambient conditions (MRB 2008). Added sunlight promotes the growth of vegetation, initially grasses, herbs, and forbs, and then shrubs and tree seedlings. These changes will benefit certain species

but act to the detriment of others. Arboreal forest species may lose habitat connectivity and face reduced foraging, breeding, dispersal, and migration opportunities. Thinning treatments often target the sub-canopy layer, affecting the wildlife of that layer most strongly. In general, thinning may harm species of cool, moist forests most, while species of disturbed and early successional habitats are likely to benefit. Thinning appears to have minimal impacts on wildlife if it is done in small patches, stem reduction is 25% or less, and legacy features are retained (*e.g.*, CalPIF 2002, Alexander and others 2007).

Mad River Biologists (MRB 2008) discussed the impacts of thinning on various forest types in the yet-to-be published *Program Environmental Impact Report for the Vegetation Treatment Program of the California Department of Forestry*, which is excerpted below. Although the excerpt discusses many types of forest stands that are not found in the Mattole, they are similar enough to have bearing on indirect impacts from thinning and early-entry selection treatments under the Program and alternatives.

Thinning

> *"...Forest-floor **detritivores** (millipedes, isopods, mites, etc.) and **decomposers** (termites, beetles, ants, etc.) may be affected severely by disruption and loss of litter and down wood, as is likely to occur with slash removal (Gunnarsson and others 2004). While these animals are able to colonize suitable areas quickly, it apparently takes a very long time for the necessary habitat elements to accumulate sufficiently for their populations to recover from such disturbance (Niwa and Peck 2004).*
>
> *Fuel reduction treatments appear to have mixed impacts on **predatory invertebrates**. Terrestrial spiders and beetles are the best studied (Pilliod and others 2006). In one study, individual carabid species responded differently to thinning, with some increasing and some decreasing such that overall abundance and diversity were unaffected (Niwa and Peck 2004). In the same study, hunting spiders were more numerous in thinned stands and sheet-web spiders more abundant in unthinned stands. Villa-Castillo and Wagner (2002) found no difference in ground beetle species assemblage between ponderosa stands 4-10 years after thinning and control stands...Site management history and size of treatment area may be significant factors influencing terrestrial arthropod responses to thinning (Apigian and others 2006).*
>
> *Indirect impacts of thinning on **invertebrate herbivores and pollinators** appear to be mostly positive. Increased solar radiation penetrating to the ground promotes vegetative growth and flowering, benefiting butterflies and moths during their larval and adult stages, respectively (Ross 1995, Waltz and Covington 2004). However, disturbance can favor invasive plants that may displace Lepidopteran host species (Huntzinger 2003).*
>
> *Most terrestrial **amphibians** require a heavy component of duff, litter, and down wood for cover and moisture; while they may benefit initially from slash created by thinning, its later removal will harm them. Overstory canopy is also important to forest amphibians (Martin and McComb 2003)...Densities of some amphibians' prey, notably ants, are higher in recently disturbed areas, and thinning may result in increased numbers of those amphibian species (e.g., toads; Kirkland and others 1996).*

Almost nothing is known about the impacts of thinning on ***reptiles*** *(Pilliod and others 2006). Since different species have different habitat requirements, they will respond differently to any given treatment, but most species will benefit from the warmer, drier conditions created by thinning. Many snakes likely will benefit from treatments that open the canopy and increase populations of terrestrial rodents (see small mammals, below). A few species inhabit litter, logs, etc. in closed-canopy forest and will be affected negatively by treatments that remove these habitat features. Most reptiles of forested landscapes occupy discrete patches such as wet meadows and rock outcrops that likely will be excluded from treatment.*

Thinning appears generally to have no or a positive effect on ***terrestrial birds****. Siegel and DeSante (2003) found no difference in densities of ground-nesting birds between thinned and unthinned mixed conifer stands in the Sierra Nevada five to eight years after treatment. They also found no difference in nest success except that of dark-eyed junco (Junco hyemalis), which was higher in the thinned stands. Hagar and others (1996) found higher breeding-season densities of dark-eyed junco and higher winter densities of winter wren (Troglodytes troglodytes) in thinned Douglas-fir stands in Oregon five to 15 years after treatment than in unthinned stands of the same age. Haveri and Carey (2000) also found higher winter densities of winter wren as well as song sparrow (Melospiza melodia) on thinned plots; they attributed this to higher vegetation densities (hence more foraging substrate) on the ground. Aigner and others (1998) compared thinned and unthinned oak-pine woodland and found that ground-nesting and/or –foraging species increased in abundance on the thinned plots, associated with brush piles.*

Small mammals *may repopulate disturbed areas very quickly, with generalists preferring early seral stages and specialists later ones (Fisher and Wilkinson 2005). Sullivan and others (2001) compared unthinned, thinned, and old-growth lodgepole pine (Pinus contorta) stands in Canada and found overall small mammal abundance higher (comparable to that in old-growth stands) in low-density thinned stands than in unthinned stands ten years after treatment. In western Washington, thinned second-growth stands had more small mammals than unthinned legacy retention stands, but neither community resembled that of old-growth (Wilson and Carey 2000). Some species (e.g., chipmunks and some deer mice) are likely to increase after thinning in conifer forests, but others (e.g., red-backed voles and snowshoe hare [Lepus americanus]) probably will decrease (Bull and Blumton 1999, Wilson and Carey 2000, Woolf 2003). Many forest-dwelling small mammals are dependent on features such as truffles and soft logs usually associated with cool, moist conditions; thus, treatments such as heavy thinning that result in warmer, drier conditions will affect these species negatively even if the soil is not disturbed and logs are not removed (Lehmkuhl and others 2004, Meyer and others 2005). Retention of unthinned patches within thinned stands may help maintain some small mammal populations.*

Reduction in canopy cover (short of complete removal) seems to have relatively little effect on ***mesocarnivores*** [e.g., fisher, pine marten] *(K. Slauson, pers. comm.). More critical is retention of key habitat elements including large trees (especially hardwoods), snags, and logs (Buskirk and Powell 1994). Impacts of treatment on key prey species are also important. Fisher and marten forage primarily on the ground when it is snow-free and may benefit from late spring to late fall from increases in rodent and grouse populations responding to vegetative growth resulting from thinning. However, they depend on arboreal prey, especially squirrels, the rest of the year, and those species may*

be affected negatively by thinning, especially if cavities and brooms are removed (see small mammal section above)...the mosaic of thinned and unthinned patches that will result from [thinning] *should benefit fisher and marten, provided that patches are large enough to sustain prey populations and that legacy features are retained in thinned patches.*

Among ***large carnivores****, black bear (Ursus americanus) is perhaps the most likely to be affected significantly by* [thinning] *treatments due to its abundance, distribution, diet, and habitat use (Pilliod and others 2006). This species relies heavily on down wood (as a foraging substrate), dense thickets (for cover), and large-diameter hollow logs (for denning) in mature forest landscapes (Bull and others 2000, 2001); thus, treatments that reduce these habitat elements are likely to affect black bear negatively. It may be easier to retain such elements with mechanical and manual treatments than with fire, but thinning may result in vegetation structure unfavorable to black bear (Mollohan and others 1989).*

Ungulates *prefer a mosaic of open areas and forest cover (Pilliod and others 2006). Fuel reduction treatments, alone or in combination, often improve foraging conditions for ungulates (Riggs and others 1996, Demarais and Krausman 2000) but retention of patches of dense cover at least 0.04 ha in size may be required (Chambers and Germaine 2003). Fuel reduction has been shown to reduce use of day beds for several years (Germaine and others 2004). Ungulates are usually limited by winter forage, so appropriate treatments on their wintering grounds are likely to be more beneficial to them than those on their summer grounds (Hobbs and Spowart 1984). Improved winter forage may outweigh loss of cover in importance to deer in some cases (DePerno and others 2002), but loss of thermal and canopy cover in wintering areas can make stands unusable by deer, especially in areas of heavy snowfall (Armleder and others 1989)."*

Alternatives I and II model a wider and different set of prescriptions, including standard even-aged harvest methods such as clearcut, shelterwood, and variable retention on 30% of the treated acreage; while the standard uneven-aged selection prescriptions are modeled to be applied without the additional restrictions specified in the PTEIR for the Program and Alternative III on the remaining 70% of their footprint acreages. These prescriptions are generally more disruptive to the existing stand than the PTEIR prescriptions, which were developed to minimize some of the perceived negative impacts from the application of the standard prescriptions (e.g., removal of all of the larger trees in a stand, harvest of snags and old growth).

Intensive treatments, such as in a standard clearcut that is cleared of all vegetation, broadcast burned and subsequently sprayed multiple times with herbicides, may create habitat configurations that are harmful to some wildlife, particularly those species dependent on large tracts of intact forest and sensitive to edge impacts. Openings may fragment contiguous blocks of habitat or sever wildlife corridors. They may create barriers to dispersal and gene flow as well as edge impacts such as increased nest predation and brood parasitism.

3.18.8 Determination of Significance - Wildlife

Table 3-60 summarizes the potential environmental impacts associated with implementation of the Program or Alternatives.

Table 3-60
Summary Of Impacts[1/]
To Terrestrial Wildlife Species
From Implementing The Proposed Program Or Alternatives

Basin	Program	Alt 1	Alt 2	Alt 3
East_1	LS	LS	LS	LS
East_2	LS	LS	LS	LS
North_1	LS	LS	LS	LS
North_2	LS	LS	LS	LS
South_1	LS	LS	LS	LS
West_1	LS	LS	LS	LS
West_2	LS	LS	LS	LS

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

Implementation of the Program or any of the three alternatives will not be extensive enough in terms of the acreage treated each year, or damaging enough in terms of adverse alterations to natural vegetation types, to create any direct threat to populations of common terrestrial wildlife species; though there will be direct and indirect impacts to individuals. For the same reasons, significant impacts to more common (non-endangered) special-status species are also not anticipated. Likewise, indirect or direct significant adverse impacts to special-status species are not expected to occur as a result of treatment under the Program or alternatives, as most of these potential impacts can be avoided or minimized through adherence to the PTEIR Checklist and/or (for Alternative I) strictly following the requirements in the FPR's. Direct impacts, by definition, are virtually never positive; but it is assumed that appropriate avoidance measures implemented at the project level will eliminate negative direct impacts on special-status wildlife.

With the application of the standard practices described above, neither the proposed Program nor any of the alternatives are likely to a) violate any state or federal wildlife protection law regarding wildlife species, or b) contribute directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native wildlife species or subspecies at the Program level.

Since no significant effects to terrestrial wildlife are expected to occur from implementation of the Program or any of the alternatives, no significant impacts are likely to occur from the application of the Program or Alternatives 2 or 3. Alternative I, continuance of the status quo, although it contains no additional constraints intended to minimize impacts from treatment as prescribed under with the Mattole Forest Futures Project, is likewise governed by the same regulatory bodies, the California Practice Rules and related regulations, and affects a limited area within the Mattole basin. In addition, Alternative I contains the application of Timber Harvest Plans and other harvest planning documents that are considered CEQA equivalent and have been determined through review at the state level not to result in a significant adverse impact if

implemented according the FPR's. Cal Fire provides both document review and on-site inspection as necessary to ensure compliance with the FPR's. Therefore Alternative I is determined not to likely cause a significant effect to terrestrial wildlife species.

3.18.9 Similar Impacts Described Elsewhere - Wildlife

The impacts to Terrestrial Wildlife described in this chapter are relatively similar to the impacts to aquatic wildlife species as described in Chapter 3.4; they differ by occurring across a much broader (and dryer) landscape and by inclusion of species with less critical need for water or a damp environment.

3.18.10 Mitigation Measures for the Proposed Program - Wildlife

Because no significant impacts to natural resources are expected to occur as result of implementing the Program or any of the alternatives, no mitigation measures are considered necessary to avoid significant impacts to terrestrial wildlife from their implementation.

3.18.11 Literature Cited - Wildlife

Alexander, J. D., N. E. Seavy, and P. E. Hosten. 2007. Using conservation plans and bird monitoring to evaluate ecological impacts of management: An example with fuels reduction activities in southwest Oregon. Forest Ecology and Management 238: 375-383.

Apigian, K. O., D. L. Dahlsten, and S. L. Stephens. 2006. Fire and fire surrogate treatment effects on leaf litter arthropods in a western Sierra Nevada mixed-conifer forest. Forest Ecology and Management 221: 110-122.

Armleder, H. M., D. A. Leckenby, D. J. Freddy, and L. L. Hicks. 1989. Integrated management of timber and deer: interior forests of Western North America (General Technical Report PNW-GTR-227). Portland, OR: USDA Forest Service Pacific Northwest Research Station.

Brocke, R.H., J.P. O'Pezio, and K.A. Gustafson. 1990. A forest management scheme mitigating the impact of road networks on sensitive wildlife species: Is Forest Fragmentation a Management Issue in the Northeast? General Technical Report NE-140, U.S. Forest Service, Radnor, PA

Baldwin, PH., Zaczkowski, NK. 1963. Breeding biology of the Vaux Swift. Condor 65: 400-406.

Boyland, Mark and Dr. Fred L. Bunnell. 2002. Vertebrate Use of Dead Wood in the Pacific Northwest. University of British Columbia.

Bull, E. L., A. A. Clark, and J. F. Shepherd. 2005. Short-term effects of fuel reduction on pileated woodpeckers in northeastern Oregon – a pilot study (Research Paper PNW-RP-564). Portland, OR: USDA Forest Service Pacific Northwest Research Station.

Bull, Evelyn L. 2002. The Value of Coarse Woody Debris to Vertebrates in the Pacific Northwest. USDA Forest Service Gen. Tech. Rep. PSW-GTR-181.

Bull, E. L., and A. K. Blumton. 1999. Effects of fuels reduction on American Marten and their prey (Research Note PNW-RN-539). Portland, OR: USDA Forest Service Pacific Northwest Research Station.

Bull, E. L., J. J. Akenson, and M. G. Henjum. 2000. Characteristics of black bear dens in trees and logs in northeastern Oregon. Northwest Science 81: 148-153.

Bull, E. L., T. W. Heater, and T. L. Wertz. 2001. Black bear habitat use in northeastern Oregon. Western Black Bear Workshop 7: 82-91.

Buskirk, S. W., and R. A. Powell. 1994. Habitat ecology of fishers and American martens. In S. W. Buskirk, A. S. Harestad, M. G. Raphael, and R. A. Powell, eds., Martens, sables, and fishers: biology and conservation. Ithaca, NY: Comstock Publishing Associates: 283-296.

CalPIF (California Partners in Flight). 2002. Version 2.0. The oak woodland bird conservation plan: a strategy for protecting and managing oak woodland habitats and associated birds in California (S. Zack, lead author). Point Reyes Bird Observatory, Stinson Beach, CA. http://www.prbo.org/calpif/plans.html.

Chambers, C. L., and S. S. Germaine. 2003. Vertebrates. In P. Friederici, ed., Ecological restoration of Southwestern ponderosa pine forests. Washington, DC: Island Press: 268-285.

Demarais, S., and P.R. Krausman. 2000. Ecology and management of large mammals in North America. Upper Saddle River, NJ: Prentice Hall.

DePerno, C. S., J.A. Jenks, S.L. Griffin, L.A. Rice, and K.F. Higgins. 2002. White-tailed deer habitats in the central Black Hills. Journal of Range Management 55: 242-252.

Desimone, S.M. 1997. Occupancy rates and habitat relationships of northern goshawks in historic nesting areas in Oregon. M.S. Thesis, Oregon State University, Corvallis, OR

Dickson, JG, Conner, RN, and Williamson, JH. 1983. Snag retention increases bird use of a clear cut. Journal of Wildlife Management 47:799-804.

Driscoll, John. 2001. Humboldt marten on the precipice; environmental groups ask feds to protect rare weasel subspecies. In the Times Standard, Eureka, CA.

Duncan N, Ed. 1999. Management recommendations for survey and manage mollusks, Version 2.0. US Department of Agriculture, Forest Service, and US Department of Interior, Bureau of Land Management, Portland, OR.

Fisher, J. T., and L. Wilkinson. 2005. The response of mammals to forest fire and timber harvest in the North American boreal forest. Mammal Review 35: 51-81.

Franklin JF, Berg DR, Thornburgh DA, Tappeiner JC. 1997. Alternative silvicultural approaches to timber harvesting: variable retention harvest systems. In: Kohm KA, Franklin JF (eds) Creating a forestry for the 21st century. Island Press, Washington, DC, pp 111–139.

Franklin JF, Spies TA, Pelt RV, Carey AB, Thornburgh DA, Berg DR, Lindenmayer DB, Harmon ME, Keeton WS, Shaw DC, Bible K, Chen J. 2002. Disturbance and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. Forest Ecol Manage 155:399–423

Germaine, S. S., H. L. Germaine, and S. R. Boe. 2004. Characteristics of mule deer day-bed and forage sites in current condition and restoration-treated ponderosa pine forest. Wildlife Society Bulletin 32: 554-564.

Grinnell, J., and J. S. Dixon. 1926. Two new races of the pine marten from the Pacific Coast of North America. Zoology 21(16):411-417.

Gunnarsson, B., K. Nitterus, and P. Wirdenas. 2004. Effects of logging residue removal on ground-active beetles in temperate forests. Forest Ecology and Management 201: 229-239.

Hansen AJ, Garman SL, Weigand JF, Urban DL, McComb WC, Raphael MG.1995. Alternative Silvicultural regimes in the Pacific Northwest: simulations of ecological and economic effects. Ecol Appl 5:535–554.

Haveri, B. A., and A. B. Carey. 2000. Forest management strategy, spatial heterogeneity, and winter birds in Washington. Wildlife Society Bulletin 28: 643-652.

Higley, Mark. Wildlife Biologist, Hoopa Valley Indian Reservation. Personal communication March 7, 2011. Phone conversation.

Hobbs, N. T., and R. A. Spowart. 1984. Effects of prescribed fire on nutrition of mountain sheep and mule deer during winter and spring. Journal of Wildlife Management 48: 551-560.

Hunter ML Jr. 1993. Natural fire regimes as spatial models for managing boreal forests. Biol Conserv 65:115–120

Huntzinger, M. 2003. Effects of fire management practices on butterfly diversity in forested Western United States. Biological Conservation 113: 1-12.

Irwin, Hugh. 2010. Regional Road Density Analysis Using Weighted Metrics Sensitive to Landscape Conservation Impacts. Southern Appalachian Forest Coalition. Asheville. Web site http://proceedings.esri.com/library/userconf/proc00/professional/paper.

Kirkland, G. L., Jr., H. W. Snoddy, and T. L. Amsler. 1996. Impact of fire on small mammals and amphibians in a central Appalachian deciduous forest. American Midland Naturalist 135: 253-260.

Klug, R. R. 1997. Occurrence of Pacific fisher (*Martes pennanti pacifica*) in the Redwood Zone of northern California and the habitat attributes associated with their detections. M.S. thesis. Humboldt State University, Arcata, CA. 50 p.

Luoma, John R. 1999. The Hidden Forest: the biography of an ecosystem. Henry Holt and Company, New York.

Maranto, Chris. Personal communication January 2011. Written comments on Draft Mattole PTEIR.

Martin, K. A., and B. C. McComb. 2003. Amphibian habitat associations at patch and landscape scales in western Oregon. Journal of Wildlife Management 67: 672-683.

Mayer, K. E., and W. F. Laudenslayer, Jr. 1988. A guide to wildlife habitats of California. Sacramento, CA: California Department of Forestry and Fire Protection.

Michel, Alexa K. and Susanne Winter. 2008. Tree microhabitat structures as indicators of biodiversity in Douglas-fir forests of different stand ages and management histories in the Pacific Northwest, U.S.A. in Forest Ecology and Management 257 (2009) 1453–1464.

Middle Mattole Conservancy and Mattole Restoration Council. 2005. Final Community Management Plan for Gilham Butte and the Scattered Parcels. Petrolia, CA.

Mollohan, C., W. W. Brady, and A. L. LeCount. 1989. Habitat use of an Arizona ponderosa pine-mixed conifer forest by female black bears. Western Journal of Applied Forestry 4: 6-9.

Motroni, B. Feb. 2011. Personal Communication. Cal Fire Staff. Written feedback on Draft Mattole PTEIR.

MRB (Mad River Biologists) 2008. Program Environmental Impact Report for the Vegetation Treatment Program of the California Department of Forestry.

Nature Conservancy, the. 2010. Managing Rich Northern Hardwood Forests for Ecological Values and Timber Production. Recommendations for Landowners in the Taconic Mountains. New York.

Neitlich PN, McCune B. 1997. Hotspots of epiphytic lichen diversity in two young managed forests. Conserv Biol 11:172–182

Niwa, C. G. and R. W. Peck. 2002. Influence of prescribed fire on carabid beetle (carabidae) and spider (araneae) assemblages in forest litter in southwestern Oregon. Environmental Entomology 31: 785-796.

Peregrine fund. 2010. Website http://www.peregrinefund.org.

Pilliod, D. S., E. L. Bull, J. L. Hayes, and B. C. Wales. 2006. Wildlife and invertebrate response to fuel reduction treatments in dry coniferous forests of the western United States: a synthesis (General Technical Report RMRS-GTR-173). Fort Collins, CO: USDA Forest Service Rocky Mountain Research Station.

Riggs, R. A., S. C. Bunting, and S. E. Daniels. 1996. Prescribed fire. In P. R. Krausman, ed., Rangeland wildlife. Denver, CO: The Society for Range Management: 295-319.

Ross, D. 1995. Short-term impacts of thinning ponderosa pine on pandora moth densities, pupal weights, and phenology. Western Journal of Applied Forestry 10: 91-94.

Self, Stephen, and Stephen Kerns. 2001. Pine Marten Use of a Managed Forest Landscape in Northern California. Sierra Pacific Industries. Redding, CA

Scott, VE. 1979. Bird responses to snag removal in ponderosa pine. Journal of Forestry 77:26-28.

Slauson, K. 2007 Personal Communication. USDA Redwood Sciences Laboratory, Arcata CA. Feb. 7 email.

Slauson, K. M. and W. J. Zielinski. 2004. Conservation status of American martens and fishers in the Klamath-Siskiyou bioregion. *In*: K. Merganther, J. Williams, and E. Jules, eds. Proceedings of the 2nd Conference on Klamath-Siskiyou Ecology, Cave Junction, OR, USA. 29-31 May, 2003. Siskiyou Field Institute, Cave Junction, Oregon.

Siegel, R. B., and D. F. DeSante. 2003. Bird communities in thinned versus unthinned Sierran mixed conifer stands. Wilson Bulletin 115: 155-165.

Smith, David M. 1962. The Practice of Silviculture. John Wiley and Sons, N.Y.

Sullivan, T. P., D. S. Sullivan, and P. M. F. Lindgren. 2001. Stand structure and small mammals in young lodgepole pine forest: 10-year results after thinning. Ecological Applications 11: 1151-1173.

Switalski, Adam. 2006. Wildlands CPR Newsletter, December 19, 2006. Web site http://www.wildlandscpr.org.

Villa-Castillo, J., and M. R. Wagner. 2002. Ground beetle (Coleoptera: Carabidae) species assemblages as an indicator of forest condition in northern Arizona ponderosa pine forests. Environmental Entomology 31: 242-252.

Waltz, A. E. M., and W. W. Covington. 2004. Ecological restoration treatments increase butterfly richness and abundance: mechanisms of response. Restoration Ecology 12: 85-96.

Wessell SJ. 2005. Biodiversity in managed forests of western Oregon: species assemblages in leave islands, thinned, and unthinned forests, Thesis, Oregon State University.

Wilson, S. M., and A. B. Carey. 2000. Legacy retention versus thinning: Influences on small mammals. Northwest Science 74: 131-145.

Woolf, J. 2003. The effects of thinning and prescribed fire on birds, small mammals, and avian species composition (Thesis). Missoula, MT: University of Montana.

3.19 Impacts of Program Implementation on Timberland Resources – MSP Analysis

This section summarizes the impacts to timber resources due to implementing the Proposed Program. It serves to demonstrate that stated goals of the program along with defined stand condition targets are achievable and comply with Board of Forestry rules relating to Maximum Sustained Production (MSP).

3.19.1 Environmental Setting – Timberland Resources – MSP Analysis

The assessment area for analyzing the direct impacts from implementing the Program's practices on timber resources is the Program footprint area— those forest stands which are actually harvested under the PTEIR. It is likely that the majority of the forested area in the Mattole would meet the technical definition of 'timberland' even though much of it could not be managed economically in the foreseeable future. For the purposes of analysis in this EIR, land cover in the watershed is divided into four broad categories of vegetation: commercial forest types, non-commercial forest types, grasslands, and other non forested vegetation types not proposed for treatment under the Program. The first step in the timber analysis was to stratify the commercial forestland into types homogenous enough to apply appropriate silvicultural simulations. These strata are derived from the GIS data (CALVEG 1998) previously described in section 2.0.5 above. The 1998 vegetation data are based on remotely sensed information using satellite imagery and subsequent ground truthing for verification and slight modification. Based on remote sensing data, there are estimated to be approximately 86,671 acres of private commercial forestland within the basin. This is used as the potentially commercial landbase and is not projected to change significantly over the analysis period.

The assessment of current and future forest conditions in the Program area relies upon the Wildlife Habitat Relationship (WHR) classification system developed by CA DFG. The following table shows the classification system categories for forestlands found in the Mattole. Forest type designations are based on predominant species, size class by average overstory tree diameter, and density by total canopy cover.

Table 3-61 (also 2-7)
WHR Classification Key forMattole Forestlands

Species		Size Class Avg Dbh Of Overstory		Density Total Canopy Cover %	
DFR	>50% relative overstory cover by conifers (Douglas fir/redwood)	6	> 24" & multi-storied	S	Sparse 10-25%
MHC	Montane Hardwood/Conifer - relative overstory conifer cover between 25 & 50%	5	> 24"	P	Patchy 25-40%
MHW	Montane Hardwood – relative conifer cover < 25%	4	11" – 24"	M	Moderate 40-60%
		3	6" – 11"	D	Dense > 60%
		2	1" – 6"		
		1	< 1"		

3.19.2 Regulatory Setting – Timberland Resources – MSP Analysis

The primary laws and regulations that relate to the Program's practices on timber resources are those contained in the California Forest Practice Rules. Timberland is a resource area under CEQA, and the FPRs are considered a functional equivalent of CEQA. Section 14CCR 1092 (b) makes the connection between operations conducted under a PTHP, the operational standards of the FPRs and the State CEQA Guidelines (14CCR 15382). The operational standards cited include Article 3, which contains the MSP rules in 14CCR 913.11. The PTEIR Guidance document states on page 18 that in addition to addressing MSP and long-term sustained yield (LTSY), "*the PTEIR must provide an analysis that leads to a finding that the management proposal for a series of actions will result in a less than significant impact to the timberland resource, in the short and long term, and cumulatively.*"

In addition to the regulatory requirements described above, participants in the Program would be required to abide by the practices described in Chapter 2 – Program description. These additional Program restrictions include:

- Uneven-aged management only including higher basal area retention requirements
- No harvesting of old-growth trees (established prior to 1850)
- 50% of trees in the largest diameter classes must be retained
- Larger no-cut buffers on Class I & II streams

3.19.3 Data and Assumptions – Timberland Resources – MSP Analysis

The stratification of the program area began with the CALVEG 1998 WHR classifications, which indicated that nearly 80% of the private commercial forestland belonged to the DFR type. This classification appeared to be at odds with the actual conifer-hardwood balance in the watershed, as most stands within the basin appear to have regenerated into more tanoak-dominated stands after the initial old-growth logging.

Fortunately, these remotely sensed GIS data were supplemented with inventory information provided by private landowners within the basin. Approximately 470 timber inventory plots measured between 1993 and 2005 were utilized to determine the final description of the vegetation within the basin and to model growth and harvest over time. Because the plot data included species-specific inventory information, it was possible to assign each plot to its actual WHR category. Since the locations of the plots were known, the actual WHR category of each plot could be compared with its remotely sensed WHR classification. The conclusion was that much of the remotely sensed Douglas-fir type (DFR) has substantially lower conifer stocking than this label indicates, and actually should have been classified as Montane Hardwood-Conifer (MHC). Some plots, however, did reflect the majority conifer overstory that characterizes the DFR vegetation type. Because of the heterogeneity within the DFR classes, clusters of plots were grouped for purposes of silvicultural modeling into two or three strata, each representing a level of conifer stocking within that WHR class— high, low, and in some cases medium. The plot data were used to calculate average stand metrics for each of ten strata — three each for remotely sensed DFR3 and DFR4, two for remotely sensed DFR5, and one each for remotely sensed MHC5 and MHC4.

The plot analysis allowed adjustments to the overall proportion of the landbase ascribed to each WHR type — an analysis that is explained in fuller detail in Section 3.14-Vegetation. The proportional area of each stratum within a remotely sensed WHR class in a given sub-basin was estimated from the density classes found in the CALVEG GIS data for that subbasin. Growth and harvest projections for all ten strata were used in developing the projections of overall harvest under the program. This section presents in detail the results of modeling for five of those strata which comprised the great majority of the Program Area landbase. Table 3-62 below lays out the correspondence between remotely sensed WHR classes, levels of conifer stocking, and actual WHR classes.

Table 3-62
Correspondence of Timber Strata to WHR Type

Remotely sensed WHR category	Conifer Stocking	Actual WHR category
DFR 5	high	DFR 5D
DFR 5	low §	MHC 4D
DFR 4	high §	DFR 4D
DFR 4	med §	
DFR 4	low §	MHC 4D
DFR 3	high	DFR 3D
DFR 3	med	MHC 3D
DFR 3	low	
MHC 5	low	MHC 4D
MHC 4	low §	MHW 4D

These 3 strata all fall into the MHC4D WHR classification.

§ denotes strata whose silvicultural modeling is included in this section.

Overall, analysis results indicate that only about 38,000 acres of the private commercial forest is true Douglas-fir type (meaning that more than 50% of the overstory canopy cover is Douglas-fir) and nearly 35,000 acres of the private commercial forestland is Montane Hardwood/Conifer type (MHC), where 50 to 75 percent of the overstory canopy cover is comprised of hardwoods, principally tanoak. This finding essentially confirms one of the hypotheses behind the Program goals outlined in chapter 1: that much of the forestland has become hardwood-dominated following the removal of valuable Douglas-fir from stands which previously had a minor tanoak component. The Program Area includes six WHR types. Their areas were calculated after shifting some of the strata acreages into the more appropriate WHR classes and are shown in the following table. Stand characteristics presented represent a weighted average of the inventory data for each of the strata comprising the WHR type.

Table 3-63
Vegetation Type Condition Summary 2010

ACTUAL WHR TYPE	Private Acres	trees/ acre Conifer	trees/ acre HW	Avg. diam. (inches) Conifer	Avg. diam. (inches) HW	Basal Area (ft2/acre) Conifer	Basal Area (ft2/acre) HW
DFR3D	2,565	289	147	11.9	9.0	272	69
DFR4D	28,915	226	48	12.5	8.7	200	32
DFR5D	6,681	117	11	20.1	10.0	297	5
MHC3D	5,345	175	439	11.1	10.3	116	205
MHC4D	29,562	155	328	11.2	10.9	96	171
MHW4D	13,603	71	488	12.0	11.2	61	207
Total	86,671	168	237	12.4	10.0	147	116

3.19.4 Growth and Yield Projections – Timberland Resources – MSP Analysis

Plots were grown forward from the time of initial measurement to 2010 in the US Forest Service's Forest Vegetation Simulator (FVS) program using the Klamath Mountains variant, which includes reference data from stands of similar species composition to much of the Mattole. Because the Mattole plot data was compiled from a variety of past projects, including an unsystematically selected assortment of landowners, the plot distribution is not a statistically valid sample. However, plots were located on sites throughout the basin, including lands in the extreme southern, northern and middle portions of the basin. These data provide a good representation of stand conditions within the primary WHR types, but should not be used to predict actual volumes that would be harvested. The per acre stand metrics in the tables below can serve to demonstrate that the Program prescriptions can achieve the target parameters from a variety of forest conditions, even though individual landowners filing PTHPs may or may not have stands that match those modeled for this EIR.

Each stratum has a site index determined by that particular set of inventory data. During growth and yield modeling, variations in site class within a stratum are accounted for since FVS growth is driven by the plot-specific site index. The resulting strata averages reflect a range of site indices from low site 2 to middle site 4. Strata with greater proportions of hardwood stocking in 2010 generally have more site 4 plot data.

Silvicultural prescriptions available under the Program along with all the restrictions are described in section 2.1. Growth and harvest were simulated in each stratum for at least 60 years applying the most appropriate prescription. Simulations were extended beyond 60 years if necessary to demonstrate that the stand would reach the target conditions under the planned regime. The prescriptions were designed to achieve the goals of the Program in regard to increasing conifer stocking and size class and /or increasing the proportion of conifers to hardwoods, depending on the starting condition of each stratum. The selection prescription was modeled for all the strata included in WHR types DFR3D, DFR4D, and DFR5D. The all-aged prescription was modeled for all the strata included in types MHC3D, MHC4D, and MHW4D.

Assumptions and parameters of the silviculture modeling in FVS include:

- Target conditions considered to meet Program goals are 150 ft^2 conifer stocking and >60% conifer composition by basal area.
- "Maximum harvest" means that the simulation represents the most intensive harvesting realistically allowed under the requirements of the PTEIR prescriptions.
- At each entry the maximum number of large trees allowed to be harvested under the PTEIR prescriptions would be harvested – stand data was carefully examined to create prescriptions that ensured FVS was retaining _ the largest conifers in the diameter class representing the upper 30% of the basal area distribution.
- Stands were projected for 60 years or longer if necessary to achieve the target conditions.
- Group openings in the All-aged prescription are simulated separately from the individual tree selection occurring in the rest of the stand.
- Stocking data in the all-aged tables are weighted averages of the group openings and the individual tree selection areas of the stand.
- Initial stand entry occurs when there is sufficient volume to allow an economically feasible harvest – generally at least 20,000 board feet per acre of conifer stocking.
- Cutting cycle is 15 years for Selection and 20 years for the All-aged prescription.
- Group Openings: retain 15 ft^2 of basal area in large trees; 350 DF trees/acre are planted; natural sprouting of hardwoods is simulated in proportion to their presence in the pre-harvest stand; 50% of the tanoak sprouts are killed 5 yrs after harvest in a release treatment; and the regenerated stand is commercially thinned at age 40 and 60.
- Individual Tree Selection area: natural regeneration is simulated after each harvest with 100 trees/acre of DF and tanoak sprouting turned on.

Data tables of the modeling projections are presented here for the strata included in the three WHR types representing the most acres in the Program Area as well as the most acres estimated to be harvested in the Program footprint. These include strata DF4 high, DF4 medium, DF4 low, DF5 low, and MHC4. The projection for stratum MHC5 is not included because very few acres of this type were prescribed due to its economic infeasibility. The inventory projections for other strata omitted here are not shown because they comprise a very small portion of the Program area. See the strata summary table later in this section.

For some particular stands to which the all-age prescription is applied, it will take longer to reach desired stand conditions, because of the time required for the conifer-dominated patches initiated through group selection and planting to contribute substantial volume to the stand inventory. Only one stratum takes substantially longer than 60 years to achieve the target conditions and reach a balanced state. This is MHC4, which begins with very low conifer stocking and is not entered until at least 2030. The FVS projection for this stratum is carried out to 2090. It is important to note, in the hardwood dominated strata, the significant improvement in the periodic board foot conifer growth through the time horizon for which the stand parameters are modeled

— an indication that timberland productivity is being enhanced through the application of the program and in particular the all-aged prescription.

For the purposes of this EIR, in order to be conservative in the estimation of any potential negative impacts, the modeling was done to reflect cutting close to as much as would be allowed at the time of each harvest entry. Essentially, the modeling results as shown in these tables indicate that stands would be on a trajectory to achieving the Program goals, even at the maximum logging rates allowed under the PTEIR standards; if landowners cut less, their lands would be even more heavily stocked, resulting in even less chance of negative impacts to the timberland resource. As long as a landowner follows the strict silvicultural standards of the PTEIR, the stand will achieve the silvicultural goals of the Program.

All values shown are for the beginning of the period before any harvesting.

Table 3-63a
Model Output For Most Common Strata

Strata: DF4 High **WHR Type:**

Rx: Selection Maximum Harvest

DFR4D
Average Stocking

Harvest

		TPA		AVG dbh >5"		BA / Acre		Vol / Acre		Conifer % of BA	Conifer Growth BF/acre/yr	BA / Acre		Vol / Acre	
Timeline	Activity	Conifer	HW	Conifer	HW	Conifer	HW	Conifer	Hdwd			Conifer	HW	Conifer	Hdwd
2005		287	13	11.4	6.0	227	3	26,944	0	99%	2,040	0	0	0	0
2010	Selection	275	13	12.3	6.4	265	3	37,145	0	99%	1,697	99	0	17,386	0
2015		217	13	12.2	6.9	204	4	28,246	0	98%	1,962	0	0	0	0
2020		216	13	13.4	7.3	242	4	38,054	0	98%	2,100	0	0	0	0
2025	Selection	216	13	14.5	7.7	279	4	48,553	9	98%	1,540	108	0	21,663	4
2030		275	13	14.4	8.1	198	5	34,588	6	98%	1,775	0	0	0	0
2035		275	13	15.5	8.4	226	5	43,465	31	98%	1,916	0	0	0	0
2040	Selection	274	13	16.5	8.8	256	6	53,044	115	98%	1,315	99	1	21,898	46
2045		223	14	16.8	8.8	180	5	37,721	102	97%	1,399	0	0	0	0
2050		223	14	16.1	9.1	204	6	44,717	119	97%	1,560	0	0	0	0
2055	Selection	222	14	15.1	9.5	230	6	52,518	132	97%	1,141	78	1	19,346	40
2060		189	14	14.9	9.8	175	6	38,879	105	97%	1,318	0	0	0	0
2065		189	14	15.3	10.2	200	6	45,469	128	97%		0	0	0	0

Table 3-63b
Model Output For Most Common Strata

Strata: DF4 Medium **WHR Type:** **DFR4D**
Rx: Selection Maximum Harvest **Average Stocking**

		TPA		AVG dbh >5"		BA / Acre		Vol / Acre		Conifer % of BA	Conifer Growth BF/acre/yr	*Harvest* BA / Acre		*Harvest* Vol / Acre	
Timeline	Activity	Conifer	HW	Conifer	HW	Conifer	HW	Conifer	Hdwd			Conifer	HW	Conifer	Hdwd
2005		182	78	12.6	10.6	143	57	28,805	4,550	72%	1,464	0	0	0	0
2010	Selection	182	78	12.8	11.1	168	61	36,123	5,045	73%	1,060	65	24	15,699	2,047
2015		154	106	11.9	11.5	124	39	25,724	3,431	76%	1,321	0	0	0	0
2020		304	106	12.6	11.9	147	42	32,328	3,790	78%	1,542	0	0	0	0
2025	Selection	303	106	13.6	12.4	172	45	40,041	4,265	79%	1,269	50	13	12,453	1,237
2030		275	118	13.7	11.9	143	34	33,930	3,330	81%	1,433	0	0	0	0
2035		275	118	14.8	12.1	167	37	41,095	3,625	82%	1,670	0	0	0	0
2040	Selection	274	117	14.6	12.5	193	39	49,444	3,982	83%	1,436	47	7	13,161	586
2045		252	150	13.5	12.6	171	34	43,463	3,743	83%	1,697	0	0	0	0
2050		251	150	13.4	13.1	200	36	51,948	4,012	85%	1,640	0	0	0	0
2055	Selection	243	148	14.4	13.1	223	38	60,150	4,239	85%	1,381	72	8	19,144	707
2060		168	191	15.0	13.8	172	33	47,911	3,825	84%	1,598	0	0	0	0
2065		167	191	15.9	14.2	194	35	55,901	4,097	85%		0	0	0	0

Table 3-63c
Model Output For Most Common Strata

Strata: DF4 low **WHR Type:** **MHC4D**
Rx: All-aged Maximum Harvest **Average Stocking**

		TPA		AVG dbh >5"		BA / Acre		Vol / Acre		Conifer % of BA	Conifer Growth BF/acre/yr	*Harvest* BA / Acre		*Harvest* Vol / Acre	
Timeline	Activity	Conifer	HW	Conifer	HW	Conifer	HW	Conifer	Hdwd			Conifer	HW	Conifer	Hdwd
2005		184	355	11.2	10.5	92	176	15,656	11,902	34%	598	0	0	0	0
2010		170	335	11.3	10.7	104	183	18,644	13,161	36%	720	0	0	0	0
2015	SEL/GS & plant	157	308	12.3	11.0	116	188	22,243	14,445	38%	397	67	109	13,869	8,162
2020	release regen	274	532	17.6	17.9	59	85	10,358	7,246	41%	536	0	0	0	0
2025		273	476	18.3	18.1	71	96	13,038	8,176	43%	632	0	0	0	0
2030		271	472	19.2	18.4	86	108	16,199	9,143	44%	630	0	0	0	0
2035	SEL/GS & plant	258	457	11.7	10.8	101	118	19,352	10,162	46%	320	53	63	10,834	5,472
2040	release regen	330	588	18.0	18.1	63	64	10,119	5,190	50%	553	0	0	0	0
2045		329	584	18.7	18.4	84	76	12,886	5,700	53%	873	0	0	0	0
2050		324	561	19.8	18.7	109	87	17,250	6,293	56%	1,048	0	0	0	0
2055	SEL & CT	319	538	11.6	12.9	138	96	22,492	6,862	59%	940	40	24	7,423	1,559
2060		288	568	11.9	10.6	130	83	19,769	5,883	61%	1,154	0	0	0	0
2065		279	512	12.8	11.0	158	92	25,539	6,439	63%		0	0	0	0

Table 3-63d
Model Output for Most Common Strata

Strata: DFR5 Low **WHR Type:** **MHC4D**
Rx: All-Aged Maximum Harvest **Average Stocking**

		TPA		AVG Dbh >5"		BA / Acre		Vol / Acre		Conifer %	Conifer Growth	*Harvest* BA / Acre		*Harvest* Vol / Acre	
Timeline	Activity	Conifer	HW	Conifer	HW	Conifer	HW	Conifer	Hdwd	Of BA	BF/Acre/Yr	Conifer	HW	Conifer	Hdwd
2005		155	307	11.0	11.1	82	140	13,953	8,762	37%	641	0	0	0	0
2010		155	307	11.0	11.2	97	153	17,158	9,904	39%	659	0	0	0	0
2015		147	295	11.4	11.4	109	163	20,451	11,065	40%	649	0	0	0	0
2020	SEL/GS & plant	135	273	11.9	11.4	119	167	23,698	12,247	42%	469	60	92	13,103	6,654
2025	release regen	268	502	17.4	17.1	69	82	12,943	6,396	46%	596	0	0	0	0
2030		268	445	18.0	17.5	80	90	15,925	7,267	47%	715	0	0	0	0
2035		386	441	18.6	17.8	93	102	19,499	8,145	48%	637	0	0	0	0
2040	SEL/GS & plant	368	432	11.4	11.2	105	112	22,682	9,048	49%	413	48	57	11,161	5,190
2045	release regen	331	578	17.8	16.6	72	63	13,585	4,266	53%	669	0	0	0	0
2050		330	518	18.5	17.0	89	74	16,929	4,654	54%	762	0	0	0	0
2055		416	505	19.1	17.5	106	86	20,737	5,086	55%	863	0	0	0	0
2060	SEL & CT	397	477	11.6	11.0	125	94	25,052	5,508	57%	763	38	35	7,741	2,139
2065		361	482	11.3	11.7	108	70	21,129	3,664	61%	968	0	0	0	0
2070		360	477	12.1	12.2	134	81	25,971	4,144	62%	1,060	0	0	0	0
2075		341	453	12.4	12.8	157	89	31,272	4,510	64%		0	0	0	0

Table 3-63e
Model Output for Most Common Strata

Strata: MHC4 **WHR Type:** MHW4D
Rx: All-Aged Maximum Harvest **Average Stocking**

		TPA		AVG dbh >5"		BA / Acre		Vol / Acre		Conifer % of BA	Conifer Growth BF/acre/yr	*Harvest* BA / Acre		*Harvest* Vol / Acre	
Timeline	Activity	Conifer	HW	Conifer	HW	Conifer	HW	Conifer	Hdwd			Conifer	HW	Conifer	Hdwd
2005		74	521	11.9	11.2	55	196	10,821	14,210	22%	338	0	0	0	0
2010		71	492	12.0	11.2	62	209	12,509	16,203	23%	368	0	0	0	0
2015		189	463	12.9	11.5	68	219	14,348	18,455	24%	385	0	0	0	0
2020		179	437	13.9	11.9	74	231	16,271	20,542	24%	386	0	0	0	0
2025		166	412	14.3	12.4	80	243	18,201	23,115	25%	428	0	0	0	0
2030	SEL/GS & plant	151	381	15.2	12.5	85	250	20,340	25,047	25%	296	40	142	9,849	14,155
2035	release regen	306	593	21.2	18.5	50	118	11,973	12,321	30%	329	0	0	0	0
2040		305	536	22.0	18.6	55	130	13,619	13,743	30%	318	0	0	0	0
2045		292	518	23.0	18.4	62	143	15,207	15,076	30%	307	0	0	0	0
2050	SEL/GS & plant	277	498	15.0	10.6	71	155	16,740	16,485	31%	278	26	87	6,788	9,859
2055	release regen	273	642	21.4	17.4	57	78	11,344	7,360	42%	496	0	0	0	0
2060		360	574	22.0	17.3	71	90	13,821	8,116	44%	589	0	0	0	0
2065		356	560	22.6	17.3	87	103	16,766	8,860	46%	651	0	0	0	0
2070	SEL & CT	347	531	12.6	9.3	104	112	20,023	9,698	48%	663	27	38	5,357	4,393
2075		327	519	11.5	8.7	100	87	17,979	5,807	53%	941	0	0	0	0
2080		324	505	12.1	9.2	126	99	22,685	6,367	56%	1,030	0	0	0	0
2085		312	477	12.9	9.8	151	107	27,835	6,939	58%	1,107	0	0	0	0
2090	SEL & CT	284	423	13.6	10.2	172	110	33,368	7,658	61%		50	41	10,652	1,766

3.19.5 Harvest Allocation – Timberland Resources – MSP Analysis

A detailed description of how Program prescriptions were allocated among landowners throughout the watershed is found in Appendix A. In projecting the harvest, the combination of harvest volume, strata acreages, property size, landowner propensity to harvest and delivered log price all interact together. As a result, in the Program, a total of 15,038 acres are likely to be entered by 2035, with a total of 41,718 acres of logging occurring by 2060 (all of the 26,680-acre difference is assumed to be reentry of previously logged areas—no new acres are assumed to be added to the Program). The estimated acres to be harvested in each 5-year time period are shown in the following table.

Table 3-64
Estimated Average Annual Harvest Acres By All Owners Participating In Program By Period And By Subbasin

Subbasin	2010-15	2015-20	2020-25	2025-30	2030-35	2035-40	2040-45	2045-50	2050-55	2055-60
East 1	250	56	121	240	104	91	323	8	138	288
East 2	154	52	63	149	65	75	183	7	87	195
North 1	257	133	224	259	177	182	368	87	226	305
North 2	152	102	141	154	121	127	200	80	146	176
South 1	48	16	11	45	52	16	56	0	52	61
West 1	116	28	82	114	123	69	162	11	164	131
West 2	140	20	26	134	32	20	161	0	32	154
Annual Total	**1,116**	**408**	**669**	**1,095**	**675**	**579**	**1,452**	**193**	**846**	**1,310**

Multiple accounting matrix spreadsheets were developed to store all the modeling outputs for the ten strata and calculate timber variables by time period and sub-basin. The matrices were used to track WHR classification, and conifer and hardwood inventory, growth and harvest. Sub-basin and footprint results were determined by the number of acres assigned to each stratum by silvicultural prescription and timing choice of first entry.

Table 3-65 shows the average conifer and hardwood stocking for each of the 10 strata in basal area and board foot volume at the beginning of the analysis period.

Table 3-65
Timber Strata Condition Summary 2010
Program Footprint

STRATUM	Prescribed Acres	Silviculture Modeled	Basal Area (sq ft. per acre)		Timber volume MBF per acre (approx)	
			Conifer	HW	Conifer	HW
DF3 high	381	Selection	250	72	31	4
DF3 medium	995	All-aged	130	209	23	15
DF3 low	473	All-aged	98	200	12	13
DF4 high	2,016	Selection	265	3	37	0
DF4 medium	2,400	Selection	168	61	36	5
DF4 low	3,086	All-aged	104	183	19	13
DF5 high	959	Selection	298	5	63	0
DF5 low	2,588	All-aged	97	153	17	10
MHC4	1,687	All-aged	62	209	12	16
MHC5	453	All-aged	66	198	10	13
	Acres				Total Conifer Volume (MBF)	Total HW Volume (MBF)
Total	15,038				390,000	135,000

The PTEIR Guidance document on page 19 stipulates monitoring for implementation consistency by looking at elements of "*(2) stand structure for partial-cut prescriptions, (3) volume control, and (4) area control, all at the resolution that the assessment is based.*" The predicted results of Program implementation should be considered reliable in terms of the development of WHR types over the planning horizon (see charts in section 3.14), but timber volume figures in the sustained yield planning table below are more theoretical. For the purposes of tracking consistency between Program implementation and long-term projections in this EIR, the acreage harvested in each time period is the appropriate metric for comparison rather than volume harvested. Stand structure development in terms of WHR as well as basal area stocking levels could be assessed once enough acreage had been managed utilizing PTHPs and sufficient time had passed.

However, in order to demonstrate MSP, an analysis of the total inventory, growth and harvest on the Program footprint is presented here. As described in 14CCR 913.11, MSP is achieved by meeting the requirements of either (a) or (b) or (c) in a THP, SYP or NTMP, or as otherwise provided in Article 6.8, Subchapter 7.

Long Term Sustained Yield is defined in 14CCR 895.1 as the average annual growth sustainable by the inventory predicted at the end of a 100 year planning period. On page 18 of the PTEIR Guidance document it states, "*One important assumption inherent by the estimate of LTSY is that a balanced distribution in age classes across productivity levels has been met for the assessment area. Planning horizons of less than 100 years may be appropriate where the quantitative analysis of MSP indicates that the current arrangement of age-class distributions and*

productivity levels will reach a balanced state in a shorter period of time." In the case of the Program area, which is subject only to uneven-aged management, all stands continue to get older even as new cohorts of trees are developing and species composition is gradually transitioning. Since this planning document represents an estimation of what a collection of private landowners might do in the context of fluctuating market conditions, harvest trends will never really smooth out and match growth. The tables above demonstrate that on a per acre basis, the prescriptions will result in achievement of target stand conditions if landowners follow through and continue to participate in the Program. Some stands may take longer than 60 years to reach these conditions, but overall inventory, growth and harvest on the footprint after 50 to 60 years shows that growth exceeds harvest and stands are in a productive state even without projecting beyond this point. A 60-year planning horizon is therefore sufficient and appropriate for the Program footprint as a whole.

3.19.6 Direct Impacts From Implementing the Program/Alternatives - Timber

The WHR charts found in section 3.14 are useful for understanding the differences between alternatives and the Program on timber resources, so they are referenced in the discussion here.

Program: Under the Program, there is a substantial increase in the acreage of WHR types dominated by conifers (mostly Douglas-fir) of larger size classes, and a decrease in the acreage of WHR types dominated by hardwoods. These trends are consistent with the Program goals of increasing the average tree size and increasing the proportion of conifers in hardwood-dominated stands. Of particular note is the increase under the Program of conifer stands of size classes 5 and 6 from about 6% (960 acres) of the footprint acreage to about 55% (8,270 acres) after 50 years. These WHR classes have an average diameter greater than 24 inches, contain the most volume per acre of any type, and generally have a level of stocking that maximizes board-foot periodic annual increment.

The total conifer growth that is predicted in the last decade of the planning horizon is approximately 16 million board feet (MMBF) per year or 1,060 bf per acre per year which could be considered the Long Term Sustained Yield. However, the projected annual harvest during the last decade is only 4.5 MMBF, about 28% of growth. Since the previous decade is projected to have a much greater harvesting level, the last 20 years of the planning horizon should also be considered in assessing the relationship between growth and harvest. Total conifer growth over this time period is projected to be about 302 MMBF compared to a total harvest of about 191 MMBF, representing 63% of growth. Harvest will always remain less than growth on the footprint as a whole due to the requirements of the PTEIR prescriptions.

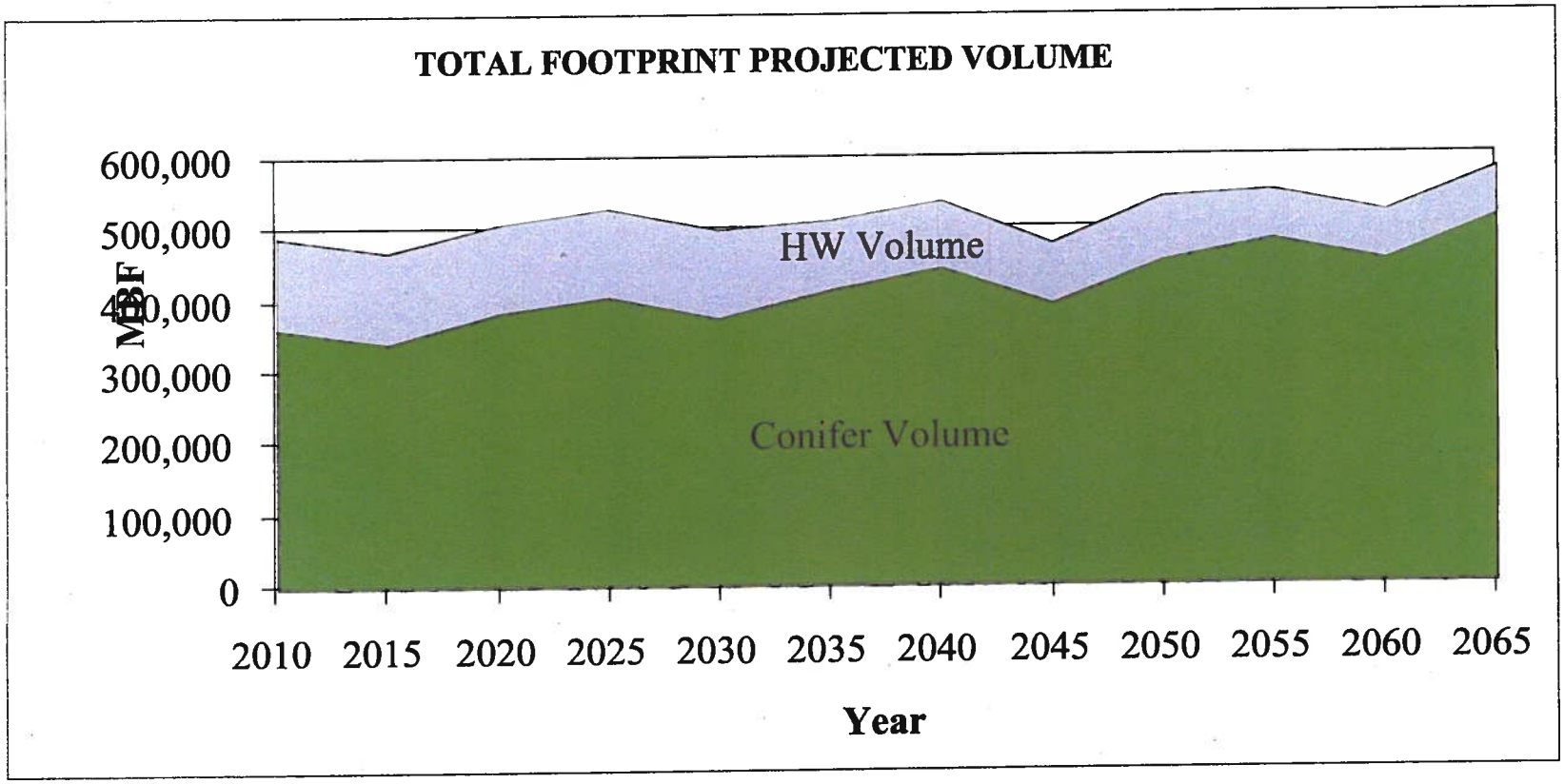
Harvest fluctuations are predicted to be much greater than would be the case for an individual timber company, because small private landowners will be following overall log market trends. Therefore, model outputs show occasional 10-year periods when harvest is greater than growth followed by periods with significantly less harvest.

Table 3-66
Conifer Volumes MBF - Program Footprint

Years	Projected Midpoint Inventory	Periodic Growth	Periodic Harvest	Annual Growth BF/Acre/Yr
2010 - 2019	340,590	137,944	119,199	917
2020 - 2029	405,937	136,080	141,752	905
2030 - 2039	411,875	138,020	72,962	918
2040 - 2049	391,637	132,404	121,800	880
2050 - 2059	481,810	143,273	146,131	953
2060 - 2069	509,556	159,275	44,775	1,059

Although one of the primary goals of the Program is to improve the timber productivity of hardwood dominated stands by restoring conifer stocking to composition characteristics that existed prior to historical conifer harvesting, it is important to ensure that this will not amount to a wholesale conversion and elimination of the hardwood component (see section 3.18 for discussion of hardwood dependent wildlife). Those stands whose WHR species designation changes over the planning horizon still contain a significant portion of hardwoods. The DFR classification only requires that greater than 50% of the total canopy cover be Douglas-fir in order to be classified as such. The growth & yield modeling reveals that the several vegetation strata that switch WHR classification begin with 30-38% conifer composition by basal area and develop into stands with 57-63% conifer composition by the end of the planning projection. The chart on the following page illustrates the increase in conifer volumes as well as the level of hardwood volume, which declines but remains substantial.

Figure 3-32: Total projected standing timber volume under the Program in the Program Footprint



Comparison of Alternatives with Regard to Timberland

Alternative 1: Under the status quo, no size class 5 and 6 stands are predicted to develop over the next 50 years on the managed landscape, as commercially valuable conifers are repeatedly harvested when markets are favorable, consistent with past and current trends. In fact, all the size class 5 that does exist in 2010 is harvested by the end of the projection period. On an aggregated basis across the watershed, overall stocking on managed lands would decline, and harvest would likely be greater than growth in any given time period depending on the log market. This trend is illustrated in the WHR chart for Alt 1 in section 3.14 which shows an increase in the acreage of size classes 1 & 2 from a negligible amount to about one third of the managed landbase (4,960 acres). These are stands with average diameters less than 6" and consequently very little volume. MSP would technically be met by each landowner filing a THP because they would check option (c), which only requires that stand age be met for even-aged prescriptions, or minimum stocking and seed-tree retention for uneven-aged prescriptions. The uneven-aged stocking requirements stipulated under option (c) are substantially less than those in the Program. Humboldt Redwood Company and possibly Barnum Timber would likely utilize a permitting document that was broader in scope with more rigorous standards for demonstrating MSP, such as an Option A or SYP.

Alternative 2: This alternative allows the same suite of silvicultural prescriptions as Alt 1 except it has much larger stream buffers. Since the effect on timberland resources is only assessed on the managed land, there would be no discernible difference between the impacts to timber resources from Alt 1 or Alt 2.

Alternative 3: Examination of the WHR chart for Alternative 3 indicates similarities between the Program and Alternative 3 (although on a much smaller landbase). These correlations are related to the similarities in silvicultural treatments. The main difference in treatments is that Alt. 3 does not allow group selections and creates relatively little disturbance to the existing forest cover since 60% of the overstory canopy must be retained within harvest units at all times. This alternative would have similar impacts to timber resources as the Program. However, achievement of the target stand conditions would be delayed because patch cuts are necessary for restoring species composition to hardwood-dominated stands. About 7,500 acres of hardwood-dominated stands transition to conifer under the Program and only about 5,600 acres move into a conifer classification under Alt 3. Therefore, it is questionable whether this type of management could be considered to meet MSP.

3.19.7 Determination of Significance - Timberland

Table 3-67 summarizes the relative impacts to timber resources and the degree to which the Alternatives are able to meet MSP as compared to the Program.

Table 3-67
Comparison of Impacts To Timber Resources And Success at Meeting MSP From Implementing The Proposed Program Or Alternatives

Program	Alt 1	Alt 2	Alt 3
LS – meets MSP	Greater impact – marginally meets MSP	Greater impact – marginally meets MSP	Lesser impact – but may not meet MSP

1/ Key to impacts: PS = Potentially Significant Effect; LS = Less than Significant Effect

3.19.6 Similar Impacts Described Elsewhere

The impacts to vegetation in Chapter 3.14 are similar to the impacts to timber. Much of the same baseline data about forest habitats was used in the analysis for both vegetation and timber.

3.20 Significant Impacts that Cannot be Avoided (CCR 15126.2(b))

Wildland Fire Behavior

Implementation of Alternative I or II could result in significant and unavoidable impacts to wildland fire behavior because mortality from wildland fire could increase by more than 50% if Alternative II were implemented.

3.21 Significant Irreversible Environmental Changes (CCR 15126.2(c))

For some projects, the environmental impacts caused by implementing the project may result in the irreversible or irretrievable commitment of environmental resources (CCR §15126.2c). EIR's are required by CEQA to describe any significant irreversible environmental changes that would result from the proposed action.

Implementation of the Program or the Alternatives would not result in the irreversible or irretrievable commitment of resources.

3.22 Growth Inducing Impacts (CCR 15126.2(d)).

Certain projects, such as freeway interchanges, housing developments, wastewater treatment plants, etc., clearly result in secondary growth inducing impacts that must be analyzed. The Proposed Program will not have any growth-inducing impacts because it will not foster growth or result in new housing or construction of facilities. No reasonably foreseeable growth-inducing impacts have been identified that would result from implementation of the Proposed Program or the Alternatives to the Program.

Chapter 4
Cumulative Impacts Assessment

4.0 Introduction and Overview of Chapter

The Cumulative Impacts Assessment (CIA) includes an evaluation of both on-site and off-site interactions of the proposed Program practices with the impacts of past and reasonably foreseeable future projects. In conducting the assessment, we distinguish between on-site impacts that are mitigated by application of the Forest Practice Rules and the Program's practices along with the impacts of other past or reasonably foreseen activities, any of which may not be significant when considered alone but when combined could be significant. This assessment is based on information that is reasonably available during the EIR preparation process.

An essential difference between THP's and PTHP's is that an RPF does not need to conduct a CIA when submitting a PTHP — unlike a THP, where such an analysis is required. Instead, the PTHP is tiered to this PTEIR, which contains a CIA for all potential cumulative impacts within the area of potential impacts.

4.1 Methodology

This CIA uses the guidance provided by the Board of Forestry and Fire Protection's Guidance in the Preparation and Review of Program Timberland Environmental Impact Reports (10/06/09) to assess cumulative impacts. This analysis is in part based on the assumption that the Program's practices constitute best management practices that have been evaluated in the resource specific analyses in Chapter 3 above and found unlikely to contribute individual effects at the project/PTHP level.

To know whether or not the Program will meet its goals requires an assessment of the nature and extent of the Program's impacts to public trust resources. To conduct this assessment requires consideration of: 1) current watershed conditions, 2) factors that led to the current condition, and 3) how the current conditions might evolve in the context of anticipated impacts from the Program and those reasonably foreseeable future projects that may occur within the analysis period. With this information, the lead agency and the public can make a reasonable assumption as to the cumulative impacts of the Program and alternatives within the affected area.

The Mattole watershed is very dynamic and its natural range of variability for physical or biological conditions is great. Because the environment is an expression of so many influences and interactions, to understand cumulative watershed impacts sometimes requires relying upon qualitative descriptions and order-of-magnitude estimates. It is necessary to recognize and separate (for analysis purposes) the inherent fluctuations of watersheds due to natural conditions from impacts caused by the Program and other human activities.

In an environmental impact report such as this, the science relating to identifying cause-and-effect relationships for past, present, and future projects is sometimes tenuous. Reasonable judgments must be made based on the quality and quantity of information available. Any

judgment made by an individual will be ultimately based upon their unique values, perspective, formal training, experiences, research and analytical tools at hand.

Natural disturbance, such as that caused by long-term climatic trends, plays a crucial role in determining conditions within the Mattole and also shapes successive conditions. Understanding how natural disturbances influence future environmental conditions and their biologic communities is critical in order to expose and predict cumulative impacts. In addition, people are continuing to modify the ecological processes in the Mattole as they have for thousands of years.

A central objective of the Program is to ensure forest and public trust resource sustainability and resilience in order to maintain the Mattole's ability to recover following disturbance. The Mattole Forest Futures Program aims to encourage landowners toward long-term management and continued sustainability by implementing practices that are designed to ensure that future generations will have the same abundant forests and wildlife that existed historically. The intent of the Program is to integrate the conservation of soil, air, water quality, and wildlife and fish habitat with the careful growing, nurturing and harvesting of trees for useful products and employment. Compliance with the FPR's and the Program practices is intended to maintain and enhance forest and stream conditions.

The methodology for assessing the cumulative effects of implementing the Program follows the "list" approach described in CEQA at 15130 (b)(1). This approach includes "listing" the past, present and probable future projects producing related or cumulative impacts and then describing the severity of the impacts and the likelihood of occurrence. The severity of the impacts and the likelihood of occurrence are described for each of the major resource areas that are required to be addressed in a PTHP per 1092.01(c).

4.2 Description of Assessment Area

Chapter 1 lists the 25 CALWAT hydrologic planning watersheds in the Mattole and the seven subbasins being evaluated in this EIR. As previously noted in Chapter 1, the 25 planning watersheds in the Mattole basin have been grouped into seven subbasins which form the basis for the description of both the direct impacts described in Chapter 3 and the cumulative impacts being described here in Chapter 4. Chapter 3 describes the direct assessment area for each resource area. Generally, the CIA area for watershed impacts (essentially water quality) is the entire Mattole basin. The CIA area for soil productivity is also the entire Mattole basin. The assessment area for biological resources such as fish and other aquatic species, vegetation, and terrestrial wildlife resources is the Mattole basin. The CIA for recreation is the Program area plus an additional 300 feet outside of the Program area. The CIA for traffic is the entire Program area road network and the County road system within the Mattole basin. The CIA for cultural and visual/aesthetic resources, air quality, greenhouse gases and wildland fire is the entire Mattole basin.

4.3 General Description of Program Area

A general description of the Program area has previously been included in Chapter 2 and further detailed in Chapter 3 and is not repeated here.

4.4 Past Activities

Qualitative Description of Subbasin Condition

A narrative description of the condition of each subbasin is included below, which qualitatively describes not only the harvest history but also other actions that may have created significant adverse impacts to public trust resources.

East_1

This subbasin, about 25,900 acres, straddles a long reach of the Mattole River between the community of Honeydew on the North and Grindstone Creek on the South. Its western boundary is Wilder Ridge. Its eastern boundary is the divide between the Mattole and South Fork Eel River Basins for the northern half of the subbasin, and the Mattole Canyon Creek Planning Watershed for the southern half.

The subdivided smaller and residential parcels in this subbasin are mostly in the Dry Creek Planning Watershed and along Wilder Ridge, with some more scattered parcels primarily in the Sholes Creek Planning Watershed and along the upstream western banks of the Mattole River. Private holdings above 160 and greater than 640 acres are mostly in the middle portion of the subbasin, with a few scattered elsewhere, mostly in southern parts of the subbasin. There are important scattered and consolidated BLM holdings that occupy at least a third of the area of the sub-basin, such as the BLM Gilham Butte old-growth reserve, which is incorporated into the "Redwoods to the Sea" corridor, connecting Humboldt Redwoods State Park with the KRNCA.

Aside from extensive more recent residential subdivision, the East _1 subbasin was also subjected to heavy grazing, timberland conversion impacts, the devastating post WW II tractor logging, and an assortment of fires. Gilham Butte is the largest contiguous old-growth legacy forest in the Mattole Valley, with its protection a major public concern since the 1960s and earlier. Although watersheds and stream habitat conditions seem to be improving, the unstable geology, flood exacerbation via human impacts, and unstable private road networks are all existing adverse factors. Some significant work has been done in the subbasin by the Good Roads Clear Creeks program, and more such work is planned.

This subbasin encompasses the widest range of bedrock types and structures in the Mattole Basin, including portions of the Coastal terrane, Yager terrane, and Central Belt mélange, along with the fault zones that form the boundaries between the terranes. Slope stability varies widely. Soft terrain grassland areas are impacted by earthflows, soil creep, and gully erosion. There is a NW to SE band of soft terrane running through the middle of the subbasin. Mapped landslides occupy almost a quarter of the subbasin.

High levels of sediment, cobble embeddedness, lack of canopy and instream cover, and seasonal high water temperatures generally impair the anadromous streams in the subbasin. There are some healthy areas, however, and Chinook and coho Salmon, and steelhead trout are present in the subbasin. According to the NCWAP Assessment Report, the estimated anadromous habitat length (in miles), going from North to South is: Dry Creek 3.0, Middle 2.1, Westlund 3.1, Fourmile 3.1, Sholes 2.0, and Harrow 0.2. Stream bank erosion is a problem, especially in the Dry Creek and Sholes Creek Planning Watersheds. There are significant barren riparian areas, especially in Dry Creek and upstream parts of the Mattole River. Dry channel reaches and toxic spill risks are two other concerns.

The East_1subbasin contains large tracts of recovering forestland that need stewardship. Fortunately, the subbasin also contains many motivated residents, whose individual and cooperative efforts can be coordinated to economically and environmentally carry out appropriate practices for recovery, fuel hazard reduction, and watershed restoration.

East_2

This sub-basin, about 24,937 acres, extends along about 13 miles of the Mattole River, from the river east to the divide between the Mattole and the South Fork Eel River Watersheds. It includes McKee Creek watershed on the South and Grindstone Creek watershed on the North. Most of the land is in ranches and subdivided ranches. Eubank, Blue Slide, and Mattole Canyon Creeks are the major creeks that either are, or have the potential to be, some of the most productive tributaries in the Mattole River watershed.

According to the NCWAP "Assessment Report," the estimated anadromous habitat length (in miles) for the streams in the sub-basin, going from North to South, are: Grindstone 0.3, Mattole Canyon 6.0, Blue Slide 7.0, Eubank 3.2, Painter (tributary of McKee) 1.1, and McKee 2.1. McKee Creek is known to definitely support coho Salmon. Eubank and McKee Creeks maintain the best cold-water temperatures. Eubank and Blue Slide Creeks have the highest quality pools.

It appears that this subbasin is probably the most heavily populated in the Mattole Watershed with two of three of its Planning Watersheds having more than 12 owners per 1000 acres, and the third having between 6 and 12 owners per 1000 acres. Access is mainly over extensive networks of private roads that are connected to the Briceland Road (both within and to the east of the Mattole Watershed), the Telegraph Ridge Road, with some easterly ownerships accessed via the Elk Ridge and Salmon Creek Roads. There are a lot of 'serious' long-term homesteaders that are concerned with road maintenance, fire prevention, water quality & quantity, and forest stewardship. This constitutes a nucleus of persons who, if encouraged and helped with cost shares, can carry out long-term stewardship measures -- and who have already participated strongly with the Good Roads Clear Creeks Program of the MRC. Many roads in the Mattole Canyon and Blue Slide Creek areas have been evaluated and/or had upgrade/corrective measures projects implemented. Other smaller areas in the sub-basin have similar work done -- with significant potential corrective measures still possible and needed throughout the sub-basin.

The forests in the sub-basin are primarily Douglas fir and Tan Oak dominated with significant components of other hardwoods such as Madrone, Black Oak and others. Little logging has been

done for the last 30 years except for some damaging cut & sell development. Typically, damage and impacts from tan barking and very heavy post WW II logging are a legacy that is difficult to adequately address. Needed measures to manage the thick regrowth for fuel hazard reduction and high-value forest stewardship have been very limited -- with fuel hazard reduction measures only around a few homesteads and some ridge top roads.

Steep forested slopes are "locally impacted by historically active debris slides and occasional large, deep seated dormant landslides . . ." (NCWAP, 2002). Certain reaches of streams in the sub-basin continue to be adversely impacted by inner gorge landslides and bank erosion despite a general trend of recovery due to reduction of impacts since the overwhelming logging disturbances. Soft terrain earthflows and gullies are a serious issue in eastern parts of the sub-basin.

North_1

This subbasin, about 34,431 acres, is the northernmost subbasin in the Mattole Valley, bounded on the far southwest by the Pacific Ocean, and on the westerly side from south to north, by the coastal Planning Watersheds of McNutt Gulch, Davis Creek and the South Fork Bear River. On the north and northeast the subbasin is bounded by the Bear River watershed, and on the south, from west to east, by the Mattole River, the divide between Conklin and McGinnis Creeks, and the divide between the Lower North Fork and the Upper North Fork watersheds.

The North_1 subbasin has the largest area of low human population density (less than 3 owners per 1000 acres) in the Mattole Valley. This subbasin, along with the North_2 subbasin has generally 'soft geology' (over 40% of the area) and the most extreme slope stability, erosion, and sedimentation problems. Over 60% of the area has either a high or very high landslide potential. This, coupled with a long history of overgrazing, tan barking, conversion of forestland to grazing land by fire, topped by huge floods during the post WW II tractor logging period has created huge problems for recovery of watershed and forestland-based resources. The subbasin also includes half of the Mattole lagoon/estuary area, which remains substantially and cumulatively impacted by problems in the Lower North Fork watershed. These problems extend from the estuary upstream, and are also caused by adverse impacts from the rest of the Mattole watershed.

There is a clustering of small parcels around the Town of Petrolia, and other areas of under-160-acre parcels, mostly in the Apple Tree and Cow Pasture Opening Planning Watersheds. Almost all of the Petrolia, Joel Flat, Long Ridge and Rainbow Planning Watersheds are in private ownerships of greater than 640 acres. The current large holdings of the Humboldt Redwood Company (formerly Pacific Lumber/Maxxam) in this subbasin are in the Rainbow Planning Watershed, with some in the Long Ridge and Apple Tree Planning Watersheds and in the Conklin Creek watershed. Most if not all of the large ranch and forestland holdings are working ranches, and about a third of the subbasin is in grasslands. This subbasin, along with the North_2 and South subbasin, has had the most 'modern' logging operations (occurring after passage of the 1973 Forest Practice Act) in the Mattole Valley. In the 1980s and '90s, public controversy reached a 'fever pitch' with logging by PL/Maxxam in the Mattole Valley in areas such as Rainbow Ridge. Litigation and non-violent citizen defense continued for years, involving such places as Sulphur Creek, where older larger firs were planned to be cut in a watershed where numerous scarred, eroding clearcuts were still in evidence.

NCWAP found this area to have "the highest concentration of mapped gullies and length of Negative Mapped Channel Characteristics (NMCCs). The length of gullies more than doubled between 1984 and 2000. Rainbow Planning Watershed NMCCs decreased in length, but increased in the Cow Pasture Opening Planning Watershed.

Fish habitat factors including temperature, large wood, pools, and spawning gravel are generally quite poor through the subbasin. There are some bright spots, such as good canopy and gravels in Sulphur Creek. Also from NCWAP: "...surprisingly few dry channel reaches [were] recorded in late summer surveys..." NCWAP estimated anadromous habitat length in miles: Jim Goff Gulch 0.7, Lower North Fork 8.0, East Mill 1.3, Conklin 2.2, East Branch of the lower North Fork 0.9 (This list seems incomplete as Sulphur Creek has had salmonids observed, and its mouth is further up the East Branch than 0.9 miles). Historically, the Lower North Fork Watershed supported Chinook and coho Salmon and steelhead. Recovery in this subbasin is problematic but foreseeable with suitable intervention and recovery time.

North_2

This subbasin, about 29,157 acres, is comprised of the Upper North Fork watershed and the smaller eastside Mattole tributary watersheds from Honeydew downstream to and including McGinniss Creek watershed. The northeastern boundary is the Bear River watershed and the Bull Creek watershed of the South Fork Eel River basin. The northwestern boundary is the Conklin Creek watershed and the East Branch of the Lower North Fork Mattole watershed. The southeastern boundary is the Honeydew and Dry Creek Planning Watersheds.

The area around the town of Honeydew and the southern half of the Rattlesnake Creek Planning Watershed are primarily small residential parcels. There are a few smaller parcels scattered across the rest of the subbasin, but the northern half of the Rattlesnake Planning Watershed and the Tent City, Camp Mattole and McGinnis Creek Planning Watersheds are almost entirely large ownerships with those over 640 acres dominant. There are two large industrial forestland blocks owned by Humboldt Redwoods Company that together, comprise between a third and a half of the area of the subbasin. The larger of the blocks is mostly in the northeast half of the Upper North Fork watershed, and the smaller is mostly in the McGinniss Creek and Camp Mattole Planning Watersheds.

This subbasin, similar to the North_1 subbasin, is extremely unstable and eroding either through the soil creep and mass movement common to 'soft terrain', or through landslides, debris torrents, and debris slide slopes on harder, steeper terrain. The impacts of overgrazing, post WW II tractor logging, coupled with fires have been especially hard on subbasin North_2, particularly in the Upper North Fork watershed. From NCWAP: "Two fires in 1990 covered 6,700 acres, mostly in the Oil Creek and Camp Mattole Planning Watersheds . . . only seven percent of the forest stands [in North_1 and North_2 subbasins] have average tree diameters greater than twenty-four inches..."

NCWAP estimated anadromous habitat length in miles: McGinnis Creek 3.1, Upper North Fork mainstem 8.0, Upper North Fork tributaries: Oil Creek 3.5 (& Oil Creek tributaries: Green

Ridge Creek 0.6 and Devils Creek 0.8); and Rattlesnake Creek 3.0. NCWAP found that Oil Creek had an increase of 8% in NMCCs between 1984 and 2000. There was locally intensive 'sanitation/salvage' logging in the Oil Creek watershed following the 1990 Rainbow Fire. "The length of gullies increased in all Planning Watersheds between 1984 and 2000." "Approximately 8,200 feet of eroding bank has been mapped in the Rattlesnake PW." Erosion from inner gorges and historically active landslides is also common in this subbasin.

Overall, habitat conditions in the North_2 subbasin are not currently "supportive of the cold beneficial use of water for salmonid habitat." Lack of canopy, gravel embeddedness, lack of pools, and lack of large wood are the common condition of these streams. Steelhead are still found in these streams, but they once supported coho and Chinook Salmon as well. Again, like North_1 subbasin, there needs to be a concerted, cooperative, and organized effort to recover the forest and watershed resources here. The small areas positively affected by the MRC's Good Roads Clear Creeks program need to be increased by orders of magnitude and scope.

South_1

The South_1 subbasin of the Mattole River Watershed is the southern most headwaters area of the Mattole, extending from the Bridge Creek and Van Arken Creek watersheds upstream to Four Corners, an area of about 17,644 acres. The area of this sub-basin coincides with a sub-basin used for the Mattole evaluation done by the state's North Coast Watershed Assessment Program (NCWAP) in the "Mattole River Watershed Assessment Report" of March 2003.

There are two CalWater Planning Watersheds in the Southern Sub-basin: Bridge Creek and Thompson Creek. The sub-basin has a number of tributaries that are very significant for spawning and rearing habitat for salmon and steelhead. They, along with the headwaters mainstem, are considered the largest and most important refugia for salmonids, especially coho, in the Mattole. Bridge, Van Arken, Mill, Baker, and Thompson Creeks are the most prominent of these tributaries, but many smaller tributaries such as Ravasoni, Harris, Gibson, and Stanley are, or are potentially, very significant and important salmonid habitat.

The South_1 subbasin has a number of noteworthy features, including but not limited to, containing almost all of the redwood forest in the Mattole Valley, having a 'hard' geology with relatively stable slopes and a lot of bedrock controls in the stream and river channels, a generally more favorable natural recovery from past adverse logging impacts, a lot of human restoration work over the last quarter century, the largest human population in the Mattole Valley, large areas of modern industrial logging, and significant areas of protected forest remnants.

There is quite a mix of land use and ownership in the South Sub-basin. There are some concentrated areas of small residential parcels -- around 'new' Thorn (Whitethorn), 'old' Thorn (Whitethorn Junction to Bridge Creek), and the Gopherville and Whale Gulch areas in the Mendocino County headwaters. There are a lot of scattered 20, 40, 80 and larger parcels -- some with residents and some not. Most of the industrial timberland in the sub-basin is on the eastern side of the Whitethorn Valley, although there are some significant areas on the westside also, notably Mill Creek. Barnum Timber Company (BTC) is the major industrial owner, although

some other smaller landowners have conducted industrial-type logging on their properties from time to time.

Past cumulative impacts include tanbark extraction and redwood split-stuff manufacture from the 1800s into the 1930s, high impact tractor logging during post WW II boom time, followed by remnant timber cutting under the 1973 Forest Practice Rules. Indigenous, generally low impact, habitation was followed by higher impact settler occupation that reached its peak population during the post-WWII logging boom. This was succeeded by a surge of back-to-the-lander immigration in the 1960s, 70s and later. In this last period, significant remnant forest was protected. Present and future cumulative effects are focused upon excessive human population pressure and water use, along with continuing recovery efforts for Salmon and steelhead in this headwaters refugium. Modern Forest Practice rules and related rules & laws coupled with public vigilance should ensure a lower risk of significant cumulative effects in the future.

West_1

This subbasin, about 25,843 acres, is generally bounded on the North and East by the Mattole River, on the West by the King Range Crest/Mattole River watershed divide and the Pacific Ocean, and on the South by the Honeydew Creek watershed. It is comprised of the Shenanigan Ridge, Squaw Creek, and Woods Creek Planning Watersheds. More than a third of the West_1 subbasin is in the KRNCA, most of it in wilderness designation except for some areas in or close to the Woods Creek watershed, in or close to the Indian Creek watershed, at the mouth of the Mattole River, and a few small scattered parcels.

The rest of the subbasin is in private holdings with quite a range of sizes. There is a large subdivided area from about Mill Creek to the ocean between Prosper Ridge and the Mattole River, with smaller to medium-sized parcels scattered among larger older ranch and forestlands extending next to or accessed by the Mattole Road upstream to (and into) the Honeydew Creek watershed. Most, but not all, of the interior private parcels are quite large, most between 160-640 acres, with a couple larger.

Some fertile, flat agricultural bottom and terrace lands are spaced along the Mattole River in this subbasin. Most of the upland areas have been severely impacted at one time or another over the last 150 years by fires, overgrazing, tan barking, and the devastating impacts of tractor logging after WW II. There is some 'harder' geology on the east slopes of the King Range, but also significant landsliding along with debris slide slopes. There are also "Large deep-seated landslides, historically active earthflows, and gully erosion on grass-covered highlands…mapped in association with soft terrain..." (NCWAP, 2002). About 10% of the subbasin is grassland, with about half of the subbasin in mixed conifer/hardwood, with hardwood forests about twice the area of conifer forests on the remainder.

According to NCWAP, the estimated anadromous habitat length in miles for the creeks in this subbasin, going from North to South, are: Bear 0.3, Stansberry 0.5, Lower Mill 1.4, Clear 0.7, Indian 1.2, Squaw 12.7, Saunders 0.4, and Woods 1.5. NMCCs between 1984 and 2001 generally decreased in the Squaw and Woods Creeks Planning Watersheds, but increased in the Shenanigan Ridge Planning Watershed (though its length of gullies went down). Gravel

embeddedness is a problem in all these streams, but Lower Mill Creek is in better shape in this regard than Squaw Creek, which had 50% or greater embeddedness in over 80% of the reaches sampled. Squaw Creek also ranks low in canopy (about 45% canopy cover) with Woods Creek somewhat better at 65%. Stream temperatures in most of the tributaries are problematic.

Both Chinook and coho Salmon have been found in Squaw and Woods Creeks. Coho have been found in Lower Mill Creek and Clear Creek. Steelhead are present in all of this subbasin's Mattole tributaries. Chinook have been found in Stansberry and Indian Creeks. Fish passage improvements have been made to Bear, Stansberry, Lower Mill, Indian and Saunders Creeks. There are almost unlimited opportunities in this subbasin for silvicultural and watershed recovery efforts–given adequate funding, motivation, and cooperation.

West_2

The West_2 sub-basin, about 32,249 acres, is bounded on the west by the crest of the King Range and on the east (from north to south) by the Wilder Ridge, the Mattole River, and the Bridge Creek watershed. There are four Planning Watersheds in the sub-basin that include all of the Honeydew Creek and Bear Creek watersheds along with some smaller west-side Mattole River watersheds that include Big and Little Finley, and Nooning Creeks. More than 2/3rds of the sub-basin is in the King Range National Conservation Area (KRNCA), which was established in 1970, with close to about half of that being classified as Wilderness in 2006. Honeydew and Bear Creeks are two of the largest and most important anadromous salmonid tributary streams of the Mattole. The NCWAP assessments concluded that the Mainstem Bear Creek had the best salmonid habitat in the Mattole watershed.

According to the NCWAP "Assessment Report" the estimated anadromous habitat length (in miles) for the streams in the sub-basin, going from North to South, are: Honeydew Mainstem 5.9; Honeydew tributaries: Bear Trap 0.1, High Prairie 0.6, East Fork 6.0, and West Fork 0.2; Bear Mainstem 6.5; Bear tributaries: North Fork 4.3, Jewett 2.4, French 0.4, and South Fork 10.7; Little Finley (less than 0.1), Big Finley 0.1, and Nooning Creek 1.5. Most of Honeydew Creek is in the wilderness area with its lower reaches and the East Fork in non-wilderness KRNCA or private holdings. There are some private holdings affecting the North, South Forks, and Mainstem Bear Creek watersheds, but a large portion of, or most of, those watersheds are in non-wilderness KRNCA. The same goes for the Finley Creeks and Nooning Creek watersheds.

Three of the four Planning Watersheds are of "medium low" population density with 3 to 6 owners per 1000 acres. Most of this population is scattered in small parcels along Wilder Ridge, above the East Fork of Honeydew Creek, and along several private roads that connect to the Wilder Ridge Road, as well as some that are similarly situated relative to the Shelter Cove and Chemise Mountain Roads.

Past significant adverse impacts to the Planning Watershed include, heavy grazing, post WW II tractor logging and tan barking. Compared to the extensive subdividing of some of the more populated Planning Watersheds, subdivision here has been limited. Management impacts to the wilderness areas of the KRNCA will be very limited due to exclusion of motorized vehicles. Management impacts to the non-wilderness areas of the KRNCA will be quite limited also, but

more management is likely due to BLM's goal of thinning to accelerate the development of late seral forest characteristics and to reduce the risk of wildfire. Fire is a very large issue and has had an even bigger impact here than in the rest of the Mattole Valley. Large fires such as the 1973 Finley Creek Fire, the 2006 Honeydew Fire, and many others have severely affected the area. BLM and the MRC have cooperated on shaded fuel breaks along the west side of the Planning Watershed and along county and private roads including the Wilder Ridge Road.

This sub-basin has some of the highest rainfall totals in the Mattole Valley because of the orographic impact of the high ridges and peaks of the King Range. Close to 20% of the area is covered by active or dormant landslides. There are abundant debris slide slopes. Despite all this, there is the potential for steady watershed and stream habitat recovery because some of the people in this sub-basin are proactively working to restore stream function.

Past 10 Year Harvest History

Chapter 2.0.3, timber harvest history, describes the acreage of harvest by various periods while Table 2-4 shows the acres harvested by subbasin by silvicultural prescription between 1983 and 2007. Technical Rule Addendum 2 requires a detailed analysis of the past 10 years of timber harvest. Table 4-1 shows the harvest by silvicultural type by subbasin between 1999 and 2010. Figure 4-1 shows the location of the last 10 years of harvest, most of which occurred in the North_1 and North_2 subbasins.

Figure 4-1

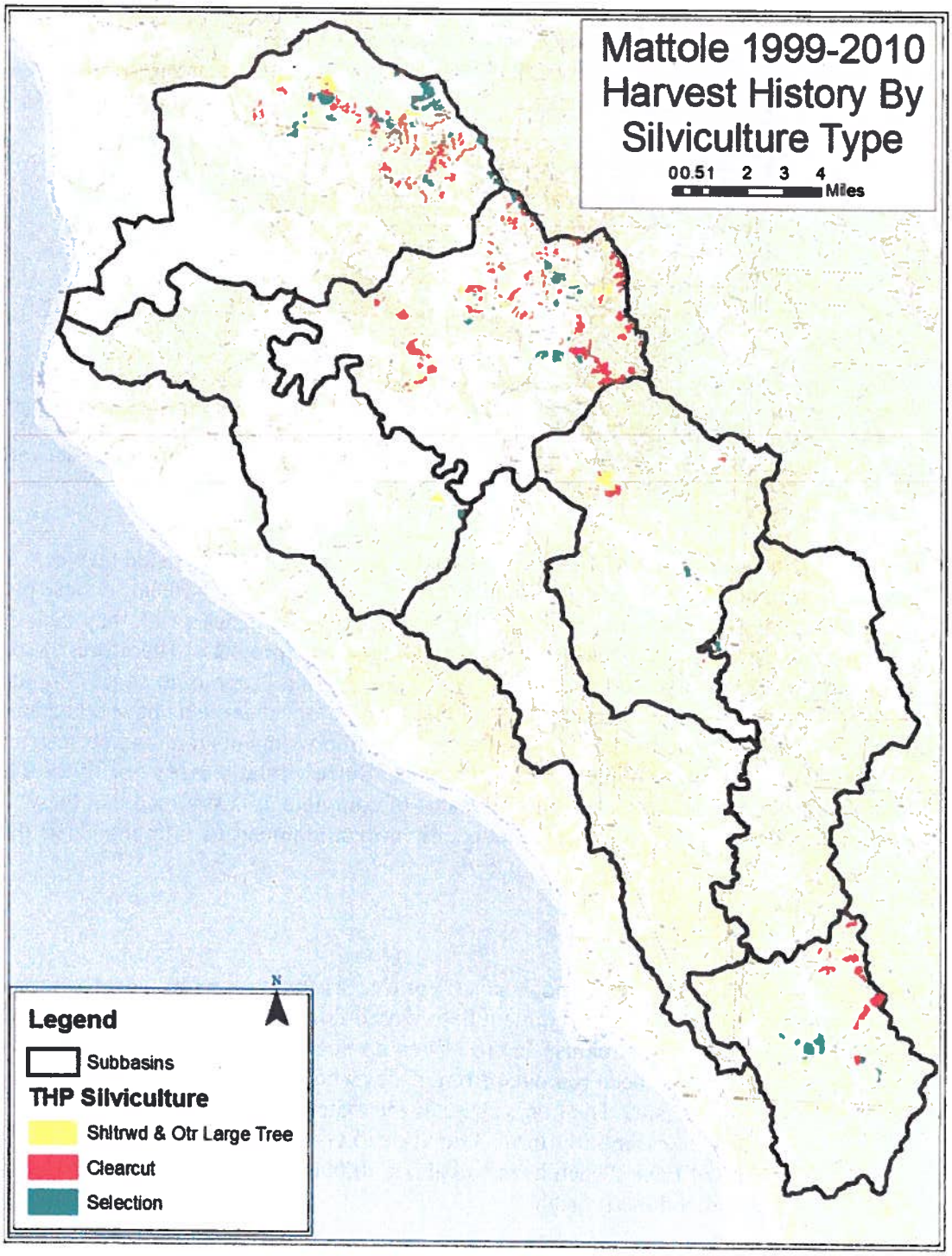

Mattole 1999-2010
Harvest History By
Silviculture Type
00.51 2 3 4
Miles
N
Legend
Subbasins
THP Silviculture
Shltrwd & Otr Large Tree
Clearcut
Selection

Table 4-1
Past THP Harvest 1/ (1999-2010) By Silviculture And By Subbasin

Subbasin	Category 1 2/ Silviculture	Category 2 Silviculture	Category 3 Silviculture	Total
East 1	66	154	34	253
East 2	5	10	40	54
North 1	567	288	590	1,445
North 2	999	210	329	1,537
South 1	288	15	150	453
West 1	0	37	23	60
West 2				
Total	1,924	713	1,166	3,803

1/ All harvest is by THP, no NTMP Harvest during period

2/ Silviculture Category 1 includes even-aged regeneration prescriptions: clear-cut, rehabilitation, seed tree step, shelterwood seed step and road construction. Silviculture Category 2 includes prescriptions that remove most of the largest trees: shelter wood prep step, shelterwood removal step and alternative prescriptions. Silviculture Category 3 includes prescriptions that leave large amounts of vegetation after harvest: selection, group selection, commercial thin, sanitation salvage, transition and seed tree removal step prescriptions.

Barnum Timber Company and PALCO filed the vast majority of the plans listed above. Virtually every plan noted above has a completion status of 'completed.' Because these plans were completed under various versions of the Forest Practice Rules since 1999, they included substantive measures to reduce the adverse impacts of these past projects. Therefore, the past plans noted above are not expected to combine with the Proposed Program to cause cumulative adverse impacts to any resource area. It is likely that many of these projects have a had a net benefit to water quality in the Mattole basin as a result of improvements to drainage structures on both permanent and temporary roads and on skid roads. Since virtually every one of the THP's filed within the past 10 years has a completion status of complete, it is assumed that these projects comply with the FPR's and the THP-specific mitigation measures for any particular THP.

MRC Good Roads Clear Creeks Program

The Mattole Restoration Council's Good Roads Clear Creeks Program treats actively used and abandoned roads to remove potential sediment before road failures deliver this sediment to the already impacted Mattole basin streams. In the 11 years since the Program was founded, about 537,000 yards of sediment has been removed from places where it would be likely to be delivered to streams in the basin. The lion's share of the material removed (250,000 yards) has been in the East_2 subbasin, essentially from Blue Slide to Grindstone Creek. South_1, East_1 and the Eubanks portion of East_2 each have had about 70,000 yards of material removed from crossings on active and abandoned roads.

4.5 Present Activities

Ongoing present activities include road improvement, residential development and livestock grazing. Until 2010, due to depressed market conditions for Douglas-fir and tanoak, most timber harvest was not economical to implement. As such, most landowners with harvestable timber have been waiting for market conditions to improve before committing to timber harvest. No THP has been filed in the Mattole since 2007. All plans were complete as of March 2010.

MRC's Good Roads Clear Creeks program is currently implementing road decommissioning and sediment removal in the Blue Slide and Grindstone Creek areas and in the Petrolia area. Approximately 30,000 yards of material are expected to be removed from the Blue Slide/Grindstone project and about 25,000 yards are expected to be removed in the Petrolia area before the end of 2010. Funding is secure and work is expected to take place in the Upper North Fork (North_1 subbasin) in 2011 to removed about 200,000 yards of material.

4.6 Probable Future Projects

CEQA does not explicitly describe what constitutes a "probable future project", but the CEQA Guidelines describe such things as private projects requiring agency approval, public projects for which money has been budgeted, projects included in a summary of projects in a general plan and projects anticipated as later phases of a previously approved project.

The Forest Practice Rules explicitly define "probable future projects" under the definition of Reasonably Foreseeable Probable Future Projects to mean; "*Projects with activities that may add to or lessen impact(s) of the proposed THP including but not limited to: 1) if the project is a THP on land which is controlled by the THP submitter, the THP is currently expected to commence within but not limited to 5 years, or 2) if the project is a THP on land which is not under the control of the THP submitter, the THP has been submitted or on-the-ground work including THP preparation has materially commenced, or 3) if the project is not a THP, and a permit is required from a public agency, and the project is under environmental review by the public agency, or 4) if the project is one which is [undertaken] by a public agency, the agency has made a public announcement of the intent to carry out the project.*"

Because the FPR's definition of reasonably foreseeable probable future projects mirrors the CEQA description of a probable future project, hereafter, the term reasonably foreseeable probable future project is considered equivalent to the CEQA definition of probable future project.

The reasonably foreseeable probable future activities include implementation of the Proposed Program as well as potential conventional timber harvest that is comprised of landowners submitting standard THP applications. In addition, there is a reasonable expectation that the MRC will continue its Good Roads Clear Creeks Program, and that there will be continued livestock grazing, residential development and road use and upgrading not associated with the MRC Good Roads Clear Creeks Program. Besides these projects, the BLM is expected to continue management under its current Resource Management Plan that includes stand improvement to increase late seral development and maintenance of existing shaded fuel breaks. Several Fire Safe Councils have prioritized projects in the Mattole that are implemented when

funds are available and there are community groups with the expertise and administrative capability to implement such projects. A more complete description of each of these reasonably foreseeable probable future activities is described below.

Program Related Timber Harvest

Chapter 3 describes in detail the project impacts associated with the projected harvest that might result from implementation of the Program. Slightly more than 15,000 acres of timberland within the Mattole basin are projected to be harvested over the next 60 years under the Mattole Forest Futures Program. Harvest by period and by subbasin has been previously described in chapter 2.2 and is not repeated here.

"Conventional Off-Program" Timber Harvest

For this analysis, the reasonably foreseeable probable future timber harvest is assumed to be comprised of harvest by Humboldt Redwood Company, Barnum Timber Company and non-industrial private timberland owners throughout the Mattole. The specific assumptions are described below but essentially are based on the historic trend of past silviculture, discussions with Humboldt Redwood Company and review of Barnum Timber Company's timber age class data based on timber harvest history.

The recent historical trend in silvicultural systems shows that uneven-aged systems have been employed 70% of the time in the Mattole and the remaining 30% of harvests have been comprised of even-aged systems. The assumption is that uneven-aged harvesting which previously would have occurred under a THP would shift into the Program, while the 30% even-aged would continue to operate under THP's. Therefore, the "conventional off-Program" harvest is projected to be comprised of primarily even-aged silvicultural systems, and is estimated at 30% of the total Status Quo harvest acreage over the 50-year projection period.

The Humboldt Redwood Company (HRC) "conventional off-Program" even-aged harvest, which is comprised of variable retention or rehabilitation treatments, is projected to take place solely in the North_1 and North_2 subbasins, where the company's holding are located. This harvest is expected to be about 150 acres/5 year period each in the North_1 and North_2 subbasins for a total of 60 acres/year across both subbasins. All other harvest by Humboldt Redwood Company is assumed to occur under the Program and is already accounted for in the direct environmental impacts described in Chapter 3 above. Table 4-2 below summarizes the projected off-Program harvest expected during the 50-year projection period by subbasin and by alternative. Even if HRC uneven-aged harvests are permitted as regular THPs instead of PTHPs to retain less basal area after harvest, the watershed protection standards to which the firm is committing under its Habitat Conservation Plan and Watershed Analysis are roughly equivalent to those required under the Program, and thus the conclusions regarding cumulative effects will still stand.

Barnum Timber Company is also expected to have reasonably foreseeable probable future timber harvest. All of this harvest is "off-Program", is expected to be even-aged, and takes place solely in the South_1 subbasin. It is not expected to begin until 2030 and is projected at a rate of 285 acres/5 year period. This harvest is expected to continue at that rate into the future.

A portion of the non-industrial private timberland owners are also expected to harvest timber "off-Program". The "off-Program" NIPF harvest is projected at 30% of the Status Quo and is expected to be comprised solely of even-aged harvest or heavy selection that would not meet the requirements of the Program.

BLM King Range National Conservation Area Reasonably Foreseeable Projects

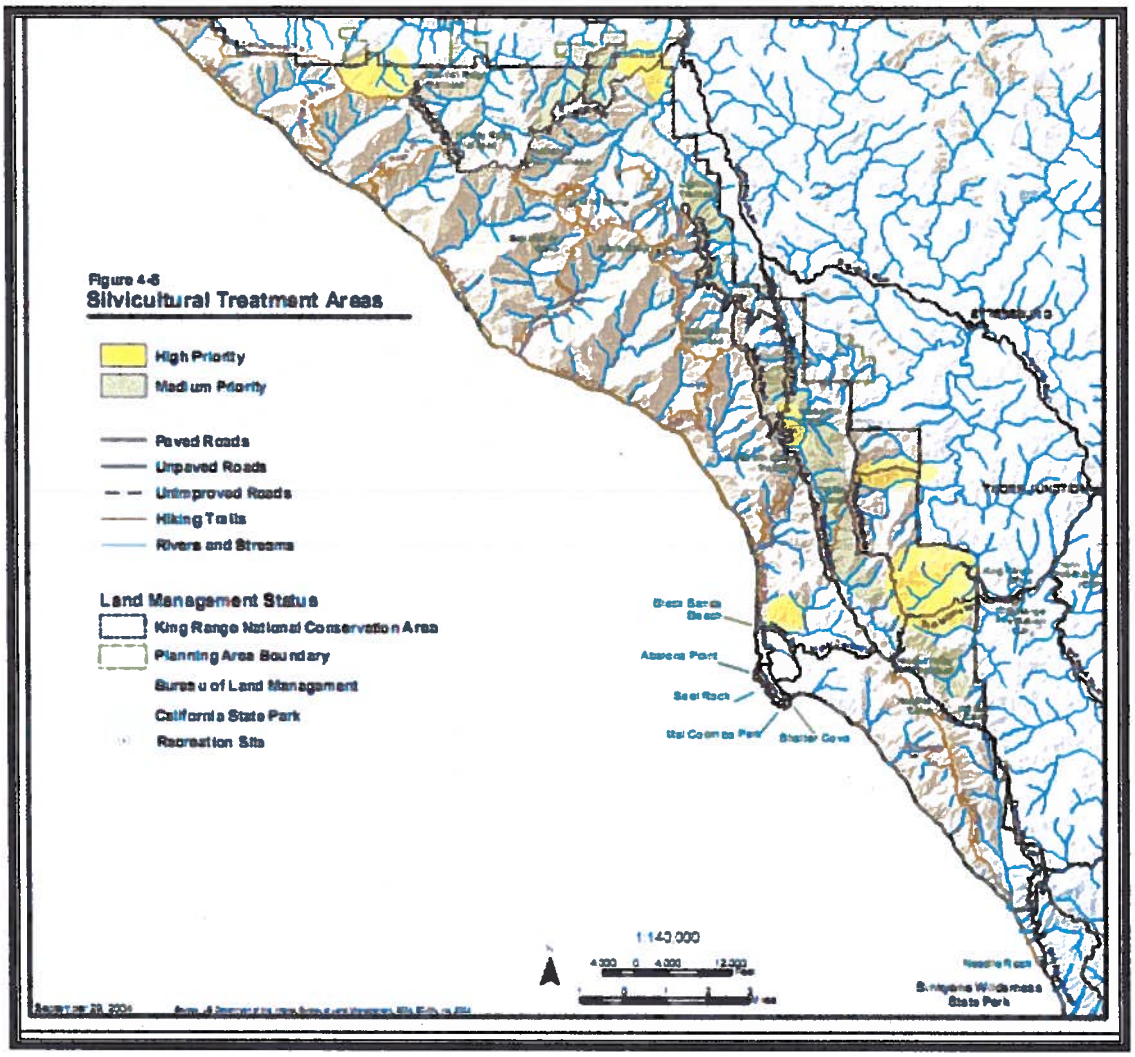
The BLM is not proposing timber harvest within the KRNCA or its other Mattole holdings, and as such, all of the KRNCA forestland will continue to mature at varying rates. For a limited number of stands, the BLM seeks to accelerate (King Range objective FM 1.4) the rate at which second-growth stands achieve old-growth or late-successional characteristics. Previously harvested stands would be treated in the Spanish Ridge, Honeydew, and Paradise Ridge areas and in the Bridge Creek and Eubank Creek areas of South_1 and East_1 respectively. The BLM also has a goal (FM-2) to enhance the development of a more diverse forest structure on approximately 700 acres of the KRNCA particularly in the Nooning Creek and Finley Ridge areas, and in Bear Trap Creek. Implementation of these projects is expected to result in negligible to moderate positive impacts to the amount of late seral forests within the Mattole. Figure 4-2 below shows the likely locations of some of the proposed silvicultural treatment areas.

Table 4-2
Cumulative Impact Analysis Area And Reasonably Foreseeable Probable Future Timber Harvest, 2010-2060

Subbasin	Total Area	Forestland Area	Commercial Forestland Area	Available* Private Commercial Forestland	Off-Program Harvest Area	Footprint Area of Program or Alt.	Total Area Harvested, including off-Program	Commercial Forestland Area Not Harvested
	Program Acres							
East_1	25,875	23,347	20,351	11,459	487	2,655	3,142	17,209
East_2	24,983	21,555	15,616	11,576	209	1,669	1,878	13,739
North_1	34,401	19,668	15,060	6,755	1,308	4,307	5,615	9,445
North_2	29,123	20,017	15,313	4,744	1,022	2,935	3,957	11,356
South_1	17,637	17,327	13,164	5,354	1,717	631	2,348	10,816
West_1	25,820	19,731	13,734	6,155	62	1,746	1,808	11,926
West_2	31,919	29,360	23,593	6,065	106	1,095	1,201	22,392
Total	189,760	151,005	116,831	52,108	4,912	15,038	19,950	96,882
	Alternative I Status Quo Acres							
East_1	25,875	23,347	20,351	11,459	N/a	1,950	1,950	18,402
East_2	24,983	21,555	15,616	11,576	N/a	770	770	14,846
North_1	34,401	19,668	15,060	6,755	N/a	5,330	5,330	9,730
North_2	29,123	20,017	15,313	4,744	N/a	4,292	4,292	11,021
South_1	17,637	17,327	13,164	5,354	N/a	1,717	1,717	11,447
West_1	25,820	19,731	13,734	6,155	N/a	277	277	13,457
West_2	31,919	29,360	23,593	6,065	N/a	379	379	23,214
Total	189,760	151,005	116,831	52,108	N/a	14,715	14,715	102,116
	Alternative II Acres							
East_1	25,875	23,347	20,351	11,459	487	2,725	3,212	17,139
East_2	24,983	21,555	15,616	11,576	209	2,083	2,292	13,324
North_1	34,401	19,668	15,060	6,755	1,308	3,973	5,281	9,779
North_2	29,123	20,017	15,313	4,744	1,022	2,441	3,463	11,850
South_1	17,637	17,327	13,164	5,354	1,717	653	2,370	10,795
West_1	25,820	19,731	13,734	6,155	62	2,295	2,357	11,377
West_2	31,919	29,360	23,593	6,065	106	1,230	1,336	22,257
Total	189,760	151,005	116,831	52,108	4,912	15,400	20,311	96,520
	Alternative III Acres							
East_1	25,875	23,347	20,351	11,459	487	1,592	2,079	18,272
East_2	24,983	21,555	15,616	11,576	209	1,001	1,209	14,407
North_1	34,401	19,668	15,060	6,755	1,308	3,027	4,335	10,725
North_2	29,123	20,017	15,313	4,744	1,022	2,377	3,399	11,914
South_1	17,637	17,327	13,164	5,354	1,717	611	2,328	10,836
West_1	25,820	19,731	13,734	6,155	62	1,018	1,081	12,653
West_2	31,919	29,360	23,593	6,065	106	602	708	22,885
Total	189,760	151,005	116,831	52,108	4,912	10,228	15,140	101,691

** Available under 2010 FPRs after WLPZ and geology removals. Total available area will be slightly different under the Program and Alternative 3 (57,601 acres) and Alternative II (46,644 acres) because of variation in the widths of riparian buffers and assumptions about how much ground is removed for geologic reasons.*

Figure 4-2
BLM Silvicultural Treatment Areas



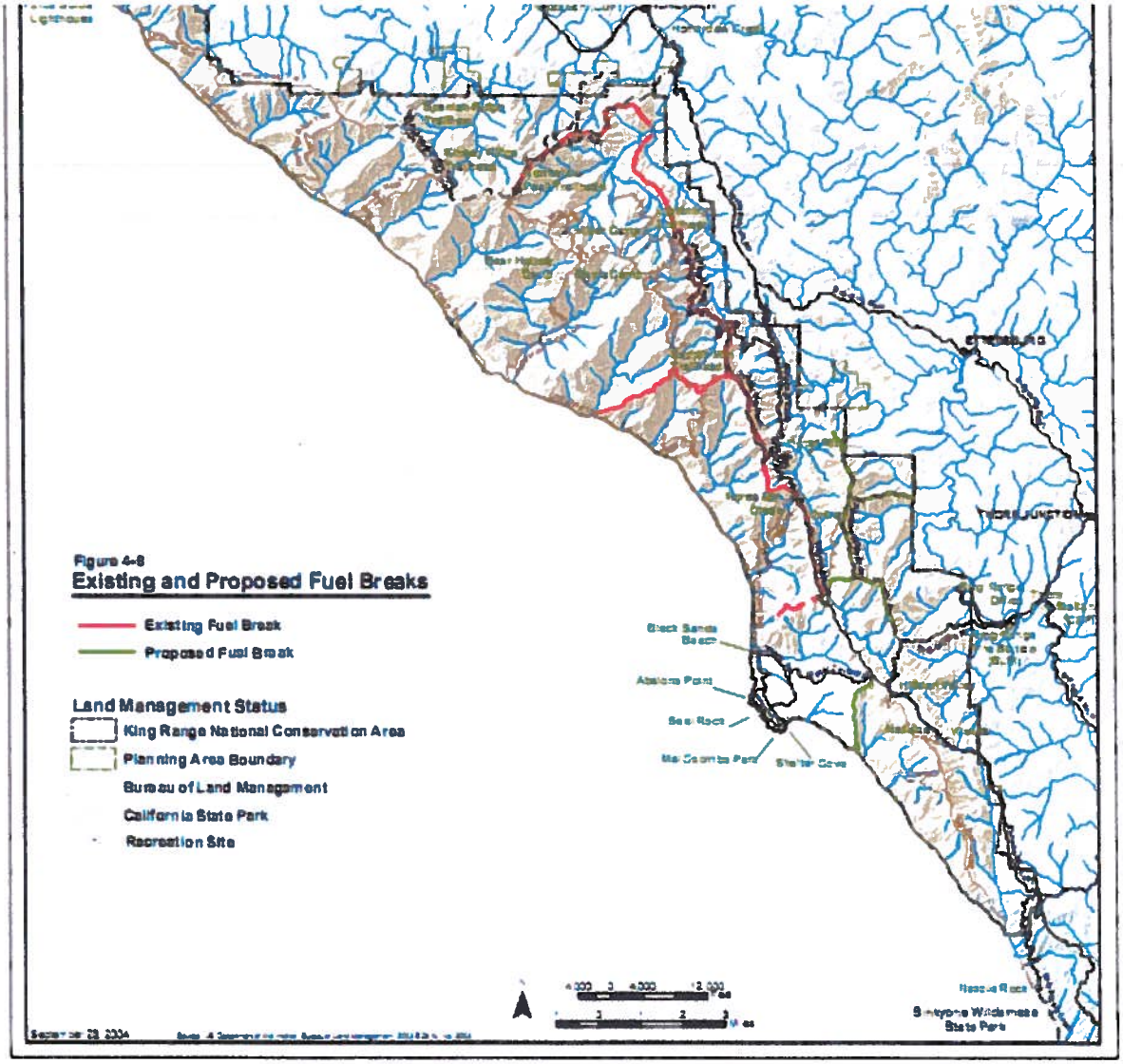
The KRNCA also has a goal to maintain its shaded fuel break system. The existing system consists of mostly ridge top road; shaded fuel breaks along the King Peak and Saddle Mountain roads and out the South Etter road to the Northside Peak Trailhead. In addition there is also the Paradise Ridge Road shaded fuel break that extends north out to Horse Mountain and south to the Shelter Cove Road. Maintenance of these shaded fuel breaks is not expected to contribute adverse environmental impacts to vegetation or soils in addition to those projected to be created by the Program in the West_2 and South_1 subbasins. Figure 4-3 below shows the location of the BLM existing or planned fuel break system in or near the KRNCA.

The BLM is not planning on additional road rehabilitation in the KRNCA, as it believes most of the essential road rehabilitation has already been completed (G. Pritchard-Peterson, personal communication 2010). The BLM is proposing to reduce the number of grazing allotments within

the Mattole portion of the KRNCA by making the 654-acre Bear Trap Ridge and 80-acre Lee French allotments unavailable since both were clearcuts that have now developed into densely stocked Douglas-fir plantations. Changing the grazing status of these two allotments is expected to have a negligible positive environmental impact by adding additional acres of conifer forest to the Mattole basin in general and to the West_1 subbasin in particular.

The KRNCA mountain bike trail network is being expanded in the Paradise Ridge area; however, this is not expected to contribute additional environmental impacts to those created by the Program.

Figure 4-3
BLM Existing and Planned Shaded Fuel Break System



Fire Safe Council Projects

The following projects were ranked high priority at the time these Fire Safe Councils prioritized them. Their current and or future status is unknown. Because most of the funding for these projects is not known until each year's state and federal budgets are approved, it would be speculative to include some or all of these projects in the cumulative impacts analysis that follows.

Lower Mattole Fire Plan 2002

a. Shaded fuel break along Fox Springs Road
b. Shaded fuel break along south Panther Gap/Stewart Ridge Rd.
c. Shaded fuel break along Panther Gap/Perimeter Rd.

Upper Mattole Fire Plan 2004

1. Shaded fuel break along Ettersburg-Honeydew Road along Telegraph Ridge (completed)
2. Shaded fuel break along Briceland-Thorne Road from Thorn Junction to Four Corners
3. Dutyville Road shaded fuel break
4. Shaded fuel break along Huckleberry Lane north from Thorn Junction
5. Shaded fuel break along Blue Slide Road
6. Shaded fuel break along Gibson Ridge Road on Barnum Property
7. Shaded fuel break along private roads east of Whitethorn along East Anderson, Harris, Gibson, Stanley and Baker Creeks.

The Humboldt County Fire Safe Council has developed an updated list of projects by working with Fire Safe Councils around the County. For the Mattole-Lost Coast area, the following projects, which are separate from the Lower and Upper Mattole Fire Safe Council projects above have been rated as high priority. However, the Humboldt County Fire Safe Council is "switching gears" to some extent and prioritizing "hardening" rural homes and access routes through education and grants that are tied with the CALFIRE 100' clearing requirements in PRC 4291 rather than implementing some of these larger landscape scale projects.

Humboldt County Fire Safe Council and Master Fire Protection Plan Projects

1. Strawberry Rock/BLM mastication project
2. Demonstration/Pilot project at Petrolia dump
3. Mill Creek-Matthews Ranch Road shaded fuel break
4. Downtown Petrolia-Chambers road eucalyptus grove clearing/cleanup

Shaded fuel breaks are typically located with a County or other major road anchoring the fuel break depending on the actual physical location of the road and the surrounding terrain. Most shaded fuel breaks in the Mattole are approximately 100 feet wide. Small trees and brush are removed, usually by chainsawing, hand piling and burning. The resulting overstory trees are not usually removed, as the goal is to maintain enough dense shade to reduce resprouting of tanoak and other sprouting species.

Implementation of these projects is expected to result in modest positive impacts to the amount of late seral forests within the Mattole, as shaded fuel breaks are designed to remove understory

trees and improve health of the overstory. In addition, there is expected to be a moderate positive impact that should reduce wildfire severity as a result of these projects. Hardening of people's houses and access roads is expected to result in a negligible to moderate positive impact that should improve the health and safety of local residents and reduce wildfire severity as a result of these projects.

Grazing

Within the Mattole, grazing is an on going and reasonably foreseeable probable future activity. The current amount of grazing is not expected to decline or increase precipitously in the reasonably foreseeable future. NCWAP estimated there were 23,332 acres of grazing land in the entire basin, the vast majority of which is North_1 and North_2 (about 16,282 acres combined or about 70% of all grazing land) and a smaller amount in West_1 and West_2 (4,023 acres). The East_1, East_2 and South_1 subbasins have a combined total of about 3,000 acres of grazing land with the vast majority in the East_1 and East_2 subbasins. NCWAP describes grazing as widespread and shifted to cattle from sheep as a result of enactment of predation protection measures. NCWAP also states that stock impacts to streams were not widespread, but watercourse exclusionary fencing is limited.

The KRNCA has about 11,000 acres of currently grazed lands, however many of these are not in the Mattole. The 11,000 acres in the KRNCA supported about 220 cattle. Only a very small amount of the four grazing leases allowed for in the KRNCA Resource Management Plan are located in the Mattole.

Mattole Restoration Council Good Roads Clear Creeks Program

The MRC GRCC program has conducted field-based inventories of controllable sediment sources in various planning watersheds in the Mattole watershed. The results of the inventories conducted thus far but not yet implemented has identified about 1.034 million cubic yards of sediment stored on actively used and abandoned roads that can be removed so as to reduce the potential for delivery during storm events. About 200,000 yards of the 1 million yards is already contracted to be removed in the North_1 subbasin. An additional 500,000 yards has been identified for removal in the North_1 and North_2 subbasins. In addition, 200,000 yards of potential sediment has been identified in the West_1 subbasin, and approximately 50,000 yards has been identified for removal in the East_2 subbasin. Beyond the 500,000 yards slated for removal in the Upper North Fork in the North_1 subbasin, an additional 102,000 yards have been identified for removal in the Petrolia area and on ranches, both in the North_1 subbasin. However, none of these projects is currently funded and it is uncertain whether such removals will take place.

Mattole Restoration Council Fuels Reduction Projects

The MRC administers several programs that implement construction of or maintenance of shaded fuel breaks as well as fire clearance work around people's homes. Recently, the MRC has instituted its FLASH (Fire adapted Landscapes and Safe Homes) program which is a slight change in emphasis from past MRC fuel reduction work in that it strives to "harden" peoples

homes and access routes similar to work being conducted by the Humboldt Fire Safe Council. As of this writing in spring 2011, the MRC is under contract to complete approximately 150 additional acres of fuels reduction in the next 5 years, with a roughly equal area in projects that have been developed but not yet funded.

Residential Development

Chapter three describes the population and housing situation within the Mattole basin. The East_2 subbasin has the highest density of owners, while the North_1 and North_2 subbasins have the lowest density of ownership. Currently and into the foreseeable future, the potential for extensive new residential development is considered low with an estimated two to five new permitted residential buildings being constructed per year (personal communication, John Williams, Humboldt County Planning Department, September, 2010). Population growth is estimated at about 0.3%/year which is equivalent to a net increase of approximately 10 people per year. This estimate is based on information from the Humboldt County Building Department and may underestimate the rate of net-in-migration, as some residential construction occurs without permits.

SOD

Chapter 3 describes the impacts of SOD on tanoak and as a result of Program implementation. SOD has been determined to occur within the Mattole basin, in the Blue Slide drainage in the East_2 subbasin. As stated in Chapter three, the entire Mattole basin is at a high or very high risk for infection. The spread rate of SOD associated tanoak mortality in Southern Humboldt is estimated at 1,000 acres per year based on an increase in extent from "1 acre" to over 10,000 acres in four years within a 74,000 acre area (Y. Valachovic, personal communication, 10/5/10). SOD is estimated to kill over 90% of infested tanoak. Once tanoak is killed, it is estimated that on average, trees remain standing for as long as 10 years, fall over and then quickly decay in another five years into material that is no longer a fire hazard. Once tanoak has died, trees and shrubs are expected to fill the vegetative niche either through release of surrounding conifers and hardwoods, if present, as well as from seedlings taking hold as a result of seedfall from adjacent overstory trees. Shrubs are less likely to seed-in since their seed sources are not likely to be activated by the low disturbance effect of tanoak mortality.

The spread of SOD is too speculative under CCR 15145 to make a determination as to significance. The uncertainty as to significance is due to the fact that:

1. The likely places where SOD might occur are impossible to predict since virtually the entire Mattole basin is listed as at high or very high risk of infection and with few exceptions, tanoak occurs virtually everywhere.

2. SOD is thought to be spread initially through the air and by water but also by vehicles including residential vehicles. Given the pervasiveness of the road system and the stream network, SOD could spread from a single point or from multiple points all at the same time.

3. The spread of SOD is highly dependent on the weather conditions in the spring, something over which landowners have no control and which cannot be predicted with any certainty. As a result, historical spread rates have varied in Humboldt County from 0 acres spread in one year to over 9,000 acres being infected in a year with more favorable weather conditions.

4. Even more speculative is the potential to use herbicides as a treatment for SOD (see Chapter 3, Hazardous Materials for discussion as to why assessing herbicides is speculative).

For this cumulative impacts analysis, it is estimated that if SOD becomes established in the Mattole, at any one time around 15,000 acres will be in some sort of condition where tanoak is either standing or has fallen over and successional trends are replacing the void created by the tanoak mortality with other tree (and occasionally shrub) species. As described in Chapter 2.1(C.6), there are numerous standard BMPs that are required by the Program to reduce the impact of SOD, as well as one additional measure particular to the PTEIR which changes the Program's practices if SOD impacts exceed the threshold of 80% tanoak mortality on 35% or more of the acres in any one subbasin.

Summary of Reasonably Foreseeable Probable Future Projects

The following table summarizes the relative magnitude of the reasonably foreseeable probable future projects:

Table 4-3
Summary Of Reasonably Foreseeable Probable Future Projects

Project or Activity	Magnitude	Time Period
Program Timber Harvest	15,038 Acres	50 year time period
Conventional (Off-Program) Timber Harvest	4,912 Acres	50 year time period
KRNCA Late Seral/Silvicultural Improvement Projects	50 Acres	Per year
KRNCA Shaded Fuel Break Maintenance	2 miles of shaded fuel break or 36 acres	Per year
KRNCA Mountain Bike Trail installation	1 mile of trail	Per year
Fire Safe Council Projects maintained or new	2-3 miles shaded fuel break or ~ 40 acres	Per year
Grazing area	24,000 acres	Per year
# Cattle grazing (10 acres per cow)	2,000 animals	Per year
MRC Good Roads Clear Creeks sediment removal in Upper North Fork and Petrolia*	225,000 yards of sediment removal	2011
MRC Fuel reduction projects	75 acres	Per year
Permitted Residential Development	2-5 new residential buildings	Per year
Population increase	10 people	Per year
SOD	1,000 acres 15,000 acres	Per year At any one time

*The GRCC program protocol collects and reports information using cubic yard units, however the TMDL and Sediment Analysis conducted in Chapter 3 reports units in tons. The conversion rate for cubic yards to tons in the Mattole watershed is 1.4 tons/cubic yard.

4.7 Watershed Cumulative Impacts

This section summarizes the cumulative impacts to the Mattole watershed from implementing the Proposed Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment areas for describing the potential cumulative impacts of implementing the Program's practices on the Mattole watershed are the seven Program subbasins which encompass the 25 Cal Wat HUC's in the Mattole basin.

Flow Effects

The methodology used for analyzing potential cumulative impacts to peak flows was the same as that used in Chapter 3.16 for analyzing Program impacts on peak flows. In summary, the cumulative canopy reduction due to timber harvest was summed annually and compared to established values in the literature. As noted in Chapter 3.16, in order for peak flows to be increased by a detectable amount it is necessary to remove 20-40% of the forest canopy in a small watershed (e.g. <1,000 acres).

The highest level of annual canopy removal predicted in Chapter 3.16 occurred in North 1 under Alternative I and was 2.53% averaged over the 50 year analytical time period, with a peak annual value of 3.77%. After accounting for the additional timber harvest that occurred during the 1999 to 2010 time period and the predicted off-Program harvest that would occur during the 2010-2060 time period it was determined that the Program in North 1 would have the highest average annual cumulative canopy removal at 2.94%, with a peak annual value of 4.35%. The other Alternatives and subbasins all had lower annual canopy removal values. North 1 continues to have the highest average annual canopy cover removal values because harvest rates have been and will continue to be amongst the highest in the Mattole watershed due to a high proportion of industrially owned timberland and to a lesser extent large ranches.

The second highest canopy removal values occurred in South 1, at 2.18% for average annual canopy removal and 4.59% for maximum annual canopy removal values. Canopy cover removal values were predicted to increase in South 1 due to the anticipated resumption of widespread, off-Program, even-aged harvesting on Barnum Timber Company lands as their stands reach maturity in the 2030 to 2060 time period.

When considering the combined effects of Program and off-Program activities, the average annual and peak annual canopy removal values fall well below the 20-40% canopy removal values required to cause a detectable effect to peak flows when analyzed at the subbasin scale (10,000-20,000 acre area). Peak flow increases may be considerably larger in smaller headwater catchments (<1,000 acres) that have all or most of their canopy removed with off-Program harvest, but these types of increases are not found when peak flow analysis is conducted at larger scales (i.e., planning watersheds, super planning watersheds, or river basins) (CAL FIRE 2005).

Timber harvest has been associated with minor, short-term increases in summer low flows, which would have a positive effect on aquatic biota. Therefore, this effect did not warrant further analysis (Beschta et al. 1995).

Determination of Significance for Peak Flows

The analysis above shows that there is a less than significant cumulative effect on peak flows or summer low flows when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Water Temperature Effects

As described in Chapter 3.16, many reaches of the mainstem Mattole River and low-gradient reaches of large tributaries have high summer water temperatures that do not support cold water fisheries designated uses. The main driver of excessive water temperatures appears to be excessive sediment storage in these reaches, which has altered channel morphology and riparian forest composition. Recent timber harvest did not appear to be having a significant effect on water temperatures in the Mattole.

As described in Chapter 3.16, the recently adopted ASP rules within the FPR's include riparian buffer protection measures designed to protect water temperatures for coho salmon and other listed anadromous salmonids. The ASP rules at minimum apply to all Alternatives and have been found by the BOF to be protective of water temperature. The Program and Alternatives 2 and 3 include riparian buffer measures that are more protective of water temperature than the ASP rules.

Grazing is a common land use in the Mattole watershed. Grazing has the potential to reduce riparian vegetation and thereby decrease stream shade and lead to increased stream water temperatures. Grazing was not mentioned in the Mattole TMDL as a significant factor affecting stream water temperatures (NCRWQCB 2002). Welsh (2005) correlated grassland dominated vegetation types with elevated water temperatures, but did not cite grazing as a causative factor. There does not appear to be evidence that grazing has had a significant effect on stream water temperatures in the Mattole watershed.

Determination of Significance for Water Temperature

The combination of protective rules for riparian buffers (ASP and Alternatives), low harvest and canopy cover removal rates and declining hillslope sediment yield over time all contribute to the finding that there is a less than significant cumulative effect on water temperature when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Nutrient Effects

Complete harvest of forests (clearcutting) can lead to increased leaching of nitrogen from forest soils and increased nitrate levels in receiving waters (Dahlgren 1998). In general this effect is short lived, as forest vegetation re-captures the site and resumes nitrogen uptake, resulting in loss rates declining to pre-harvest levels within 5-7 years. In some regions or ecosystems the loss of soil nitrogen and increase in water column nitrate levels can be significant; however this is generally not the case in the Pacific Northwest (Beschta et al. 1995). The effect of partial harvest

on soil nitrogen loss and water column nitrate concentrations is less well known, but is assumed to be less than for clearcutting.

Based on harvest history in the Mattole for the 1984-2008 time periods, the majority of timber harvest on NIPF lands has been uneven-aged, selection style. Although silviculture on industrial lands has historically been dominated by even-aged systems, the change in ownership from PALCO to HRC indicates that uneven-aged forestry will be more common on industrial lands in the future. Thus, the majority of Program and off-Program timber harvest are expected to be uneven-aged, which has a low likelihood of significant nitrogen export and resulting elevated water column nitrate concentrations.

Determination of Significance for Nutrients

Based on the prediction that even-aged harvesting is expected to be a minor component of cumulative harvest techniques in the Mattole and that the PNW ecosystems are relatively resilient to nitrogen losses, there will be a less than significant cumulative effect on water column nutrient levels when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Large Wood and Organic Debris Effects

As described in Sections 3.4 and 3.16, the Program (and to a lesser extent Alternatives 2 and 3) is expected to provide increased LWD recruitment potential compared to the status quo (Alternative 1), due to having greater riparian buffer protections, measures that lead to the avoidance of logging on landslide-prone areas, and prohibition of even-aged harvest techniques. The additional off-Program forest harvest considered in this cumulative impacts section would be implemented following the ASP rules in the FPR's and would be primarily even-aged harvesting.

The ASP rules, which govern the off-Program harvest in the entire Mattole watershed, have been found by the BOF to be protective of salmonid habitat, including LWD recruitment levels (BOF 2009). This means that LWD source areas and recruitment mechanisms will be sufficiently protected under standard FPR harvests in areas where the ASP rules apply.

The Mattole Restoration Council and Mattole Salmon Group also have active LWD placement programs to target LWD additions to stream reaches that could benefit from habitat enhancement. The South_1 subbasin in particular has had extensive LWD additions from these two restoration groups.

Regarding small (fine) organic debris levels, the following conclusions were reached at JDSF and are equally applicable in the Mattole watershed (CAL FIRE 2007):

> *Smaller organic debris also can affect beneficial uses of water. Fine organic materials provide food and host sites for benthic macroinvertebrates and microbes. However, decomposition of large amounts of fine organic matter may lead to oxygen depletion that can kill fish and other oxygen-requiring aquatic organisms and can release undesirable*

chemical compounds and odors. The Forest Practice Rules prohibit the deposition of slash or other fine organic materials in Class I or II waters, and require prompt removal if deposition occurs [14 CCR §§ 916.3, 916.3(a), 916.3(b)]. Inventories of Forest Practice Rule implementation and effectiveness related to water quality (Cafferata and Munn 2002) have not found compliance problems with these rule requirements, and the low level of timber operations in Class I and II WLPZ's indicates that there are few opportunities for deposition of fine organic materials into these watercourses.

Determination of Significance for Large Wood and Organic Debris

The analysis above shows that there is a less than significant cumulative effect on LWD and organic debris levels when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Sediment Effects

As described in Chapter 3.16, hillslope sediment yields continue to decline across the Mattole watershed. The primary reason for the decline is that sediment yields peaked at such a high level in the 1965-1970 time period due to a combination of destructive logging practices and an extreme storm event. However, as noted in the Mattole TMDL, watershed-wide sediment yield levels as of 2002 were still far above natural background levels (NCRWQCB 2002). The primary reason that hillslope sediment yield values remain above background levels is the extensive network of active and abandoned roads, which continues to be a significant source of chronic and episodic sediment. Secondary to the road network in terms of management-related sediment yield was the ongoing erosion from legacy timber harvest practices, such as diverted stream channels at watercourse crossings and harvest-related mass wasting.

A computer model was developed to analyze sediment yield based on the data and assumptions contained in the Mattole TMDL, the details of which were described in Appendix D. In order to analyze the cumulative impacts of past and reasonably foreseeable future projects described in Table 4-3, the additional projects were included along with the predicted harvest levels for the Program in the computer model. The following off-Program impacts were included in the sediment yield model:

- All sediment sources described in the TMDL, which covered the period from 1983-2002.
- Timber harvest that occurred from 2002-2009
- Good Roads Clear Creeks sediment reductions projects - both those completed as of 2009 and those predicted for the future
- Predicted off-Program timber harvest from 2010-2060
- Natural decline of legacy harvest sediment sources by 75% over the 2002-2060 time period (described in Appendix D).

Grazing-related sediment sources were not included because they were not quantified in the TMDL. New residential development was not included because the predicted activity was very minor and typically makes use of existing roads. KRNCA projects were not included because

they have been designed to produce insignificant quantities of erosion and many are or were conducted outside of the Mattole watershed.

It was established in Chapter 3.16 that the Program and Alternatives were similar in their impacts on net sediment yield, with the Program typically having the greatest beneficial effect. The net sediment yield was negative for all Alternatives and subbasins except the West_1 and West_2 subbasins, where it was slightly net positive. When the cumulative effect of all projects and natural decay of legacy sediment sources was added to Program impacts, the net result was a decline in hillslope sediment yield for all subbasins (Figure 4-4).

The modeled results indicate that the existing road network is the dominant source of anthropogenic sediment and only declines a little over time because only a small portion of the road network was predicted to receive harvest or treatment over the next 50 years. The total area subject to timber harvest, or footprint area, including Program and off-Program harvests ranges from a low of 3.8% in West 2 to a high of 16.3% in North 1 subbasin- thus leaving 83-96% of the poorly maintained road network untreated[1]. New harvest contributes a minor amount to the overall sediment yield, because the area treated is small; the yield is low and decays within 15 years. New roads contribute so little sediment that they do not even show up on the chart, which is largely because there is not much need for new roads to be built when such an extensive road network already exists. Finally, there is the effect of legacy sediment sources from historic harvests, which were predicted to decline steadily over the 58-year analytical time frame (2002-2060). The reason that the decline of legacy sediment sources was predicted to be so significant was that it occurred across the entire watershed, rather than only in areas that received treatment.

There is an important difference between the actively treated sediment sources and natural decline of legacy sediment sources. The actively treated sources (timber harvest or restoration efforts) actually prevent delivery of sediment to the channel network, whereas the decline of sediment yield from legacy sources is partly due to the failure of vulnerable sites which are unable to fail again in the future, e.g. Humboldt crossings or gullies which have reached a relatively stable state. The predicted net sediment savings for the Program and Alternatives due to road upgrades, treatment of legacy sediment sources and new timber harvests and roads calculated in Chapter 3.16 ranged from 1 to 2 million tons over the next 50 years. The Good Roads Clear Creeks (GRCC) program estimated that it has saved approximately 400,000 tons of sediment as of 2009 and plans to save an additional 1.4 million tons in coming years for a total of 1.8 million tons. Thus the GRCC program and the Mattole Forest Futures Program are expected to save roughly the same quantity of sediment over the 50-year analytical period, for a total of approximately 3 to 4 million tons or 60,000 to 80,000 tons per year.

[1] It is likely that the total extent of roads treated may exceed the area contained in the harvest footprint because appurtenant roads are required to be treated in harvest plans. Appurtenant roads are defined in the FPRs as roads "under the ownership or control of the timber owner, timberland owner, timber operator, or submitter of the plan." Unlike large industrial single ownership land bases, in the Mattole much of the private road network that accesses scattered rural parcels is not under the ownership or control of the timber owner, timberland owner, timber operator, or submitter of the plan. Therefore, the conservative assumption was made that only the roads within the harvest plan area would receive road upgrade treatments, as treatment outside of harvest footprint areas was speculative.

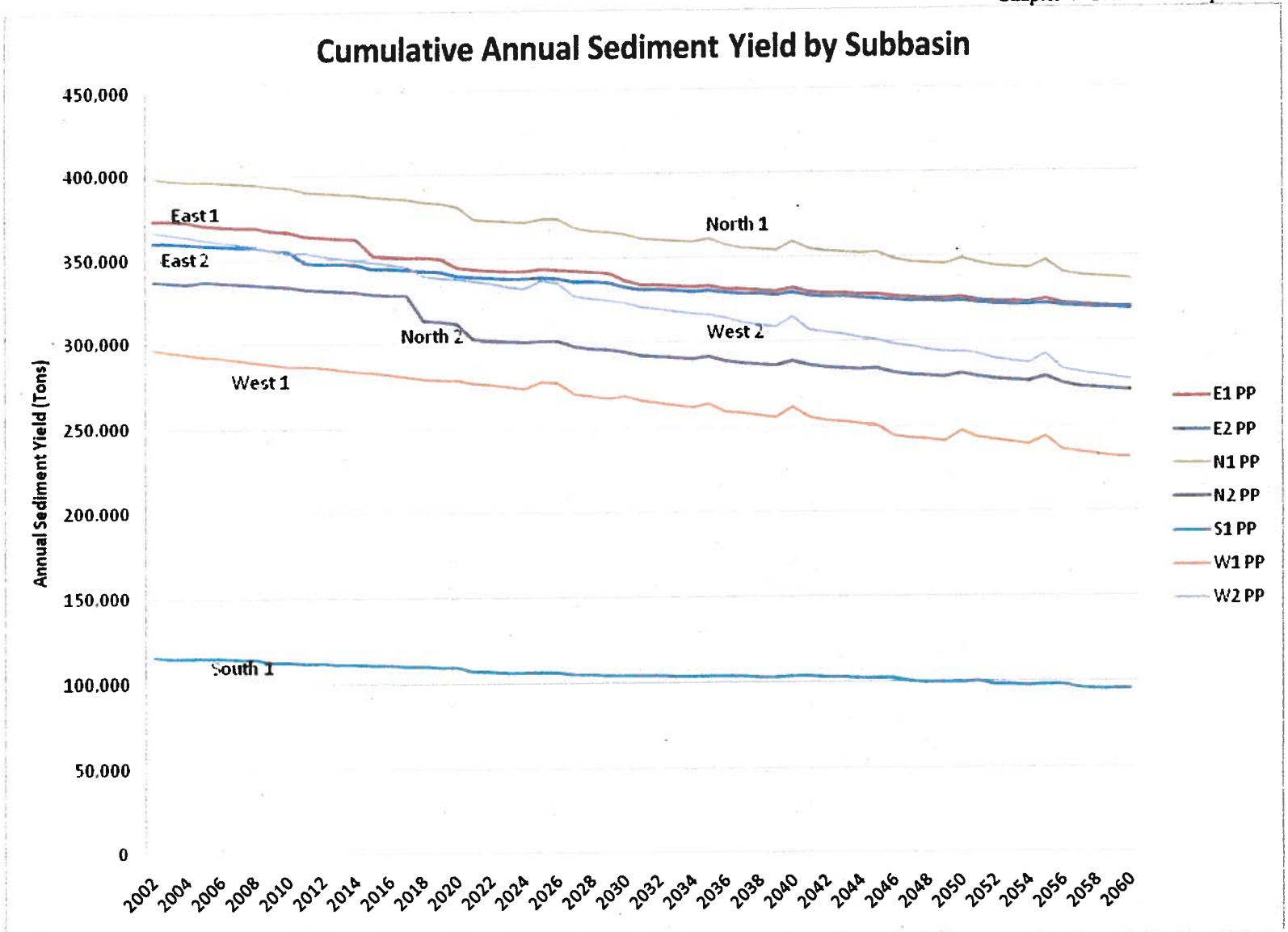
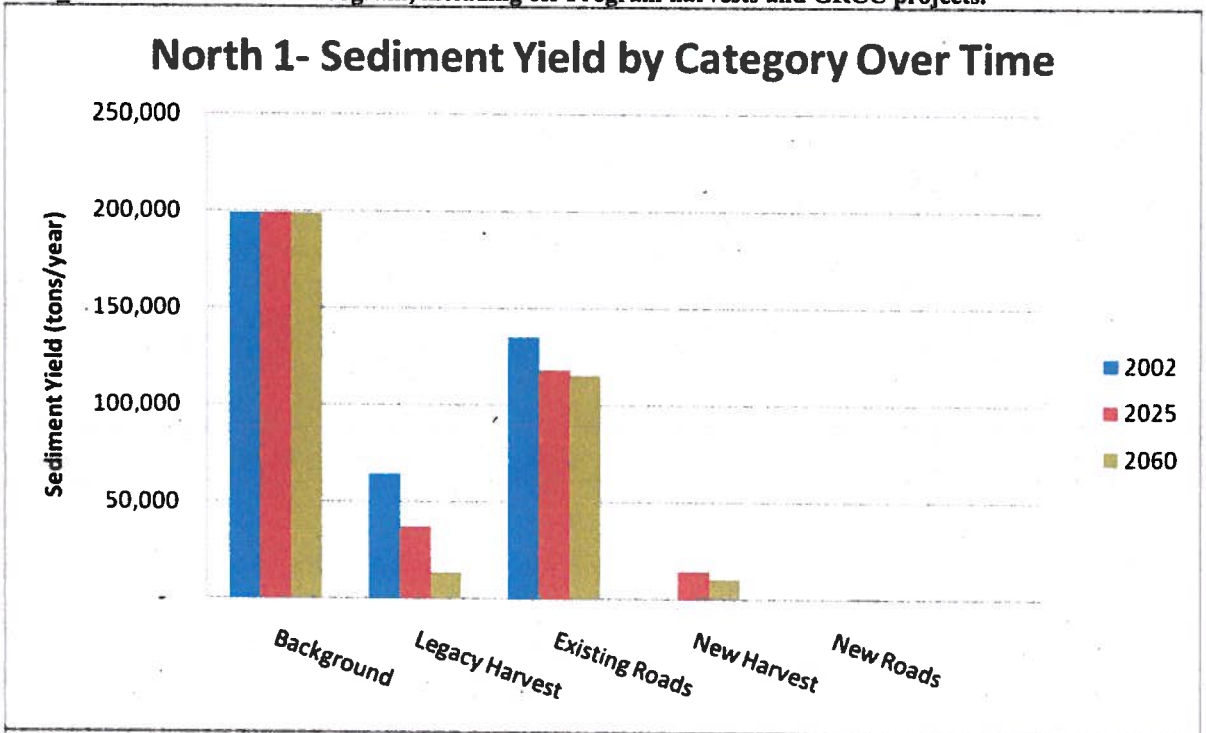
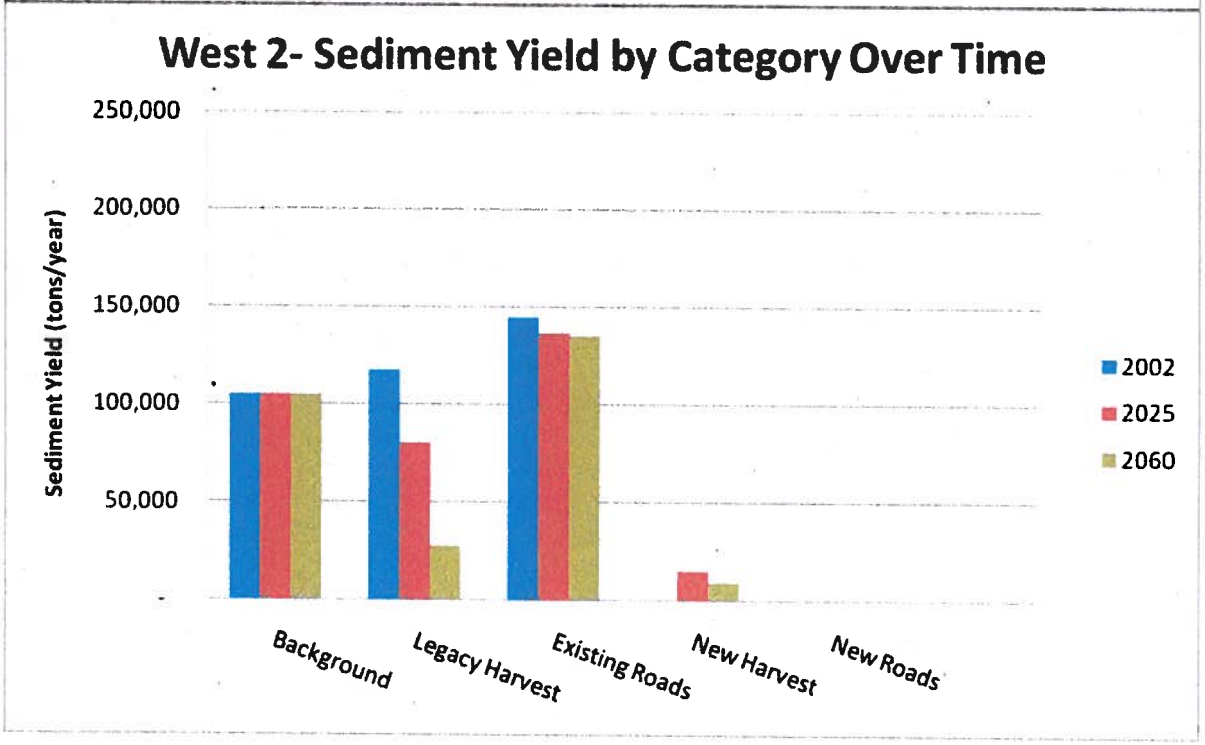


Figure 4-4. Comparison of predicted cumulative annual sediment yields for all subbasins under the Program including off-Program activities.

In order to understand why cumulative sediment yield is predicted to decline across all subbasins it is useful to look at examples of sediment yield by category from North 1 and West 2.

Figures 4-5 and 4-6. Comparison of predicted annual cumulative sediment yield by category for North_1 and West_2 subbasins under the Program, including off-Program harvests and GRCC projects.





The average annual cumulative sediment savings of 60,000 to 80,000 tons per year equates to 200 to 270 tons/mi^2/year. The Mattole TMDL calculated that management-related sediment yield in the Mattole (roads and legacy harvest) contributed 5,100 tons/mi^2/year. The load allocation for the Mattole from management-related sources was set at 700 tons/mi^2/year, which was an 86% reduction from loading as of 2002. The cumulative sediment savings from GRCC, MFFP and off-Program harvests of approximately 200-270 tons/mi^2/year represents a load reduction of about 5% over the next 50 years.

The TMDL estimated that Mattole-wide sediment yield due to legacy harvest was 1,410 tons/mi^2/year. If this sediment source declines by 75% as predicted, the total load will be reduced by about 1,060 tons/mi^2/year by 2060- or 21% of the management-related sediment load. Thus, the total management related sediment load reduction from planned management and natural decay of legacy sediment sources adds up to about 26%, still well short of the 86% load reduction target established in the TMDL.

The main impediment to reaching the TMDL goal of 86% reduction in sediment yield from management related sediment sources is that 80-90% of the 3,000+ mile road network remains untreated by the year 2060.

The cumulative effect of the Program and off-Program harvests on sediment yield in the Mattole basin is estimated to be a reduction in management-related sediment yield of approximately 2-3% over 50 years.

There may be minor, short-term, localized increases in water column turbidity associated with timber harvest and/or road upgrade treatments the year after harvest or treatment. However, as described in Chapter 3.16, the annual rate of harvest even when adding in off-Program harvests is still well below the 1.5% rate established as a threshold above which chronic turbidity impacts were likely to occur (Klein et al. 2008).

Determination of Significance for Sediment

The analysis above shows that there is a less than significant cumulative effect on sediment loading and water column turbidity when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Watershed References Cited

Beschta, R.L. et. al. 1995. Cumulative Effects of Forest Practices in Oregon: Literature and Synthesis. Prepared for the Oregon Department of Forestry. Salem, Oregon.

Board of Forestry and Fire Protection (BOF). 2009. Final Statement of Reasons. Anadromous Salmonid Protection Rules 2009. [Adopted by BOF on October 7, 2009] Title 14 of the California Code of Regulations (14 CCR): Sacramento, California.

CAL FIRE. 2005. Appendix 10: Peak flow analysis. Draft Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan. December 2005. Prepared by the California Department of Forestry and Fire Protection, Sacramento, CA. 25 p. Available online at:
http://www.fire.ca.gov/resource_mgt/downloads/jdsf_deir_05/DEIR_Appendix_10_PeakFlowAnalysis_12.2005.pdf

CAL FIRE. 2007. RECIRCULATED DRAFT Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan Alternative G. Prepared by the California Department of Forestry and Fire Protection, Sacramento, CA.

Klein, R.D, W.J. Trush and M. Buffleben. 2008. Watershed condition, turbidity, and implications for anadromous salmonids in the north coatal California streams. Report to North Coast Regional Water Quality Control Board, Santa Rosa, CA.

North Coast Regional Water Quality Control Board. 2002. Mattole River Watershed Technical Support Document for Sediment and Temperature. North Coast Regional Water Quality Control Board, Santa Rosa, California

Welsh, H., G.R. Hodgson and A.J. Lind. 2005. Ecogeography of the herpetofauna of a northern California watershed: linking species patterns to landscape processes.

4.8 Soil Productivity and Geologic Cumulative Impacts

The section summarizes the cumulative impacts to soils and to geology due to implementing the Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts on soils and geology is the Mattole basin.

The significance criteria and the determination thresholds have already been previously described in Chapter 3. The determination thresholds are reproduced here since they establish the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined might create a significant cumulative impact if they would:

- Substantially increase mass wasting in the form of landslides or other geologic hazards
- Substantially increase soil erosion rates, or
- Substantially reduce soil productivity.

As described in the FPRs, adverse cumulative impacts to soil productivity can occur when the impacts of two or more activities, from the same or different projects, combine to produce a significant increase in soil erosion rates or substantially reduce soil productivity.

Forest Management Impacts

Factors influencing soil productivity that can be affected by timber operations include: organic matter loss, surface soil loss, soil compaction, and growing space loss. Recovery from these impacts is often slow, so mitigation measures must focus on prevention and limits on the extent of impact

Chapter 3 described the impacts to soils and geologically unstable areas resulting from the Program's practices. Generally, the impacts from implementing the Program on 15,038 acres were considered to create a less than significant impact to soils and geologically unstable terrain. These negligible impacts are partly the result of the fact the Program only treats about 13% of the commercial forestland within the Mattole (although as much as 29% of North_1 might be treated). Off-Program harvest adds an additional 4,912 acres of mostly even-aged harvest to the 15,038 acres of "light touch" harvest from the Program. The additional off-Program impact is concentrated in the North_1 and South_1 subbasins as a result of additional HRC even-aged harvest in North_1 and even-aged harvest from Barnum Timber Company in South_1.

Old-growth timber operations typically were conducted with little concern for soil productivity impacts. These activities removed much of the surface organic material and left slopes exposed to erosion. Later tractor logging resulted in large numbers of excavated skid trails, landings, and roads with little erosion control, often directly filling watercourse channels; deeply excavated layouts; extensive slash removal and site preparation by tractors with large amounts of soil movement; and the continued use of hot, broadcast burning for slash removal and site preparation. Through the 1960s, erosion control was rarely provided for roads and skid trails after use and before winter rainfall. This phase of tractor logging resulted in the removal of

much organic matter, large amounts of soil disturbance, displacement, and direct placement into watercourses, the creation of large areas of compacted surfaces, and greatly accelerated surface erosion, gully erosion, and mass wasting.

Organic matter loss can cause a decrease in site productivity due to loss of support for critical soil microbial activity and diminished capability of the soil to store moisture in a form readily available to both plants and soil microorganisms. Organic matter loss can occur by displacement of surface organic materials during skidding, mechanical site preparation, and other land disturbing timber operations and from erosion, burning, or oxidation of exposed fine organic material. Soil productivity is affected by the loss of nutrients stored in organic matter, surface exposure that results in higher temperatures and increased evaporation during the dry season, and reductions in soil porosity from loss of soil organic matter. These impacts can be avoided or reduced by minimizing the use of broadcast burning for slash control and site preparation.

The potential for erosion following logging is largely a function of the area of exposed mineral soils. Soil loss occurs from mechanical displacement during road building, harvesting, or site preparation and by surface erosion or mass wasting on harvest units. Removing the surface soil has a disproportionate impact on soil productivity because the upper layers of soil are the storehouse of organic matter and nutrients that have accumulated from decomposing plant materials and atmospheric sources. As described in Chapter 3, loss of soil by mass wasting (above background rates) from timber operations is prevented by identifying and placing limits on operations in unstable areas. Implementation of the Geologic Flow Chart is a key part of the proposed methods to reduce and avoid soil disturbance and mass wasting. Surface soil erosion is further minimized by the reduced emphasis on use of broadcast burning and other intensive site preparation methods in the Program. Loss of surface soil by mechanical displacement is avoided or reduced by re-use of existing skid trails, and restrictions on the use of yarding systems that create excavation on steep slopes.

Soil compaction leads to loss of soil productivity by reducing pore space for water storage, movement of water, and for the exchange of oxygen, carbon dioxide, and other gases that are required and produced by roots and soil organisms. Compaction also increases soil density and strength, which impedes root penetration. Measures designed to limit compaction produced by timber operations include controlling the location and amount of ground disturbance by ground-based equipment (e.g., through the use of cable yarding, pre-designated skid trails) and suspending operations above specified soil moisture contents (Froehlich and McNabb 1984). .

Growing space loss is most affected by the construction of new roads and landings that take timberland out of production. Minimizing the number of roads, landings, and skid trails used for timber operations can reduce growing space loss along with re-use of existing landings and skid trails. Cable yarding tends to take less ground out of production since no skid roads are constructed. However, multiple stand entries over time can increase soil impacts so that cumulative impacts at the watershed scale can become significant. In addition, uneven-aged silvicultural systems that often involve reentry on a shorter time scale than even-aged systems can also increase soil impacts.

Impacts from Reasonably Foreseeable Probable Future Projects

Off-Program harvest adds an additional 4,912 acres of mostly even-aged harvest to the 15,038 acres of "light touch" harvest from the Program. The additional off-Program impact is concentrated in the North_1 and South_1 subbasins as a result of additional HRC even-aged harvest (e.g. variable retention is considered an even-aged silvicultural technique) in North_1 and even-aged harvest from Barnum Timber Company in South_1. The Chapter 3 impacts analysis of Alternative I (which uses even-aged harvest) shows a potential for a moderate impact in the East_1 and North_1 and North_2 subbasins. As the amount of exposed soil increases, the erosion hazard rating of soils in these subbasins is elevated to a level higher than when the Program's practices are employed.

Chapter 3 described the impacts to soils and geologically unstable areas resulting from the Program's practices. Generally, the impacts from implementing the Program on 15,038 acres were considered to create a less than significant impact to soils and geologically unstable terrain. These negligible impacts are partly the result of the fact the Program only treats about 13% of the commercial forestland within the Mattole (although as much as 29% of North_1 might be treated). The addition of the off-Program harvest of an additional 4,912 acres is not expected to change the impacts to soils except for the North_1 and North_2 subbasins, because the additional harvest amounts to around 1-4% additional acreage harvested in the future.

Other reasonably foreseeable probable future projects are generally so limited in extent, such as the KRNCA shaded fuel break maintenance, residential development and fire safe council projects, that the cumulative impact of these additional projects is not expected to create significant adverse impacts beyond those already described above.

The reasonably foreseeable probable future "project" that might have an impact is the continued impact of cattle grazing. While the Program does not treat grasslands, there may be an adverse impact to soils from cattle that venture into forested areas. The largest accumulation of grazing animals is in the North_1 and North_2 subbasins, where the greatest adverse impacts from the Program and other cumulatively additive projects are located.

The action of animal hooves would cause some disturbance, shearing, and compaction of soil, increasing its susceptibility to both water and wind erosion. These impacts can be severe in heavily grazed areas, but are less so under light and moderate grazing intensities. Severe compaction often reduces the availability of water and air to the roots, sometimes reducing plant vitality. Soil organisms can be negatively affected as grazing animals can cause the loss of surface organic matter, create soil compaction, and create structural habitat alterations. Recovery time from grazing-induced compaction is site-dependent, with recovery observed usually within 1 to 2 years (Wheeler et al. 2002).

Determination of Significance for Soils and Mass Wasting

The analysis above shows that there is a less than significant cumulative effect on soils when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

For mass wasting, the analysis above shows that there is a less than significant cumulative adverse impact resulting from additional landslides due to the additive impacts of combining the individual Program practices together with the reasonably foreseeable probable future projects and activities.

Soil Productivity and Geologic Reference Cited

Froehlich, H.A. and D.H. McNabb. 1984. Minimizing soil compaction in Pacific Northwest forests. Pgs. 159-192 in: E.L. Stone (ed.) Forest Soils and Treatment Impacts. Proc. of the 6th N. Am. For. Soils Conf. Univ. of Tennessee, Knoxville, TN. June 1983.

Wheeler, Melinda A., M.J. Trlica, Gary W. Frasier, and J.D. Reeder, 2002. Seasonal grazing affects soil physical properties of a montane riparian community. Journal of Range Management 55:49-56, January 2002.

4.9 Biological Cumulative Impacts

Aquatic Resources

The Mattole NCWAP report (NCWAP 2002), MRRP (2009) and MRRP (2010) contain the most recent and relevant descriptions of fisheries populations, trends and habitat conditions for the Mattole and are not repeated here. Welsh at al. (2005) provide the most recent and relevant description of herpetofauna distribution in the Mattole watershed. For a detailed review of the relationship of habitat parameters to aquatic species needs see CAL FIRE (2007).

According to the NCWAP report, the most limiting habitat conditions for each subbasin were as follows;

- Northern subbasin - high water temperatures
- Southern subbasin - low summer water flows/dry reaches
- Eastern subbasin – excess sediment delivery to watercourses
- Western subasin- instream habitat, lack of complexity

As noted in Section 3.4, aquatic habitat conditions in the Mattole have been degraded by excess sediment delivery, much of it delivered during the 1964 flood event. Since 1964 the quantity of sediment delivered to the stream channel via landsliding, which is the dominant sediment delivery mechanism in the Mattole, has declined dramatically (NCRWQCB 2002). As sediment supplies from hillslopes declined, water and gravity carried much of the delivered sediment down the channel network. The result was a 42% decrease in the length of channel reaches with negative mapped channel characteristics[2] between 1984 and 2002 (NCWAP 2002). Essentially, stream channels in the Mattole watershed are recovering from the top down; smaller and higher-gradient channels have largely recovered from the excessive sediment loading experienced post 1964. However, the sediment is still accumulating in low-gradient tributaries and the mainstem of the Mattole, where sediment transport rates have not been sufficient to move the excess sediment out to the ocean. Regardless of current land management practices, a complete recovery to pre-1964 channel conditions in the low-gradient tributaries and the mainstem Mattole will take decades to centuries.

The California Board of Forestry and Fire Protection (BOF) recently adopted regulations to address the situation of poor aquatic habitat common to salmonid-bearing streams across forestland in California, known as the Anadromous Salmonid Protection Rules (FPR 916.9, 936.9, 956.9). In a formal review of the environmental impacts of adopting these rules the BOF (2009) made the following findings (among others):

- *The Board finds that the adopted regulations are based on the consideration of an extensive review and evaluation of applicable scientific literature. The adopted rules are found to be based upon the science literature review and testimony from scientists*

[2] Negative mapped channel characteristics (NMCC) was a term developed by aerial photo interpreters in the NCWAP Mattole process to refer to channel reaches that appeared to be overly wide due to sediment aggradation and/or had unstable riparian vegetation due to high sediment loads (NCWAP 2002).

and technical experts in the fields of watershed processes, riparian functions, and fisheries biology.

- *The Board finds that the adopted regulations are based on recommendations by the Department of Fish and Game, the California Department of Forestry and Fire Protection, the State Water Quality Control Board and Regional Boards, and numerous individuals.*

- *The adopted regulations are found by the Board to be consistent with goals established in the California Fish and Game Commission, Board of Forestry and Fire Protection, Joint Policy Statement on Pacific Salmon and Anadromous Trout*

- *The Board finds that the adopted regulations will maintain and improve aquatic habitat and contribute to restoration of listed anadromous salmonids. This finding is based on the expected effects on the beneficial uses of water, including cold freshwater habitat, spawning, migration and rare and endangered species...*

All subbasins within the Mattole watershed are subject to the ASP rules, which have been determined to be protective of salmonid habitat. The Program and Alternatives 2 and 3 include additional regulations to further protect salmonid habitat and are therefore even more likely to, "maintain and improve aquatic habitat and contribute to restoration of listed anadromous salmonids."

The Mattole coho Recovery Strategy (MRRP 2010) contains a ranked listing of mainstem and tributary reaches of highest priority for protection and restoration. Most of the high priority habitat occurs in the South_1 subbasin, while very little occurs in the North_1 and North_2 subbasins.

Furthermore, as determined in Chapters 3.16 and 4.2, neither the Program nor will any of the Alternatives in combination with off-Program activities have a significant adverse impact on water quality or LWD recruitment.

Cumulative harvest levels (footprint) over the 50-year analytical period are highest in the North_1, North_2 and South_1 subbasins, at 16.3%, 13.6% and 13.3% respectively. This pattern is driven by the ownership pattern in the Mattole; almost all of the industrially owned lands are located in these three subbasins. Although these three subbasins represent the most intensively managed lands in the Mattole, the annual rate of harvest and average annual cumulative canopy reduction levels are still quite low at less than 1% and 3% respectively (see Section 4.2).

As discussed in Chapter 3.4 amphibians are sensitive to water quality conditions and also to microclimatic conditions. In regards to forest harvest, it appears that increased canopy removal is related to increased change in microclimatic conditions, i.e. warmer and drier. A subset of cool temperature adapted amphibians is very sensitive to warmer, drier climatic conditions and therefore are more often found in older stands with more canopy cover. Thinning of forest stands has less of an effect on amphibians than clearcutting and both had variable responses

observed in studies. Riparian buffers are helpful for protecting amphibians, but linkages across watershed and sub-watershed divides are also important.

The Program clearly provides the best combination of prescriptions to maintain amphibian populations relative to the other Alternatives. First, even-aged harvesting is prohibited, which is an improvement over Alternative 1 and 2 in regards to buffering microclimate impacts. Also, by eliminating even-aged harvesting, forested linkages between subbasins will be maintained at all times. By requiring uneven-aged harvesting and retention of half of the largest trees after each entry, stands managed under the Program will continue to become bigger and older over time, rather than oscillating between zero and 50-70 years of age indefinitely as typically occurs in even-aged managed stands. Old-growth trees, which are a component of habitat types preferred by some amphibians, are prohibited from harvest within the Program and Alternative 3. Within the Program, the riparian buffer widths and protective measures on class I, II and III streams exceed those for Alternatives 1 and 3. Alternative II includes wider no-cut buffers than the Program, but also permits even-aged harvests that offset this benefit to some extent.

The cumulative impact assessment includes an additional 4,912 acres of off-Program, mostly even-aged harvesting beyond the harvest predicted for the Program, or 2.5% of the Mattole watershed over 50 years. The highest concentrations occur in the North_1, North_2 and South_1 watersheds at 3.8%, 3.5% and 9.7% of watershed area respectively. The most concentrated area of even-aged harvesting occurs in South_1, which is a unique subbasin within the Mattole climatically. As noted in Chapter 3.4, despite extensive even-aged harvesting over the 1984-2008-time period on the same industrially owned lands projected for future harvest, stream water temperatures remained suitable for coho. The South_1 subbasin is influenced by coastal fog and contains the only substantial population of redwood trees in the Mattole watershed. The coastal influence of the South_1 subbasin will likely ameliorate the potential adverse impacts to microclimate due to even-aged harvest (Ashton, Marks and Welsh 2005).

Determination of Significance for Aquatic Resources

The analysis above shows that there is a less than significant cumulative effect on aquatic resources when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Aquatic Biologic References Cited

Ashton, D.T., S.B. Marks and H.H. Welsh. 2005. Evidence of continued effects from timber harvesting on lotic amphibians in redwood forests of northwestern California. Forest Ecology and Management 221:183-193.

CAL FIRE. 2007. Recirculated Draft Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan Alternative G. Prepared by the California Department of Forestry and Fire Protection, Sacramento, CA.

MRRP (Mattole River and Range Partnership: Mattole Restoration Council, Mattole Salmon Group, and Sanctuary Forest) 2009. Mattole Integrated Coastal Watershed Management Plan:

Foresight 2020. Petrolia, Calif. 190 pp.

Mattole River and Range Partnership. 2010. Draft Mattole Coho Recovery Strategy. Petrolia, California.

NCRWQCB, 2002. Mattole River Watershed Technical Support Document for the Total Maximum Daily Loads for Sediment and Temperature. California Regional Water Quality Control Board North Coast Region. Santa Rosa, CA. 2002.

NCWAP, 2002. (Downie, Scott T., C.W. Davenport, E. Dudik, F. Yee, and J. Clements (multi-disciplinary team leads). 2002). Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program, p. 441 plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

Welsh, H., G.R. Hodgson and A.J. Lind. 2005. Ecogeography of the herpetofauna of a northern California watershed: linking species patterns to landscape processes.

Vegetation Cumulative Impacts

This section summarizes the cumulative impacts to vegetation due to implementing the Program in conjunction with the on-going and reasonably foreseeable probable future projects. Section 3.14 provides a substantial level of cumulative impacts analysis for this topic because it is largely based on an assessment of stand structure classification over time. Also, the description of potential impacts from Sudden Oak Death apply to the whole watershed and could easily be included in both the direct effects and cumulative effects sections. Even though no significant direct impacts to botanical resources were identified in that analysis, there is still the potential for impacts from the Program to combine with those of other reasonably foreseeable future projects or processes to cause significant adverse cumulative impacts.

The significance criteria and the determination thresholds have already been previously described in Chapter 3. The determination thresholds are reproduced here since they establish the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined might create a significant impact if cumulatively they would:

a. Threaten to eliminate a plant community;
b. Violate any state or federal wildlife protection law; or
c. Contribute directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native species or subspecies at the watershed level.

Impacts to Vegetation from Reasonably Foreseeable Probable Future Projects

The cumulative impacts analysis requires identification and analysis of reasonably foreseen projects that could occur within or outside of the Program area, such as off-Program timber operations. In addition to human-initiated projects, impacts from processes such as the spread of sudden oak death (SOD) must also be considered.

Of the reasonably foreseen projects, the off-Program timber operations are the most pertinent to analyzing the cumulative effects to vegetation from all types of timber harvesting combined. Off-Program timber operations would not be tiered to the PTEIR and filed as PTHP's, but would likely be filed as THP's tiered to the FPR's. Off-Program timber operations are assumed to be similar to the status quo prescriptions modeled and are not expected to meet most of the goals of the Program, such as increasing development of mature conifer stands. An assumption of the modeling of off-Program activities is that even with the Program in place, many landowners would not choose to utilize PTHP's but would continue to file THP's (see explanation in section 4.6 earlier in this chapter).

In addition to the off-Program timber operations, other reasonably foreseeable projects and processes which could affect forest habitat and special status species over the 50-year analysis period are shown below.

KRNCA Late Seral Silvicultural Improvement Projects	50 acres/year
KRNCA Shaded Fuel Break Maintenance	1800 acres
MRC Fuel Reduction Projects	120 acres/year
Sudden Oak Death Infestation	possibly up to 1,000 acres/year

Impacts to Vegetation From Sudden Oak Death

The spread of SOD in the Mattole watershed has the potential to have significant effects on forest vegetation in the Mattole regardless of whether the Program is implemented or not. SOD is expected to impact the hardwood vegetation types the most, particularly the non-commercial forestlands where hardwood stocking is the highest. Also, stands managed under the Program that have a substantial hardwood component could potentially suffer from widespread tanoak mortality independent of silvicultural treatments. However, these impacts will not be exacerbated to a significant extent by activities conducted under the Program, largely due to the standard BMPs described in Section 2.1(C.6). Additionally, if SOD kills more than 80% of tanoak on 35% or more of the acres in any one subbasin, then the Program's practices associated with the All Aged prescription will be modified to mitigate for the loss of hardwood canopy and mast. (see section 2.1(C.6) for details)

In general, stands affected by SOD would have a much higher level of tanoak mortality than would occur in even the most intensive Program treatments. The effect to vegetation of Program treatments is extremely different than the effect of SOD infestation and subsequent mortality, particularly the level of standing dead fuel. For these reasons, stands managed to reduce the proportion of hardwood stocking are not expected to add to the acreage of high mortality SOD stands.

Forest Habitat Analysis

The assessment area for describing the potential cumulative impacts on vegetation is the Mattole basin rather than just the Program area itself. This larger area of evaluation for cumulative impacts includes many acres of forestland where timber operations are not projected to occur, such as most public lands; non-commercial timber stands, no-cut buffers within managed areas, and forested properties where no commercial management is anticipated to take place. All these areas contribute to the overall forested landscape of which the Program managed lands are a part.

Therefore, all the commercial forest types were grown forward using the FVS modeling software without any management for the 50-year analysis period. The WHR classification of these stands at each time period was determined as described in Sections 3.14.5. The WHR Classification Key is shown in Table 2-7, and is repeated here below for the facility of the reader. Non-commercial forest (mostly lands classified as MHW4D in the GIS data) was not included in the projections due to a lack of data and the fact that it would not develop any differently under the Program or the Status Quo. However, as explained in chapter 3.19-Timberland Resources, the lands classified as MHC4D in the GIS data had inventory plot data and were included in the projections but were renamed MHW4D based on the inventory data.

In order to develop the WHR charts for the whole watershed, projections for the Program footprint were combined with projections for the off-Program harvests as well as all the unmanaged commercial forest types to create the same type of chart used in the direct impacts analysis in Chapter 3.14. The same thing was done for the Status Quo situation so that the Program impacts at the landscape level could be compared to the distribution of forest types without the Program in place.

Table 4-4 (also 2-7)
WHR Classification Key for Mattole Forestlands

SPECIES		SIZE CLASS avg dbh of overstory		DENSITY Total Canopy Cover %	
DFR	>50% relative overstory cover by conifers (Douglas fir /redwood)	6	> 24" & multi-storied	S	Sparse 10-25%
MHC	Montane Hardwood/Conifer - relative overstory conifer cover between 25 & 50%	5	> 24"	P	Patchy 25-40%
MHW	Montane Hardwood – relative conifer cover < 25%	4	11" – 24"	M	Moderate 40-60%
		3	6" – 11"	D	Dense > 60%
		2	1" – 6"		
		1	< 1"		

Charts showing the progression of WHR classification on all the commercial forestland in the watershed are displayed below for the Program and the Status Quo. The most telling result indicated by these watershed charts is the apparent similarity between the Program and the Status Quo. While the difference between silvicultural treatments and subsequent stand development is great on the actual footprint acres, once all the unmanaged lands are included in the picture, the differences are greatly diluted. However, there are still some important differences to highlight. Under the Program there are significantly more acres in the 'M' density class (shown as the patterned series in the charts) than in the Status Quo due to the much greater amount of uneven-aged management occurring, even though this still represents a very small proportion of the landscape.

The same metrics utilized in analyzing the footprint area – late seral habitat change and transition from hardwood to conifer classification – are important to point out on the landscape scale as well. As of 2010 the watershed is estimated to have 9,440 acres of size class 5 or 6 forest. By the end of the projection, the area of potentially late succession forest stands will have increased to about 85,000 acres in the Status Quo and 88,000 acres with the Program in place. All of the increase in class 5 & 6 under the Status Quo is the result of unmanaged stands growing into this classification, whereas under the Program some of the managed lands develop into class 5 & 6 in addition to the unmanaged lands. While the increase in late succession habitat in the watershed by 3,000 acres under the Program could be considered moderately beneficial, this is only 4% more of an increase than occurs in the Status Quo. However, there is significantly more size class 6 beginning earlier in the projection under the Program, since stand structure becomes multi-storied much sooner under Program selection than it would with no management.

Generally, WHR class 6 has much greater late seral habitat value than class 5 due to its diverse stand structure. Under the Status Quo no class 6 stands occur until 2055, but with the Program in place they begin to develop 15-20 years earlier. By 2060 there are projected to be 15,900 acres of WHR class 6 forest compared to 8,200 acres projected in the Status Quo scenario – nearly twice as much.

The gradual transition of hardwood-dominated stand types to conifer is characterized in the same charts. Under both the Program and Status Quo scenarios the proportion of the commercial forest landscape in MHC and MHW types goes from 53% in 2010 to about 19% in 2060. The vast majority of these acres go unmanaged in both scenarios, but stands generally have sufficient conifer stocking to eventually grow into a conifer classification without management. Treatments in hardwood dominated stands tend to accelerate the successional change from hardwood to conifer dominated, but these treatments represent only 37% of the total harvested acres under the Program and thus an even smaller portion of the cumulative effects area. These treatments would likely occur on too small a portion of the landscape to detect the changes at the watershed level.

Figure 4-7

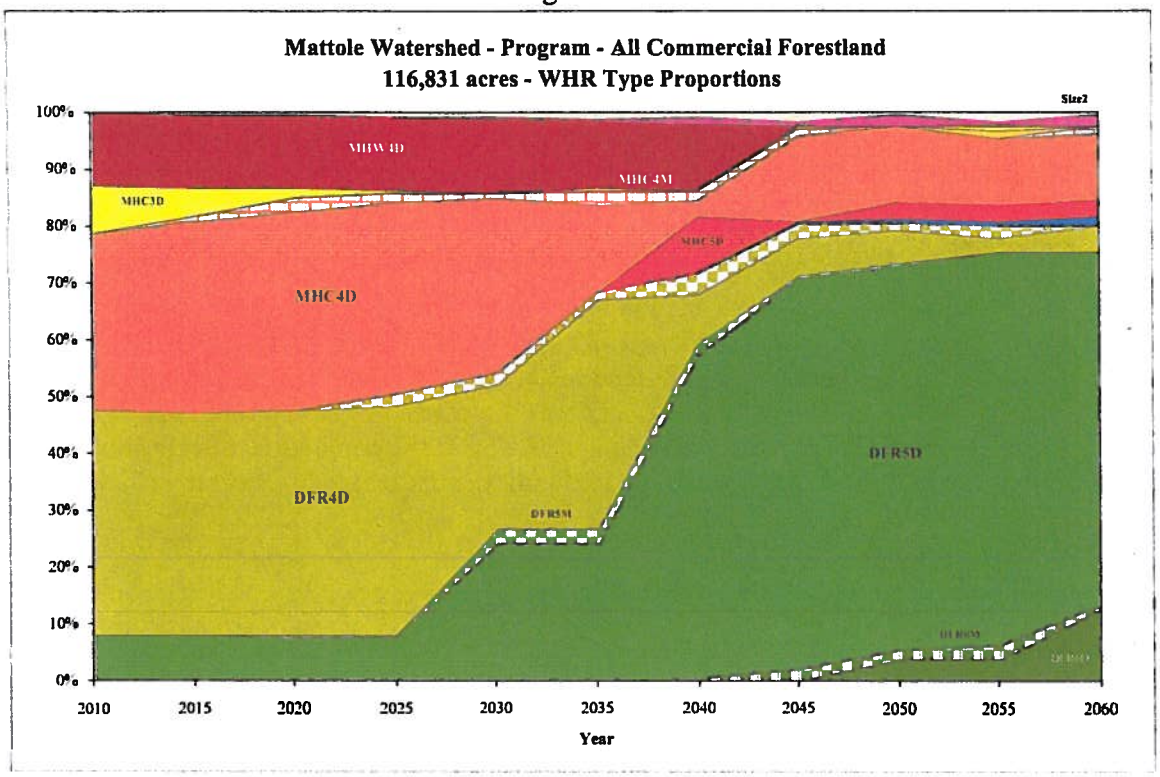
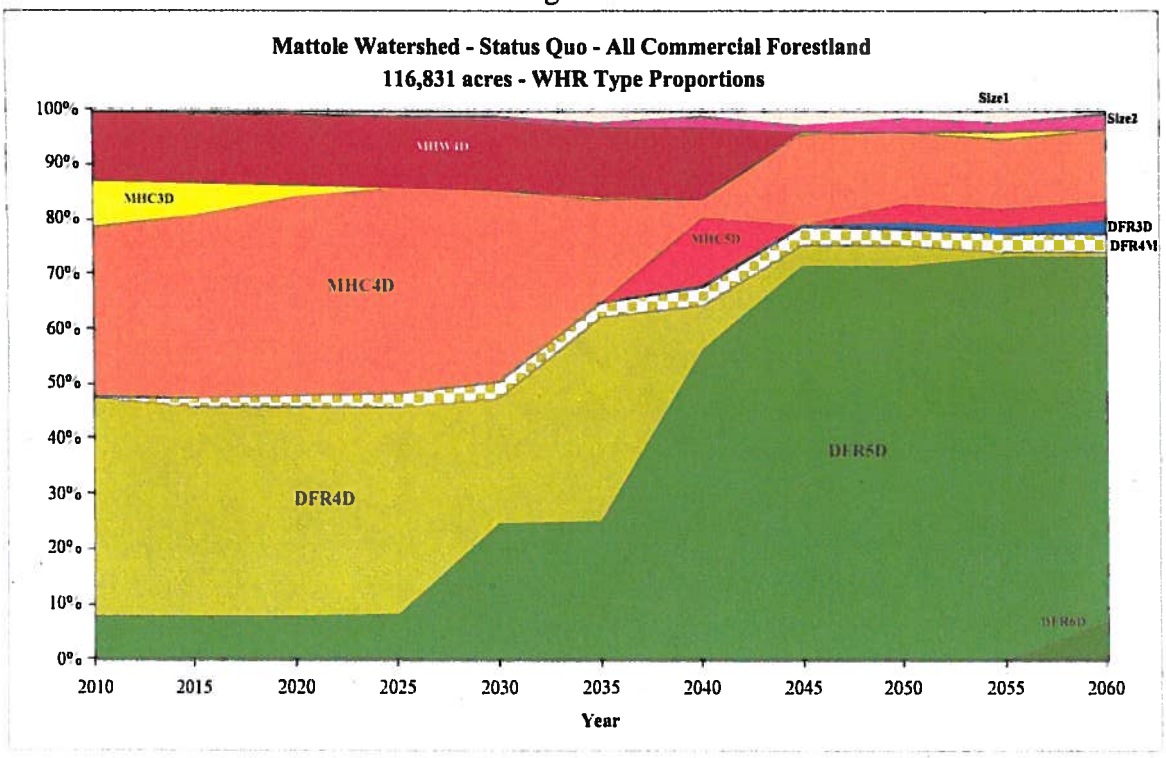


Figure 4-8



Invasive Species

Under California law, certain invasive non-native plants are designated as noxious weeds (California State-listed Noxious Weeds) because they are, or are likely to be:

> "troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and difficult to control or eradicate" (Title 3 CCR, FAC 5004).

These noxious weeds are ranked by the State Department of Food and Agriculture as A, B, C, or Q (refer to http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/noxweedinfo_hp.htm for most current list) that denotes the appropriate action (eradication, containment, etc.) to be taken when such species are detected.

In addition to designated noxious weeds, there are invasive non-native plants, termed "non-noxious invasive weeds", that may have a significant negative impact on natural ecosystems. The nonprofit California Invasive Plant Council (Cal-IPC), in its "California Invasive Plant Inventory, Feb 2006", maintains a database of these weeds. More information on invasive plants and levels of concern can be found at www.cal-ipc.org/inventory/weedlist.php

Adverse impacts are those where invasive non-native plants are able to either successfully invade or reinvade treatment areas and establish viable populations, either because the treatments prepared hospitable site conditions or left viable populations of invasive non-native plants intact and able to increase in extent. A significant adverse impact would be a major increase in a population sufficient to enable invasive non-native plants to dominate the natural plant community within the short-term (2-5 years).

The list of invasive plants relevant to the Mattole and their rankings can be found in the table in Section 3.14.1. A discussion of their current status in the watershed and potential for spread is also found there so does not need to be repeated here.

At the watershed scale, the potential for cumulative effects would exist if conditions were being created conducive to the spread of invasives at a much greater level than would occur in the absence of the Program. On the contrary, there is much more even-aged treatment projected in the Status Quo than under the Program. Exposed ground along roads is the primary conduit for the spread of invasives and would be more prevalent in even-aged harvesting. Even though uneven-aged management often utilizes more of the extensive road network, it does not leave as much exposed ground with minimal canopy cover. The data in the WHR charts indicates that by 2060 there would be approximately 60% more forestland in size classes 1&2 (average diameter < 6") under the Status Quo than under the Program.

Determination of Significance for Vegetation Resources

- Special Status Species

Potential direct impacts to special status plant species at the project level have been addressed in Section 3.14. These are avoided by compliance with the DFG scoping and survey requirements. Also, the maintenance or improvement of beneficial habitat conditions in the watershed will help ensure the long-term viability of plant populations. Since no significant effects are expected to occur at the project level, none would be expected at the cumulative effects level unless one or more of the reasonably foreseeable future projects could have at least a moderate level of adverse effects.

Although some herbaceous species can serve as SOD hosts, there is no evidence that SOD has a negative impact on herbaceous species such as those Special Status plants on the list in Table 2-8, and none of these plants has a particular known association with habitat types most likely to be heavily affected by SOD. Stand improvement activities conducted by KRNCA would presumably be subject to the same kind of scoping requirements for special status plant species, as would the fuel reduction projects conducted by the MRC.

Therefore, cumulative impacts are predicted to be less than significant from Program activities and would not, in combination with Program treatments,

a. Threaten to eliminate a plant community;
b. Violate any state or federal wildlife protection law; or
c. Contribute directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native species or subspecies at the watershed level.

- Late Succession Forest Stands

The cumulative impact from Program treatments in combination with the reasonably foreseeable future projects is determined to be moderately beneficial, largely due to the increased amount of WHR class 6 habitat created compared to the Status Quo. There will be no significant adverse impacts to late succession forest stands in the watershed as a result of implementing the Program.

- Invasive Species

The results of analysis indicate that the spread of non-native invasive species in the Mattole watershed will not be increased to a significant extent by activities conducted under the Program. While some of the Reasonably Foreseeable Probable Future Projects could facilitate the spread of invasives, Program treatments would not exacerbate these conditions to a level that would cause significant adverse impacts.

Terrestrial Wildlife

This section summarizes the cumulative impacts to wildlife from implementing the Proposed Program combined with impacts from reasonably foreseeable projects or processes. The assessment area for describing the potential cumulative impacts of implementing the Program's practices on wildlife, including threatened and endangered species, is the Mattole basin. However, many of the impacts described below are analyzed against the commercial forest landbase in the basin for two reasons: first, they apply largely to impacts to wildlife habitat in forested ecosystems, such as percent canopy cover; and second, because the analysis would be more likely to identify adverse impacts within a smaller landbase than the entire basin, which contains many non-commercial forest stands and non-forested areas.

Section 3.18 provides a substantial level of cumulative impacts analysis for this topic because it is largely habitat-based and examines habitat and its wildlife implications across the assessment area. Even though no significant impacts to terrestrial wildlife resources were identified in the direct affects analysis, there is still the potential for impacts from the Program to combine with those of other reasonably foreseeable future projects or processes to cause significantly adverse cumulative impacts.

- Terrestrial Wildlife Significance Criteria

The Program and Alternatives would have a significant cumulative effect to wildlife resources if impacts from the Program or any alternative, combined with those of reasonably foreseen projects or processes would:

a) Violate any state or federal wildlife protection law; or
b) Contributes directly (through immediate mortality) or indirectly (through reduced productivity, survivorship, genetic diversity, or environmental carrying capacity) to a substantial, long-term reduction in the viability of any native species or subspecies at the state level.

- Direct Impacts to Terrestrial Wildlife from the Program or Alternatives

The cumulative impacts analysis requires identification and analysis of reasonably foreseen projects that could occur within or outside of the Program area, such as off-Program timber operations. In addition to human-initiated projects, impacts from processes such as the spread of sudden oak death (SOD) must also be considered.

Of the reasonably foreseen projects, impacts from off-Program timber operations are indistinguishable from those for Alternative I as described in 3.18. Off-Program timber operations would not be tiered to the PTEIR and filed as PTHP's, but would likely be filed as THP's tiered to the FPR's. Off-Program timber operations are not expected to meet most of the wildlife goals of the Program, such as favoring the development of mature conifer stands. An assumption in modeling off-Program activities is that even with the Program in place many landowners would not choose to utilize PTHP's, but would continue to file THP's. As noted, since Alternative I is entirely off-Program it contains no additional acreage of off-Program

operations for analysis; while for the Program and Alternatives 2 and 3, the impact of each is combined with that of expected off-Program timber operations for the cumulative impacts analysis. Off-Program operations are predicted to occur on approximately 4,912 acres over the analysis period under implementation of the Program and Alternatives 2 or 3.

In addition to the off-Program timber operations, other reasonably foreseeable projects and processes, which could affect terrestrial wildlife species over the 50-year analysis period are shown below.

KRNCA Late Seral Silvicultural Improvement Projects	2500 acres
KRNCA Shaded fuel break maintenance	1800 acres
KRNCA mountain bike trail installation	50 miles of trail
Livestock Grazing	2,000 animals/ 24,000 acres
MRC Good Roads Clear Creeks Program	Removal of 225,000 yards of sediment (year 2011)
MRC Fuel Reduction Projects	6000 acres
Residential Development	100-250 new dwellings
Population Increase	500 people
Sudden Oak Death Infestation	50,000 acres

- <u>Cumulative Impacts from the Program, Alternatives, and Reasonably Foreseen Projects/Processes</u>

The methodology utilized in Section 3.18 to predict direct impacts to terrestrial wildlife from implementation of the Program and alternatives is to analyze the projected changes in WHR type over the analysis period, as illustrated in the charts in that section. This section utilizes the same methodology to determine cumulative impacts to terrestrial wildlife from Program-related activities and reasonably foreseen non-Program activities. WHR charts for the whole watershed are shown in the previous section.

As shown in the figure for the Program-treated area in Section 3.18, treatments conducted under the Program have the effect of substantially increasing the proportion of multi-storied, maturing conifer-dominated stands (DFR 6M&D) over the next 50 years. However, as shown in Figures 4-7 and 4-8 in the Vegetation section above, the effects of implementing the Program have a far greater relative impact within the Program area compared to the impacts across the 116,831 acres of commercial forestland in the basin.

However, examination of Figure 4-7 against Figure 4-8, which shows the development of WHR types under implementation of the status quo (Alt. 1) across the same area of commercial forestland, indicates only minor differences: the Program area shows a slightly higher proportion of DFR4D stands (young growth Douglas-fir stands ranging from 12 to 24 inches in diameter) and of DFR6M&D stands (multi-storied Douglas-fir stands over 24" diameter). But the remarkably similar feature of both is the vast increase in DFR5D stands. These stands occupy a relatively small proportion of the overall Program area at the beginning of the analysis period but increase to well over 60% of the landscape after 50 years under both the Program and status quo. The primary source of the increase appears to be natural maturation of younger, well-stocked

DFR4D stands into DFR5D stands; the implication being that conifer stocking and dominance is likely to increase over the analysis period primarily because younger stands are not being harvested but are allowed to mature, and that timber harvest, as modeled for both the Program and status quo, has a fairly minor effect to vegetation type development over time, because of the low proportion of the commercial timberland being harvested.

The 87% of commercial timberland that is not modeled for harvest includes conservation lands, such as Sanctuary Forest, government lands such as the KRNCA, and private lands that have too low a volume of commercial stocking to support a harvest. It is possible that the predicted increase in the acreage of commercially valuable DFR5D stands will stimulate an increase in demand and trigger another logging boom; but rather than speculate on future trends, the PTEIR models future harvest on recent past patterns of timber harvest activity, including periods of available and abundant timber and far fewer regulations

- Summary of Cumulative Impacts to Terrestrial Wildlife

The analysis of cumulative impacts to wildlife must consider impacts to special-status species and to particular wildlife habitat elements that the FPR's consider important for maintenance of wildlife habitat within managed forestlands. Many of the special-status species (as discussed in detail in Section 3.18) prefer mature, multi-storied, well-developed timber stands, and these features are enhanced by implementation of Program practices over time. Table 4-5 below compares cumulative impacts from the Program, off-Program timber operations, and the reasonably foreseen impacts noted above, against the important habitat elements recognized in Appendix Technical Rule Addendum #2 of the FPR's. (Of the seven critical habitat elements analyzed in this document, only higher road density is determined to have a negative effect to wildlife, whereas the other habitat elements are presumed to have a more beneficial effect with greater presence on the landscape.)

The following table summarizes the evaluation of the potential for the Program or other reasonably foreseen activities to cause significant adverse impacts to any of the Critical (Wildlife) Habitat Elements identified in Technical Addendum 2 of the FPR's.

TABLE 4-5
Cumulative Impacts[1/] to Critical Habitat Elements from Program Activities and Reasonably Foreseen Projects and Processes Across Commercial Timber Strata in the Mattole Basin

	Snags/Den Trees	Road Density	Large Woody Debris	Multistory Canopy	Hardwood Cover	Late Seral Characteristics	Late Seral Continuity
Program Timber Harvest	LS	LS	LS	LS	LS	LS	LS
Off-Program Timber Harvest	LS	LS	LS	LS	LS	LS	LS
KRNCA Late Seral Silvicultural Improvement	LS	LS	LS	LS	LS	LS	LS
KRNCA Shaded fuel break maintenance	LS	LS	LS	LS	LS	LS	LS
KRNCA mountain bike trail installation	LS	LS	LS	LS	LS	LS	LS
Basin-wide livestock Grazing	LS	LS	LS	LS	LS	LS	LS
MRC Good Roads Clear Creeks Program	LS	LS	LS	LS	LS	LS	LS
MRC Fuel Reduction Projects	LS	LS	LS	LS	LS	LS	LS
Residential Development	LS	LS	LS	LS	LS	LS	LS
Population Increase	LS	LS	LS	LS	LS	LS	LS
Sudden Oak Death Infestation	LS	LS	LS	LS	PS2/	LS	LS

1/ Key to impacts: **PS = Potentially Significant** Effect; **LS = Less than Significant** Effect: Adverse impacts are those effects which degrade the diversity, structure, size, integrity, abundance or number of; or are outside the natural range of variability, for the resource at issue. Beneficial effects are those effects that improve the diversity, structure, size, integrity, abundance or number of; or are within the natural range of variability, for the resource at issue.

2/ The impact to hardwood cover from SOD is potentially significant, however, the direct effect is estimated to be less than significant because, as described in Chapter 3, the impacts from SOD are highly speculative. In addition, one of the SOD mitigation measures would change the Program's practices if SOD were to kill more than 80% of tanoak on more than 35% of any subbasin. The cumulative effect of all of the reasonably foreseeable future projects, other than SOD, is not likely to reduce hardwood cover by any more than a negligible amount, so that the cumulative impacts are mostly the result of the direct effects. As such the cumulative effect is essentially the direct effect, which, as previously stated in chapter 3 is both highly speculative and together with the mitigation measures is considered as less than significant. The cumulative impact would be significant without the mitigation measure.

The impacts to the Critical Habitat Elements from implementation of the Program are discussed in detail in Section 3.18. Likewise Off-Program timber operations are indistinguishable from those described for Alternative I in Section 3.18, because they employ the same treatments. The other reasonably foreseen actions are analyzed below:

The KRNCA late seral improvement project is beneficial to many critical habitat elements because its primary purpose is to increase late seral conditions within the conservation area. Because this project does not overlap physically with the Program or alternatives, any impacts would affect other areas of the Mattole basin. Because of its purpose, the The KRNCA late seral improvement project is considered to be beneficial to snags and den trees, large woody debris, and development of a multistory canopy. It should have little if any impact to road density, as there is no information that it affects the extent of the road system. It could have a slight adverse impact to hardwood cover, as the intent of the project is to hasten the development of late seral conifers stands; and because it is designed to increase late seral conditions it has a beneficial impact to late seral characteristics and continuity within its area of operation.

KRNCA shaded fuel break maintenance is expected to create a slight adverse impact to most of the critical habitat elements because it tends to simplify stand structures and remove fuels (e.g., down woody material, snags) within the fuel break areas. There is no evidence that it affects the extent of the road system.

The KRNCA mountain bike trail installation should have little effect to elements related to stand structure. It could have a moderately adverse impact to road density because although a bike path creates fewer impacts than a well-traveled road, it still fragments habitat for some wildlife species and introduces human presence into their habitats.

Livestock grazing should have little adverse impact to the critical habitat elements because it largely occurs outside of forested areas where the critical habitat elements exist. There is no evidence to suggest that road use related to grazing would increase road density over its current level.

The MRC Good Roads Clear Creeks Program should have little to no impact to most critical habitat elements because its purpose is to remove sediment and improve road conditions. It is expected to create a beneficial impact to road density because some roads will be decommissioned and others hydrologically disconnected and rendered undriveable, removing barriers to wildlife passage.

The MRC fuel reduction projects are expected to create a slight adverse impact to most of the critical habitat elements because they tend to simplify stand structures and remove fuels that make up critical habitat elements such as the understory canopy and large down woody material. There is no information that these projects affect the extent of the road system.

Residential development and population increase are expected to have a slight adverse impact to all of the critical habitat elements because they will likely be mostly removed by clearing for home construction; and many elements that may remain nearby are not compatible with human uses of the immediate dwelling area. As snags are removed for safety purposes, the understory cleared for visibility and defensible space, etc. Residential development is expected to cause a slight adverse impact across the basin in terms of road density through construction of driveways and access roads. This impact is not considered significant due to the projected low rate of residential development.

Sudden oak death infestation is rated as significantly adverse to snags and den trees because it will likely kill thousands of mature tanoaks that would eventually become snags or den trees. Wildfire intensity and rate of spread could also be exacerbated if these stands are affected by wildfire as discussed in Section 4.15, Wildland Fire. SOD is also rated significantly adverse to multistory canopy because of projected mortality of much of the current overstory, and to hardwood cover because SOD is expected to destroy substantial amounts of hardwood cover across the basin. It is rated moderately adverse to late seral conditions and continuity, because although it could destroy many hardwoods that contribute to late seral structures, it has little effect to the mature conifer stands that currently comprise most of the late seral stands in the assessment area; in addition, SOD would not delay maturation of most stands to late seral conditions given the diversity of tree species in the Mattole and their ability to colonize forest openings. It is expected to have a slight adverse impact to road density because some now brushed-over roads could be opened to better combat SOD infestations. It would have a short term benefit to large woody debris as dead trees fall, which would be relatively short lived due to the rapid decay rates of down hardwood logs.

- Cumulative Impacts to Special-Status Terrestrial Species

In the following table, each of the special-status species that were discussed in detail in Section 3.18 is listed, along with the rating of direct impact from the Program as discussed in Section 3.18. The next column to the right rates the cumulative impact from implementation of the Program as well as from all the reasonably foreseen projects discussed above. The final column summarizes reasons for the determination. (It should be noted that although sudden oak death has an impact on many habitat elements, including mast production, few of the species listed below are known to be highly dependent on the presence of extensive stands of tanoak (the most likely species to be decimated by SOD), even though tanoak represents 1/3 of all trees by basal area within forest stands of the basin.

Table 4-6
Cumulative Impacts to Special Status Species from Program Activities and Reasonably Foreseen Projects and Processes Across Commercial Timber Strata in the Mattole Basin

Special-Status Species	Direct Impacts From Program	Cumulative Impacts	Reason for Determination (Cumulative Impacts)
Cooper's hawk	LS	LS	Creation of suitable habitat through forest stand management. Slight adverse impacts from small acreage of homesite conversion, population increase, decline in squirrel prey base as a result of tanoak mortality from SOD.
Golden eagle	LS	LS	No likely impact to habitat from timber operations
Great egret	LS	LS	No impact expected to very limited habitat
White footed tree vole	LS	LS	Slight adverse impact from disturbance to habitat from logging & development on relatively small proportion of analysis area
Red tree vole	LS	LS	Somewhat increased disturbance to habitat from off-Program projects and processes
Great blue heron	LS	LS	No impact to very limited habitat
Ruffed grouse	LS	LS	Slight increased disturbance to habitat
Marbled murrelet	LS	LS	Beneficial impact due to increased habitat from Program, some habitat loss from other projects
Vaux's swift	LS	LS	
Olive sided flycatcher	LS	LS	
Townsends big eared bat	LS	LS	No impact to very limited habitat
Hermit warbler	LS	LS	Increased habitat from Program, some loss from other projects
Pacific slope flycatcher	LS	LS	
Little willow flycatcher	LS	LS	Increased habitatfrom Program area, no expected loss from other projects
Peregrine falcon	LS	LS	No expected impacts to limited habitat. Legal protections mitigate against impacts
Bald eagle	LS	LS	
Osprey	LS	LS	
Purple martin	LS	LS	Beneficial impact due to increased habitat from Program, some loss of habitat from other projects
Pacific fisher	LS	LS	
Humboldt marten	LS	LS	
Northern spotted owl	LS	LS	

1/ Key to impacts: **PS = Potentially Significant** Effect; **LS = Less than Significant** Effect.

As indicated in the table above there appears to be little likelihood for the cumulative effects of the Program along with the reasonably foreseen projects and processes to cause significant cumulative impacts to any particular special-status terrestrial wildlife species in the Mattole basin. For many of these species impacts from the program are considered beneficial due to projected increases over time in late seral habitat; this is also true of the KRNCA late seral

improvement project. On the other hand a slight adverse cumulative impact is expected from many of the reasonably foreseen projects (with the exclusion of the KRNCA late seral improvement project) as they tend to diminish rather than improve late-successional habitat.

- Summary of Cumulative Impacts to Terrestrial Wildlife

The analysis above shows that there is a less than significant cumulative effect on terrestrial wildlife when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

4.10 Recreation Cumulative Impacts

This section summarizes the cumulative impacts to recreation from implementing the Proposed Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts of implementing the Program's practices on recreation is the Program area plus 300 feet

As described in Chapter 3.10 the primary potential impact to recreational use of the Mattole watershed would be occasional, mid-week use of public camping facilities by logging crews. Although this hypothetical effect has never been described by public resource agencies, the potential exists. The addition of off-Program harvests to the Program harvests analyzed in Chapter 3.10 would add approximately one more logging crew per year so rather than 2-3 crews there could be 3-4 crews.

It is highly unlikely that this additional influx of workers would significantly impact the 49 public camping sites available in the Mattole.

As described in Chapters 3.4 and 4.2 impacts to fisheries resources are highly unlikely and effects on deer habitat are likely to be positive. Due to the low harvest rates and predominance of uneven-aged silviculture methods it was determined in Chapter 3.15 that impacts to scenic resources would also be minimal, which are a key component of the recreational appeal of the Mattole watershed.

Determination of Significance for Recreational Resources
The analysis above shows that there is a less than significant cumulative effect on recreational resources when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

4.11 Visual and Aesthetic Cumulative Impacts

This section summarizes the cumulative impacts to visual and aesthetic resources from implementing the Proposed Program in conjunction with on-going and reasonably foreseeable probable future projects or processes. The assessment area for describing the potential cumulative impacts of implementing the Program's practices on visual resources is the Mattole basin rather than the FPR prescribed area that is within three miles of the logging area, as explained in Section 3.15. Even though no significant direct impacts to visual and aesthetic resources were identified in the analysis in Section 3.15, the less than significant impacts from the Program could combine with those of other reasonably foreseeable future projects or processes (e.g., sudden oak death, population increase) to cause significantly adverse cumulative impacts. Reasonably foreseen projects are shown in Table 4-5 above and listed and discussed below.

Significance Criteria

The Program and Alternatives would have a significant cumulative impact to visual and aesthetic resources if impacts from the Program or any alternative combined with those of reasonably foreseen projects would:

a) Have an adverse impact on a scenic vista;
b) Damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway; or
c) Degrade the existing visual character or quality of the site and its surroundings.

Cumulative Impacts to Visual and Aesthetic from the Program, Alternatives, or Reasonably Foreseen Projects/Processes

Impacts to visual and aesthetic resources are discussed in detail in Section 3.15. These impacts are related to the magnitude of disturbance to the landscape and the visibility of the disturbance from public roads or lands. The analysis of direct impacts to these resources in Section 3.15 equates 'adverse visual impacts' to even-aged management, and considering the rugged terrain of the Mattole, it is estimated that 50% of the projects would likely be visible in most of the subbasins (excluding the North_1 subbasin), including fleeting views, from public roads or lands.

The reasonably foreseen project with the most similarity to the Program is timber harvest that occurs outside of the Program, or 'off-Program' timber operations, which is predicted to occur on approximately 4,912 acres over the analysis period. Table 4-7 below compares estimated areas of effect on visual resources from Program and off-Program timber operations against those of the Program and alternatives using the methodology used in Section 3.15 and described briefly in the footnotes to the table.

Table 4-7
Potential Visually Adverse Footprint Harvest Acres by Program/Alternative[1/]

Subbasin	Off-Program[6/]	Program[2/]	Alternative I[3/]	Alternative 2[4/]	Alternative 3[5/]
East_1	73	133	293	409	0
East_2	31	83	116	312	0
North_1	196	215	800	596	0
North_2	153	147	644	366	0
South_1	258	32	258	98	0
West_1	9	87	42	344	0
West_2	16	55	57	185	0
TOTAL	737	752	2207	2310	0

1/Harvest acreage likely to have a negative impact to visual resources/aesthetics based on amount of primary canopy layer removed (acreage of even-aged vs. uneven-aged management) and estimated 50% visibility of treatment acreage from public roads or public lands.
2/Program acres = Footprint acres x 0.10 (estimated group selection openings x 0.50 (estimated visible acres)
3/Alternative 1 = Footprint acres x 0.30 (estimated even-aged prescriptions) x 0.50 (estimated visible acres)
4/Alternative 2 = Footprint acres x 0.30 (estimated even-aged prescriptions) x 0.50 (estimated visible acres)
5/Alternative 3 = Estimated at 0 adversely affected acres because no even-aged management and no group selection, plus mandatory 60% canopy retention
6/Off-Program = Footprint acres x 0.30 (estimated even-aged prescriptions) x 0.50 (estimated visible acres)

Off-Program timber operations are similar in the acreage of adverse visual impact they create to the Program at 737 vs. 752 acres; however, the openings created in the Program are never more than 2.5 acres in size, while the disturbances created by off-Program harvest could be made up of clearcuts and other even-aged harvest units of many sizes.

In Section 3.15, Table 3-45 rates estimated visual effects from the Program and alternatives by subbasin. Impacts to all subbasins from Alternative 3 were rated as less than significant. Impacts to the North_2 and South_1 subbasins from Alternative I, and to the North_2 and West_1 subbasins from Alternative 2 were expected to be moderately adverse but still less than significant. Impacts to all the remaining subbasins by Program and alternatives were rated as less than significant. (As noted in Chapter 3, although the North_1 subbasin shows the most adversely affected acres, the visual impact is largely negated by the fact that this subbasin is essentially not visible from public roads and lands, and visual impacts in the subbasin are considered to have at the most a slight adverse impact.

Table 4-8 below compares the acreage of commercial timberland in the Program area that is potentially visible from public roads or lands (using the same methodology as in the table above) against the total impacted acres from the Program and alternatives plus the impacted acreage of the off-Program harvest. Percentage of the potential impacted commercial forestland is also shown.

Table 4-8
Acres Of Potential Cumulative Impact To Visual/Aesthetic Resources By Acreage From Program And Off-Program Timber Harvest By Subbasin

Sub-basin	Prog.+ off-Prog.	Alt 1 + off-Prog.	Alt 2 + off-Prog.	Alt 3 + off-Prog.	Commercial Forest in Program. Area	Percentage of Commercial Forestland Adversely Impacted[1/]			
						Prog.	Alt 1	Alt 2	Alt 3
East_1	206	366	482	73	20351	1.01	1.80	2.37	0.36
East_2	115	147	344	31	15616	0.94	0.94	2.20	0.20
North_1	412	996	792	196	15060	6.61	6.61	5.26	1.30
North_2	300	797	519	153	15313	5.21	5.21	3.39	1.00
South_1	289	515	356	258	13164	3.91	3.91	2.70	1.96
West_1	97	51	354	9	13734	0.37	0.37	2.57	0.07
West_2	71	73	200	16	23593	0.31	0.31	0.85	0.07
TOTAL	1489	2944	3047	737	116,831	2.52	2.52	2.61	0.63

1/Includes off-Program impacts.

Section 3.15.1, Determination Threshold for impacts to visual and aesthetic resources, concludes that impacts would be considered significant if the acreage of treatments

- caused adverse and long term impacts exceeding more than 10% of the scenic vistas or the existing visual quality,
- caused damage to 10% or more of the scenic resources within the Program area, or
- degraded more than 10% of the visual character of the operations sites of a PTHP and its surroundings in any 10-year period.

Such impacts would be considered particularly significant if they occurred within the Coastal Commission Special Treatment Area in the Mattole basin (as discussed in 3.15).

Examination of Table 4-8 above indicates that far less than 10 percent of the commercial forestland in any one subbasin is affected over the analysis period by the Program or any of the alternatives combined with additional impacts from off-Program timber operations. It is assumed that in most of the subbasins the scenic vistas and other aesthetic values are directly related to the acreage of commercial forestland, as that is the landscape context in which they occur; however, in terms of cumulative impacts to the Mattole basin as a whole, it should be remembered that commercial forestlands only make up slightly over 60% of the acreage of the entire basin. Non-commercial forestlands occupy 34,174 acres of the basin and non-forested acres occupy 38,755 acres, so the impact to visual resources to scenic values from Program and off-Program activities would be an even smaller fraction of the threshold of significance to visual resources across the basin, making these impacts fall even further below the determination threshold percentages.

The extreme western portions of the West_1 and North_1 subbasins lie within the Coastal Commission Special Treatment Area (See discussion in Section 3.15.2). The Special Treatment Areas in the Mattole basin are recognized (as per the FPR definition of Special Treatment Areas)

for being *B. Site[s] of significant scenic value,* and *C. Wetlands, lagoons, streams, estuaries, and marine environments.* It is possible that a direct view from the mean high tide mark looking east could take in some private lands that might be impacted by Program-related or off-Program effects from timber operations. However, any impacts to this special treatment area must be disclosed during the timber plan preparation process, as noted in the Regulatory Setting Section, 3.15.2, and mitigated as guided by the FPR's. Because of this regulatory emphasis, no significant cumulative impacts are expected to the BOF special treatment area from operations conducted under the FPR's, including on- and off-Program timber operations.

Implementation of Alternatives 1, 2, or 3, although they affect slightly different landbases and acreages, is also expected to have at most a slightly adverse cumulative impact when combined with the other reasonably foreseen impacts noted above, for the same rationale as that discussed for the Program.

Table 4-3 above lists several reasonably foreseen ground-disturbing projects and processes that have potential to impact visual and aesthetic resources over the 50-year analysis period, including:

KRNCA Late Seral Silvicultural Improvement Projects	250 acres
KRNCA Shaded fuel break maintenance	36 acres/year
KRNCA mountain bike trail installation	50 miles of trail
Livestock Grazing	2,000 animals/ 24,000 acres
MRC Good Roads Clear Creeks Program	Removal of 225,000 yards of sediment (year 2011)
MRC Fuel Reduction Projects	6000 acres
Residential Development	100-250 new dwellings
Population Increase	500 people
Sudden Oak Death Infestation	50,000 acres

KRNCA Late Seral Silvicultural Improvement Projects : Figure 4-2 above shows the areas within the Mattole basin where the BLM intends to implement late seral improvement projects. This is estimated to occur on 50 acres a year, which projected over 50 years could total 250 acres. As with timber operations, these projects would impact visual resources to the extent that they could be viewed from public roads or lands inside the basin or impact the other visual resource evaluation criteria noted in Section 3.15. However, given the relatively low-impact nature of the KRNCA projects and the small acreage they are projected to impact, they should have no significant adverse visual impact when combined with Program and off-Program timber operations.

<u>Livestock Grazing</u>: Impacts from livestock grazing to visual and aesthetic resources are addressed by the USFS in General Technical Report PSW-035 (Brown and Kissel 1979), which notes that:

> *"The visual impacts of grazing systems are associated with range conditions. That is to say, how livestock are grazed in a certain allotment affects the perceived visual patterns of the landscape. The perceived patterns are affected by the following factors and*

conditions: The existing vigor and condition of the vegetation, soil fertility, erosion potential, the availability and spacing of water sources, the number of livestock being grazed and the length of time they are grazed. All these factors and more combine to determine the degree of visual impacts associated with grazing systems. [and]

As described in this paper, the visual impacts of range management vary in degree depending on how the specific actions are planned, designed and implemented in the various characteristic landscape types. A project in one landscape type may look totally different in another landscape type. There are many variables involved when evaluating any type of visual impact. Most impacts are noticeable in the foreground and middleground viewing zones. The more varied the landscape the less impacting they become. The visual impacts of range management activities vary in degree over the life of the project. The visual impact of site construction for example, will probably diminish over time. Vegetative manipulations are most noticeable within the first five years after implementation. The longest visual impact occurs with grazing practices themselves. Overgrazed rangeland takes a long time to recover and the effects go far beyond visual impacts. Because of the historical significance associated with cattle ranching, range management activities are not considered a major visual impact nationally. However, as people are becoming more aware of their environment, they are objecting to adverse visual changes caused by highly competitive land uses. It, therefore, becomes more important to consider how range management activities "fit" the landscape in order to reduce negative visual impacts."

During review of documents related to the Mattole basin in regard to this project none have surfaced that are critical of the visual or aesthetic impacts from grazing. Livestock can keep prairies open by suppressing invasive shrubs and trees, and intact prairies add to the visual variety characteristic of the region. Many persons appreciate the aesthetic values of such a landscape, as illustrated by Brown (2008), who notes that grazing land can confer a

"...strong appreciation of nature, especially its visual qualities and even the colour green. Related attraction to the idea of living in [such areas] with associated attraction to pastoralism and farming, livestock and a country life in which humans are part of nature...scenes preferred are virtually devoid of development and have a high natural content, even if this is essentially visual and/or aesthetic, as opposed to 'real'..."

From the above considerations, it appears that livestock grazing can have a beneficial visual impact as long as its various impacts are well managed, particularly the avoidance of overgrazing. Livestock grazing as a stand-alone activity in the Mattole is considered to have a less than significant adverse impact to visual resources when combined with Program and off-Program timber harvesting.

<u>The MRC Good Roads Clear Creeks</u> project affects only already-constructed roads. In that its goals are to help avoid road failures and associated stream pollution, this project should have a moderately beneficial and less than significant impact on visual and aesthetic resources.

<u>The MRC Fuels Reduction</u> projects will create a minor disturbance to established vegetation in the short term, but over the longer term will likely create a pleasing visual effect as more park-like conditions are created by the construction of shaded fuel breaks. Effective fuel breaks can

also help mitigate the effects of wildfire, the blackened landscape of which is considered an adverse visual impact, as discussed in Section 3.5. These treatments are estimated to occur on 120 acres a year, which projected over 50 years could total 6000 acres. The MRC fuel reduction projects, combined with the Program or alternatives or other expected impacts should not create a significant cumulative adverse impact to visual resources due to the long term positive visual impacts and the slow rate of implementation of the project.

Residential Construction: Construction of 100-250 dwellings over the 50-year assessment period would have a variable impact to visual resources depending on the dwelling site and type of dwelling. In many circles, well-designed buildings are considered to complement visual resources; however, people who prefer bucolic landscapes generally have a strong aversion to even small occurrences of urban-type development (Brown 2008). If the dwellings are constructed on undeveloped land, other buildings such as garages, shops, etc., would no doubt follow, and the area of visual impacts could total at least 1 acre per homesite. Of course, these impacts tend to be permanent in effect rather than transitory, compared to the rather transitory impacts caused by on and off-Program timber operations and most of the other reasonably foreseen projects. But even if each homesite created adverse visual impacts by itself, the overall impacts in terms of adversely affected acres could still not reasonably be considered significantly adverse to visual resources, given that the greatest impact would be no more than 5 acres per year over 50 years.

Sudden Oak Death

Another factor that is reasonably foreseen is the likely spread of sudden oak death (SOD) into the Mattole basin. This is predicted at 1000 acres per year, or 50,000 acres over the analysis period, which clearly exceeds the significance thresholds noted above. At any one time it is estimated that up to 14,000 acres could be heavily impacted (e.g., most tanoak trees killed) at any one time across the basin (Valachovic, pers. comm. 2010). Because as tanoak makes up approximately 50% of the tree stocking in the Mattole and SOD largely kills tanoaks, this mortality could heavily impact visual resources in some areas. However, observation of SOD-infected stands in the Redway-Briceland area indicates that the mixture of species (many of which are not affected by SOD) in most stands and the ability of vegetation to quickly restock open areas can mitigate visual effects to a fair degree and over time. If SOD spreads quickly into the Program area, it is likely that it would have a significant adverse impact on visual resources and aesthetics.

Some stand manipulation treatments as envisioned under the Program or off-Program timber harvest could help mitigate the effects of SOD since they have the potential to remove dead and dying trees and break up the potentially large areas of negative visual impacts, especially as these areas would be regenerated with conifers. There could also be adverse effects to visual resources if large areas were treated by removing trees within and around infected areas in a sanitation treatment; however, if this happened it would likely be only on industrial timberland in the North_1 watershed, where visual effects are limited. It is considered unlikely that a coordinated program to treat all infected sites would be applied to the patchwork of private parcels in the watershed.

Determination of Significance for SOD

As discussed in Section 4.6, the anticipated infestation of SOD into the Mattole basin is so unpredictable that impacts to even almost pure tanoak stands are too speculative under CCR 15145 to make a determination of cumulative significance. The possible use of herbicides as a control to SOD is even more speculative, as described in Section 3.11.

Environmental Clearance for Reasonably Foreseen Projects

Environmental clearance for the reasonably foreseen projects to visual resources would depend on the funding source of the projects. Federal KRNCA projects would be addressed through NEPA, while the MRC projects would likely be state-funded and addressed via CEQA. Both CEQA and NEPA require evaluation of impacts to visual and aesthetic resources.

In terms of new dwelling construction, the primary regulatory responsibility would rest with the Humboldt County Planning and Building Departments. If a permit is obtained for an existing parcel, the environmental review is conducted by a building inspector who fills out a Pre-Site Investigation Checklist. This checklist contains no requirements related to visual or aesthetic resources. On the other hand, if a residential subdivision is planned, it is subject to a CEQA analysis, which follows a similar review to a timber harvest plan, whereby the proponent must consider views from public roads and lands, visual screening, etc., before being permitted A CEQA review can also be generated if a landowner files for a special permit (for instance, to decrease the setback from a stream for a building site), in which case visual impacts could be investigated (Estlow, pers. comm. 2010).

Determination of Cumulative Significance on Visual and Aesthetic Resources

Over the 50-year analysis period implementation of the Program along with reasonably foreseen projects is not likely to create a cumulative significant adverse impact to visual resources.

However, with the addition of up to 14,000 acres of dead or dying hardwoods being present on the landscape at any one time, if even half of these were visible the effects from SOD plus the Program and reasonably foreseen impacts would be considered significantly adverse.

Mitigation Measures

Section 2.1(C.6) contains state-mandated best management practices designed to impede the infestation of SOD into the Mattole basin, and/or to control the spread of the infestation. It is hard to measure the effects of these BMPs (which are already in place) against the spread of SOD as documented and predicted; but they represent the best thinking of experts at this state of the infestation. Given the relatively small impact of the combined Program and reasonably foreseen projects, further modifying the Program or the projects to reduce the overall visual impacts to a landscape in order to mitigate against SOD as well is too speculative to consider given the unpredictable nature of impacts from SOD.

Literature Cited

Brown, Bruce R. and David Kissel. 1977. USDA Forest Service, Pacific Southwest Resarch Station General Technical Report 035-01.

Brown, Stephen R. 2008. Project Central Wind: Assessment of Landscape and Visual Amenity Effects. Stephen Brown Environments. New Zealand.

Estlow, Trevor. 2010. Humboldt County Planning Department. Eureka.

Valachovic, Yana. Personal Communication October 2010. Forest Advisor, University of California Extension Service.

4.12 Cumulative Impacts to Traffic and Transportation

This section summarizes the cumulative impacts to traffic and transportation from implementing the Proposed Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts of implementing the Program's practices on transportation is the public road system, in particular the Humboldt County road system. Because the location of possible Program implementation is unknown at this time, singling out the first road not part of the logging area, as the FPR's require, is not possible. As a result, for CWE purposes, the impacts from implementing the Program are limited to the impacts to the County's road system.

The significance criteria and the determination thresholds have already been previously described in Chapter 3. The determination thresholds are reproduced here since they establish the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined, might create a significant impact if cumulatively they would result in impacts to traffic and transportation that result in:

a) An increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections).
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways.

As described in the FPR's, cumulative impacts to traffic and transportation can occur when the impacts of two or more activities, from the same or different projects, combine to produce a significant increase in traffic which is defined as traffic increases in excess of 10% of the ADT of the capacity of roads that serve residential and/or commercial areas near project areas.

Program Impacts Analysis

The direct impact of the Program and alternatives on traffic and transportation is evaluated in Chapter 3. The findings suggest that the direct Program impacts are likely to have a negligible adverse impact to traffic patterns and on transportation within the Program area. Although the Program only takes place on 13% of the Mattole basin acreage, all of the traffic generated by the Program eventually utilizes the main county roads serving the Mattole. In spite of this, total traffic associated with the Program is expected to increase by only about 175 vehicle trips per year which is just a 0.23% increase in ADT assuming that all of the traffic associated with implementation of the Program occurs between June and October of each year.

Cumulative Impacts Analysis

The cumulative additive impact of the reasonably foreseeable probable future projects together with implementation of the Program results in a slightly increased ADT above that projected for the Program. Cumulative traffic impacts would occur if traffic from the Program either makes existing traffic problems significantly worse or is combined with existing traffic to create a

significant adverse impact. There is no indication that there are currently any existing traffic cumulative impacts within the assessment area.

Log truck traffic in the project area has declined in recent years proportionately with the decline in timber harvesting activity. However log hauls are now longer, due to the recent closure of the Harwood Company mill in Branscomb. These closures have increased the potential amount of log truck traffic traveling north on highway 101, since some loads from the Mattole would likely have gone to Branscomb but now have to travel north to Eureka.

The log truck traffic levels resulting from implementation of the Program or any of the alternatives will vary with the alternative and also will vary over time and space and seasonally. However, none of the alternatives would result in significant ongoing increases in log truck traffic beyond the historic levels that have resulted from timber harvest in the Mattole.

Further, sources of traffic growth in the area are minimal, resulting in little or no traffic growth over time. The evaluation of traffic impacts in Chapter 3 considered the overall effect of traffic increases from the proposed Program on existing traffic levels, and concluded that there were no substantial impacts causing a level of service standard established by the county congestion management agency for designated roads or highways to be exceeded. Therefore, the proposed alternatives will not add to or create significant, adverse cumulative impacts to traffic.

All of the reasonably foreseeable probable future projects are associated with traffic increases that are so small as to be un-detectable at the Programmatic level. Many of the reasonably foreseeable probably future projects such as recreation, cattle ranching, home building, implementation of the MRC Good Roads Clear Creeks program etc, are already accounted for in the ADT for the basin.

Determination of Significance for Traffic and Transportation

The cumulative impact to transportation/traffic from treatments under the Proposed Program in conjunction with the on-going and reasonably foreseeable probable future projects are such that they will neither, a) cause a substantial increase in traffic nor, b) will it individually or cumulatively exceed the level of service for designated roads or highways. The combined impact of the Program and the reasonably foreseeable probable future projects only slightly increases ADT such that this increase will have a less than significant cumulative adverse impact to traffic.

4.13 Air Quality Cumulative Impacts

This section summarizes the cumulative impacts to air quality from implementing the Proposed Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts of implementing the Program's practices on air quality is the Mattole basin

The significance criteria and the determination thresholds have already been previously described in Chapter 3. The determination thresholds are reproduced here, since they establish

the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined might create a significant impact if cumulatively they would result in emissions that exceed the California Violation Thresholds described in Chapter 3.3.

As described in the FPR's, cumulative impacts to air quality can occur when the impacts of two or more activities, from the same or different projects, combine to produce a significant increase in emissions.

Program Impacts Analysis

The direct impact of the Program and alternatives on air quality is evaluated in Chapter 3. The findings suggest that the direct Program impacts are likely to have a negligible adverse impact to air quality on the Program acres. Because the Program only takes place on 13% of the commercial forest acres within the Mattole, and only a small percentage of those will be treated with fire, any change in air quality would likely be minimal.

The NCUAQMD is in attainment for all criteria air pollutants except for PM10. As chapter 3 points out, production of exhaust-related PM, SOX, NOX and TOG generated by the Program's practices or the Alternatives is insignificant compared to total emissions within the district. Total production of exhaust-related particulate matter from the Program is about 0.012% of the total exhaust-related particulate matter generated in any year within the NCUAQMD. Particulate matter production from prescribed fire is estimated at 1% of district totals from managed burning, while particulate matter production from wildfires burning in areas treated under the Program where slash is assumed not to have been treated, represents an extremely low proportion of total emissions from wildfires burning in the NCUAQMD area, generally on the order of between 0.07% to 0.08% of total emissions.

Cumulative Impacts Analysis

The cumulative additive impact of the reasonably foreseeable probable future projects results in a mixed set of both beneficial impacts and adverse impacts depending on the type of project being considered.

The air quality impacts associated with the reasonably foreseeable probable future projects are virtually undetectable compared to emissions throughout the district. Given the rural nature of the Mattole basin with no point-source emitters and with the vast majority of the basin not likely to be harvested, the role of other projects in PM10 production is negligible save for the impacts from the off-Program harvest. Impacts to air quality from maintenance of shaded fuel breaks, construction of 2 to 5 houses per year as well as daily traffic of around 2,500 vehicle trips per day along with other reasonably foreseeable probable future projects is not likely to result in significant increases to PM10.

If every acre that is treated through off-Program harvest were to be burned by wildfire, in a worst-case scenario, it would be expected to emit about 9 tons of PM10 per year if every acre were burned by wildfire, which is about 0.013% of total wildfire PM10 emissions in the

NCUAQMD, an amount that is negligible. Total off-Program PM10 emissions from operation of heavy equipment exhaust emissions and dust from log trucks operating on unpaved roads is estimated to be about 1/3 of Program emissions, which were estimated at 0.012% of total district exhaust and dust emissions. Emissions of PM10 from off-Program prescribed fire are expected to be negligible since most off-Program harvest is not expected to be treated with prescribed fire.

Determination of Significance for Air Quality Resources

Based on the projected emissions from prescribed fire, wildfire and from use of heavy equipment, the Program and on-going and reasonably foreseeable probable future projects would:

a. Not conflict with or obstruct implementation of any NCUAQMD air quality plans and air quality regulations
b. Not exceed the California Violation Threshold for criteria air pollutants and thus would not violate any air quality standard or contribute to an existing or projected air quality violation;
c. Not result in a cumulatively considerable net increase of any criteria pollutant for which the region is in non-attainment under an applicable federal or state ambient air quality standard since emissions of PM10 from the Program and on-going and reasonably foreseeable probable future projects are not "considerable".
d. Not expose sensitive receptors to substantial pollutant concentrations, generally since operations under the Program and on-going and reasonably foreseeable probable future projects do not take place adjacent to such receptors,
e. Not create objectionable odors affecting a substantial number of people;
f. Not otherwise degrade the atmospheric environment since emissions would not exceed the California Violation Thresholds for criteria air pollutants; and
g. Not expose workers or the public to hazardous toxic emissions or substantial pollutant concentrations in excess of the California Violation Thresholds

As a result, the Proposed Program, together with the on-going and reasonably foreseeable probable future projects, will have a less than significant cumulative adverse effect on air quality.

4.14 Greenhouse Gas Cumulative Impacts

The section summarizes the cumulative impacts to greenhouse gas emissions from implementing the Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts on greenhouse gas emissions is the Mattole basin.

The significance criteria and the determination thresholds have already been previously described in Chapter 3. The determination thresholds are reproduced here since they establish the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined might create a significant impact if cumulatively they would emit more than 6.6 metric tonnes of carbon dioxide equivalent per "service population"/year (the service population is the sum total of all residents plus outside employees within the district). Using such guidance, the threshold of determination would be whether the Program would generate an annual total of approximately 13,200 tons of CO2 equivalent per year.

Program Impacts Analysis

The direct impact of the Program and alternatives on greenhouse gas emissions is evaluated in Chapter 3. The findings suggest that the direct Program impacts are likely to have a negligible beneficial impact on greenhouse gas emissions on the Program acres. However, the Program only takes place on 13% of the commercial forest acres within the Mattole. As the findings in Chapter 3 state, the Program is likely to sequester about 2,200 metric tons of CO2 equivalent per year.

Cumulative Impacts Analysis

The cumulative additive impact of the reasonably foreseeable probable future projects results in a mixed set of both beneficial impacts and adverse impacts depending on the type of project being considered.

There are negligible adverse impacts from greenhouse gas emissions in the Mattole basin created by the implementation of KRNCA (King Range National Conservation Area) shaded fuel break installations and maintenance projects, since such projects improve forest health and growth rates, which leads to additional carbon being sequestered, and reduce the risk of widespread wildfire, thus avoiding wildfire GHG emissions. Thus, the work by Fire Safe Councils to maintain or install shaded fuel breaks along with the MRC FLASH program is also expected to improve greenhouse gas sequestration. Negligible adverse impacts are expected to greenhouse gas concentrations associated with MRC's Good Roads Clear Creeks program from heavy equipment operation associated with removing the 225,000 yards of sediment over the next several years. In addition, residential development and increased in-migration are likely to create negligible adverse impacts from the emission of carbon dioxide from vehicles.

The off-Program emission of GHG's is likely to be approximately 1/3 of the GHG's given off (sequestered) by the Status Quo. As a result, the amount of GHG's sequestered each year is expected to be around 822 metric tons of CO2 equivalents.

While the Program and off-Program activities sequester carbon along with several of the reasonably foreseeable probable future projects, the role of cattle in emitting methane, which is a potent greenhouse gas with over 15 times the warming impact of CO2, could be substantial. Cattle produce about 75 Kg of methane per head per year, which is the equivalent of about 1 metric ton of CO2 equivalent per year or, based on the estimated number of cattle in the Mattole approximately 2,000 metric tons of CO2 equivalent per year. The amount of cattle-Produced GHG's essentially is equivalent to the amount of GHG's sequestered by the Program.

The 116,831 acres of commercial forestland in the Mattole that is not projected to be harvested over the next 50 years is sequestering about 7.8 metric tons of CO2 per acre/year, which is approximately 900,000 tons of CO2/year.

Determination of Significance for Greenhouse Gases

Overall, the combination of Program practices, off-Program harvest, other reasonably foreseeable probable future projects such as fuel break maintenance along with no harvest across the vast majority of the Mattole's commercial forests, results in an annual sequestration of around 903,000 tons of CO2 equivalent per year, which far exceeds the determination threshold. As a result, there is a less than significant cumulative adverse effect on GHG emissions from the additive impacts of combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

4.15 Wildfire Cumulative Impacts

The section summarizes the cumulative impacts to wildfire behavior from implementing the Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts from wildfire behavior is the Mattole basin.

The significance criteria and the determination thresholds have already been previously described in chapter three. The determination thresholds are reproduced here since they establish the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined might create a significant impact if cumulatively they would:

a. Increase tree mortality by 50% or more between 2011 and 2060:

As described in the FPR's, cumulative impacts from a change in wildfire behavior can occur when the impacts of two or more activities, from the same or different projects, combine to produce a significant increase in tree mortality.

Program Impacts Analysis

The direct impact of the Program and alternatives on Wildfire severity is evaluated in Chapter 3. The findings suggest that the direct Program impacts are likely to have a less than significant impact on wildfire behavior on the Program acres. As noted in Chapter 3, up to 29% of the North_1 subbasin might be treated with flame lengths increasing from 1.5' to 3.5' between 2010 and 2035 and then falling to less than 3.5' by 2060.

Cumulative Impacts Analysis

The cumulative additive impact of the reasonably foreseeable probable future projects results in a mixed set of both beneficial impacts and adverse impacts depending on the type of project being considered.

There are moderate benefits to the environment in the Mattole basin by reasonably foreseeable probable future shaded fuel break installation and maintenance projects, particularly those being pursued by the Lower and Upper Mattole Fire Safe Councils, and the Southern Humboldt Fire Safe Council. There are additional additive cumulative benefits to the Mattole basin by projects being implemented by the KRNCA to maintain shaded fuel breaks and to increase the rate at which late seral stand conditions are achieved from timber harvest undertaken 15-30 years ago. KRNCA slash treatment requirements in the late seral silvicultural projects require lopping slash to 12" and pruning limbs on all remaining small trees up 6'. These two practices in particular should easily reduce flame lengths to less than 2' in these treated areas. The Humboldt Fire Safe Council goal to "harden" homesites and access roads is also likely to reduce wildfire behavior in these treated areas. The impacts to wildfire behavior from implementation of fuel hazard abatement work and installation or maintenance of fuel breaks are not expected to cumulatively

add more than a negligible beneficial impact beyond those already described for the Program, since these efforts are at such a small scale compared to the basin as a whole.

Actions that reduce vehicle access tend to reduce the potential for ignition, thus the MRC Good Roads Clear Creeks program which removes abandoned roads has the potential to reduce access and thus to reduce ignitions. However the projected increase in population and residential buildings increases the potential for new ignition sources, particularly from backyard debris burning and from increased vehicle usage within the basin. The impacts to wildfire behavior from sediment removal, residential development and population increase are not expected to cumulatively add more than a negligible beneficial or adverse impact beyond those already described for the Program.

Grazing in and of itself is not likely to cumulatively impact wildfire behavior, other than the potential that vehicle access associated with tending cattle potentially results in a limited number of ignitions in the Mattole. As a result, cattle grazing in the commercial forest, along with the Program specific impacts are not expected to result in anything more than a negligible adverse impact to wildfire behavior beyond those already described resulting from implementation of the Program itself.

The largest cumulatively additive adverse impact to wildfire behavior is the projected off-Program harvest of almost 5,000 acres within the Mattole basin using even-aged silvicultural prescriptions. Analysis of the direct impacts to wildfire behavior from implementing Alternative I show that these even-aged treatments could result in significant adverse impacts as a result of an increase in mortality during moderate fire weather conditions. Percent mortality increases from around 15% from fires burning in untreated stands today to 50% mortality in stands, which have even-aged silvicultural treatments today through the next 50 years. For these specific 4,912 acres, the direct impacts would be significant, particularly in the North_1 and North_2 subbasins. However, the cumulatively additive combination of the Program fire impacts, the off-Program fire impacts and the 83% of the Mattole commercial forestland that is never harvested results in an actual decline in percent mortality over time. Stands that are never harvested improve in terms of fire behavior over time with mortality under moderate fire weather conditions dropping from an average of 17% mortality to 9% mortality when averaged across all commercial vegetation types. The change in mortality occurs even as moderate fire weather flame lengths increase from an average of 1.6' today to 4.2' in 50 years. Increased tree size accounts for the majority of the beneficial change in mortality rates. As a result, the cumulatively additive impact of the off-Program harvest, Program harvest and the 83% of stands that are never cut results in a moderate beneficial impact to wildland fire behavior across the entire Mattole basin.

The cumulatively additive impact of the spread of SOD on wildland fire behavior is difficult to predict. SOD is almost certain to advance into the Mattole, particularly given the high risk of SOD infection throughout the basin. At an infection rate of 1,000 acres/year (average of the low infection spread rate in the Southern Humboldt area), the spread of SOD is likely to create a cumulatively additive substantial adverse impact to fire behavior over time. Within 15 years, at the spread rates above, SOD could easily have a greater impact on the environment than either the Program or the Status Quo. Predicted flame lengths increase from 2.7' to 6.5' in moderate fire weather conditions after tanoak is killed by SOD. Mortality from simulated wildfire is

projected to increase from 18% to approximately 45% as a result of SOD mortality. In severe fire weather conditions, SOD-affected stands could see a projected increase in flame lengths from 5' to 13' along with a projected mortality increase from 55% mortality pre SOD to 85% post SOD infestation. Over time, killed tanoaks fall over and decay, such that their contribution to fuel loading declines at some point after the trees die from SOD. A rough estimate might be that tanoak killed by SOD remains standing for 5-10 years, then falls over and decays at a relatively fast rate. At any one time, there might be as many as 15,000 SOD acres that are likely to have increased wildland fire behavior.

Climate Change

Chapter 3 discusses the role of climate change in relation to wildfire frequency and is not repeated here other than the concluding paragraph, which is summarized below.

> "*The findings from Chapter 3 suggest that predictions about wildland fire behavior in the Program area over the next 100 years due to global climate change vary since such predictions are highly sensitive to the assumptions made including the choice of GCM. Amazingly, give the large scale nature of GCM's, there are at least two studies which focus on northern California, including Fried's 2004 study which focused on the Humboldt Del Norte Ranger Unit. Fried's 2004 work suggests only a minor change in the number of escaped fires due to global climate change, however Fried's 2004 work used a GCM not used by other researchers. Other work by Fried, and Westerling and Bryant, ... predicted increases in wildland fire behavior and change in the number of escaped fires due to global climate change. Both pieces of work predicted global climate change would likely result in more escaped fires in grassland and brushland types, and only a minor increase in forestland fire types. Fried's 2006 work also noted that there would probably be a slight reduction in wind speed due to global climate change. However, with a longer fire season, more ignitions due to more people in the Program area and with most escaped fires occurring during severe fire weather conditions, it can be concluded that there is likely to be a greater number of escaped fires during the next 100 years due to climate change than would be the case without climate change.*"

Given the conclusion above, it seems likely that the Program together with the reasonably foreseeable probable future projects and activities is not likely to be significantly adversely impacted by climate change in terms of wildfire behavior.

Determination of Significance for Wildfire

Overall, the combination of Program practices, off-Program harvest, other reasonably foreseeable probable future projects such as fuel break maintenance along with no harvest across the vast majority of the Mattole's commercial forests results in wildfire-induced mortality that declines through time and certainly never increases by 50% to create a significant adverse impact.

As a result, the analysis above shows that there is a less than significant cumulative adverse impact on wildfire behavior from the additive impacts of combining the individual Program practices together with reasonably foreseeable probable future projects and activities including the effects on wildfire behavior from SOD.

4.16 Population and Housing Cumulative Impacts

This section summarizes the potential for cumulative impacts to Population and Housing from implementing the Program in conjunction with the on-going and reasonably foreseeable probable future projects. The assessment area for describing the potential cumulative impacts from to population and housing is the Mattole basin.

The significance criteria and the determination thresholds have already been previously described in Chapter 3. The determination thresholds are reproduced here, since they establish the point at which cumulative impacts might be significant. The Program in conjunction with the reasonably foreseeable probable future projects and activities, when combined might create a significant impact if cumulatively they would induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

As described in the FPR's cumulative impacts from a change in population or housing as a result of implementing the Program can occur when the impacts of two or more activities, from the same or different projects, combine to produce a significant increase in population or housing

As stated in section Chapter 3, there is no accepted threshold for evaluating a significant change in population so the following threshold was used: Population increases less than 0.5% were considered negligible.

Program Impacts Analysis

The direct impact of the Program and Alternatives on population and housing are evaluated in Chapter 3. The findings suggest that the direct Program impacts are likely to have a negligible adverse impact to population and housing.

Cumulative Impacts

There is no growth inducing impact associated with the Program. The only changes to population and housing, as discussed in Chapter 3, are temporary increases associated with workers traveling into an area to complete timber harvest operations.

Determination of Significance for Population and Housing

Based on the analysis above, there is a less than significant cumulative effect on population and housing expected from the additive impacts of combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

4.17 Cultural, Archaeological, and Historic Resources Cumulative Impacts

This section summarizes the cumulative impacts to cultural, archaeological and historic resources from implementing the Program in conjunction with on-going and reasonably foreseeable probable future projects. As noted in Section 3.15; under the FPR's each PTHP must be evaluated separately for potential effects to cultural resources. For the purpose of this analysis the assessment area for describing the potential cumulative impacts to cultural, archaeological and historic resources is the Mattole basin, because it offers a defined boundary to the Program area and, at least in historical times, is considered a discrete community of place, as evidenced by the many groups, such as MRC, which have identified the basin as their working circle.

Even though no significant direct impacts to cultural, archaeological, and historic ('cultural') resources were identified in the analysis in Section 3.5, there is still the potential for impacts from the Program or alternatives to combine with those of other reasonably foreseeable future projects or natural processes to bring about significantly adverse cumulative impacts.

Determination Threshold

The Program and Alternatives would have a significant cumulative effect to cultural resources if impacts from implementation of treatments in the Program or any alternative combined with those of reasonably foreseen projects or processes ultimately results in:

a) A substantial adverse change in the characteristic(s) contained in that resource which qualify it as being significant;
b) An adverse change to locations associated with the traditional beliefs of Native Americans, including areas used or assumed to be used for ceremonial activities; or
c) An adverse change to locations and or resources used by Native Americans to carry out or support economic, artistic, or other cultural practices

Cumulative Impacts from the Program or Alternatives

Effects on cultural resources are directly tied to acreage potentially impacted by operations and the potential for cultural resources to be present within the any area of impacts. Although intensity of the impact also is a factor, any ground disturbance can potentially create an adverse impact and therefore area of potential disturbance equates to project area.

The Program is estimated to implement logging across a 15,038-acre 'footprint.' Because uneven-aged management is utilized, 12,549 of the approximately 15,000 acres are projected to be re-entered for harvest at least once more during the 50-year analysis period, for a total area of ground disturbance of 41,718 acres. The 15,038-acre Program footprint represents approximately 13% of the 116,831 acres of commercial forestland in the basin. Alternative I, the status quo, is estimated to have a footprint of 14,715 acres and Alternative 2, 15,400 acres, each equivalent to about 13% of the commercial forestland in the basin. Alternative 3 is projected to impact 10,228 acres, or about 9% of the commercial forestland in the basin.

The reasonably foreseen project with the most similarity to the Program is timber harvest that occurs outside of the Program, or 'off-Program' timber operations, which is predicted to occur on approximately 4,912 acres over the analysis period. The total cumulative footprint acres affected by timber operations after adding the off-Program acreage is 19,950 acres for the Program, 20,311 for Alternative 2, and 15,140 under Alternative 3. Alternative I, which occurs without the Program in place, is projected to impact a total of 14,715 acres over the 50-year analysis period (also ~13% of the commercial timberland).

Off-Program timber operations would be conducted consistent with FPR regulations and under CAL FIRE oversight, and the effects would basically be to add additional acres having similar impacts to those discussed in Section 3.5, including soil disturbance, increased erosion and sedimentation and removal of vegetation, all of which could cause damage to cultural resources. These projects are projected to occur on private timberlands; no commercial logging is projected to occur on federal lands in the basin (Bureau of Land Management 2005), although there are expected to be federal ground-disturbing projects, as shown below.

Table 4-3 above lists several reasonably foreseen ground-disturbing projects that have potential to impact cultural, archaeological, and historical resources over the 50-year analysis period, including:

KRNCA Late Seral Silvicultural Improvement Projects	2500 acres
KRNCA Shaded fuel break maintenance	1800 acres
KRNCA mountain bike trail installation	50 miles of trail
Livestock Grazing	2,000 animals/ 24,000 acres
MRC Good Roads Clear Creeks Program	Removal of 225,000 yards of sediment (year 2011)
MRC Fuel Reduction Projects	6000 acres
Residential Development	100-250 new dwellings
Population Increase	500 people
Sudden Oak Death Infestation	50,000 acres

Environmental clearance for projects expected to occur in the basin, including their impacts to cultural resources, would depend on the funding source of the projects or the permits required. Federal KRNCA projects would likely be addressed through NEPA, while the MRC projects would likely be state-funded and addressed via CEQA. Both CEQA and NEPA require evaluation of cultural, archaeological and historical resources, including, as appropriate, a field survey and/or consultation with the State Historic Preservation Office.

Environmental Clearance for Reasonably Foreseen Projects

Many of the reasonably foreseen projects would require additional environmental review outside of the PTEIR process, as noted below.

Residential Construction: For residential construction the primary regulatory responsibility would rest with the Humboldt County Planning and Building Departments. If a permit is obtained for an existing parcel, a building inspector, who fills out a Pre-Site Investigation

Checklist, conducts the environmental review. This checklist contains no requirements related to cultural resources. On the other hand, if a residential subdivision is planned, it is subject to a CEQA analysis, which follows a similar review to a timber harvest plan, where the proponent must consider cultural resources and apply mitigation measures to avoid significant impacts to them. The North Coast Information Center is consulted for all proposed subdivision developments, and archaeological studies may be conducted, according to the recommendations of the NCIC. A CEQA review can also be generated if a landowner files for a special permit (for instance, to decrease the setback from a stream for a building site), in which case impacts to cultural resources could be investigated (Estlow, pers. comm. 2010).

Sudden Oak Death: Infestation by the sudden oak death fungus of 50,000 acres over 50 years will be limited to stands containing substantial amounts of hardwoods. There is likely no direct effect to cultural resources from the infestation and killing of affected trees, although there could be ground-disturbing effects from control measures such as tree felling and slash burning. Presumably, however, control activities would be funded by the state and covered by CEQA, under which project-scale impacts to cultural resources would have to be evaluated.

Cattle grazing: Cattle grazing appears to be the only reasonably foreseen ground-disturbing land use for which there is no overt permitting or regulatory oversight. The effects of herbivory on cultural resources can include trampling, artifact breakage, soil compaction (which can disturb soil profiles and affect dating), reduced ground cover, and destabilization of stream banks, leading to erosion and displacement of artifacts (USDA 2009). Grazing animals, especially large, heavy animals such as cattle, can dislodge and damage cultural resources (Osborn et al. 1987). However, the Mattole basin has been used for livestock grazing for over 100 years, so it can be somewhat safely assumed that many of the possible impacts to cultural resources from grazing have already occurred and are not likely to increase during the analysis period. While there could be some slight negative impact from maintenance of grazing at its current rate, cattle grazing is estimated to create at most a slight adverse impact to cultural resources, as a stand-alone activity.

Determination of Significance for Cultural, Archaeological, and Historic Resources

The analysis above shows that there is a less than significant cumulative adverse impact to cultural, archaeological, and historic resources resources when combining the individual Program practices together with reasonably foreseeable probable future projects and activities.

Literature Cited

Estlow, Trevor. 2010. Humboldt County Planning Department. Eureka

Osborn, Alan J. and S.K. Hartley. 1987. Adverse Effects of Domestic Livestock Grazing on the Archaeological Resources of Capitol Reef National Park, Utah. National Park Service. Lincoln, Nebraska

USDA Forest Service. 2009. Rube and Powder Magazine Grazing Environmental Assessment. Sequoia National Forest, Tulare County, CA

Valachovic, Yana. Personal Communication October 2010. Forest Advisor, University of California Extension Service.

4.18 Cumulative Impact Summary

The foregoing analysis has considered the effects of the proposed Program in combination with past, present, and reasonably foreseeable probable future projects, and found that no significant impacts are reasonably expected to occur as a result of the Program and those other projects.

Table 4-9
Cumulative Impacts by Resource Area: Significance Summary

Resource Subject	Yes, After Mitigation (a)	No, after Mitigation (b)	No reasonably potential significant impacts (c)
Watershed effects			
Peak flows			X
Water temperatures			X
Nutrients			X
Large Wood and Organic Debris			X
Sediment loading and turbidity			X
Soils and Mass Wasting			X
Biological			
Aquatic resources			X
Vegetation [1]		X	
Terrestrial wildlife			X
Recreation			X
Visual and aesthetic			X
Traffic and transportation			X
Air quality			X
Greenhouse gases			X
Wildfire			X
Population and housing			X
Cultural, archaeological and historic resources			X

[1] The effect of the possible spread of Sudden Oak Death is considered in this EIR, with a mitigation measure described on page 2-38. This is a conditional mitigation that would become effective in the event that Sudden Oak Death kills more than 80% of tanoak on 35% or more of the acres in a subbasin.

Appendix A: Methods and Procedures Used to Establish the Footprint of the Mattole Forest Futures Program and Alternatives

Most landscape level timber management planning documents (Habitat Conservation Plans (HCPs), Sustained Yield Plans (SYPs), USFS Forest Plans, etc.) are developed for single ownerships where the owner is able to state what they intend to do, where and how. In contrast, the Mattole Forest Futures Program could theoretically include all of the approximately 900 private forestland landowners in the Mattole watershed that choose to participate. Therefore, evaluating the environmental effects that may occur due to implementation of the Mattole Forest Future Program (and the alternatives required by CEQA) necessitates developing predictions (estimates) of how many acres will be harvested, where the harvests will occur and which treatments will be used.

The Procedure to develop the Program and Alternatives footprints included the following approach:

1. Identify Commercial Timber Landbase

The assessment area for analyzing the direct impacts from implementing the Program's practices on timber resources is the Program footprint area— those forest stands that are actually harvested under the PTEIR. It is likely that the majority of the forested area in the Mattole would meet the technical definition of 'timberland' even though much of it could not be managed economically in the foreseeable future. For the purposes of analysis in this EIR, land cover in the watershed is divided into four broad categories of vegetation: commercial forest types, non-commercial forest types, grasslands, and other non forested vegetation types not proposed for treatment under the Program. The first step in the timber analysis was to stratify the commercial forestland into types homogenous enough to apply appropriate silvicultural simulations. These strata are derived from the GIS data (CALVEG 1998) previously described in section 2.0.5 above. The 1998 vegetation data are based on remotely sensed information using satellite imagery and subsequent "ground-truthing" for verification and slight modification. Based on remote sensing data, there are estimated to be approximately 86,671 acres of private commercial forestland within the basin. This is used as the potentially commercial landbase and is not projected to change significantly over the analysis period.

The assessment of current and future forest conditions in the Program area relies upon the Wildlife Habitat Relationship (WHR) classification system developed by CA DFG. The following table shows the classification system categories for forestlands found in the Mattole. Forest type designations are based on predominant species, size class by average overstory tree diameter, and density by total canopy cover.

Table A-1 (From Tables 3-61 (also 2-7))
WHR Classification Key for Mattole Forestlands

SPECIES		SIZE CLASS Avg. dbh of overstory		DENSITY Total Canopy Cover %	
DFR	>50% relative overstory cover by conifers (Douglas fir/redwood)	6	> 24" & multi-storied	S	Sparse 10-25%
MHC	Montane Hardwood/Conifer - relative overstory conifer cover between 25 & 50%	5	> 24"	P	Patchy 25-40%
MHW	Montane Hardwood – relative conifer cover < 25%	4	11" – 24"	M	Moderate 40-60%
		3	6" – 11"	D	Dense > 60%
		2	1" – 6"		
		1	< 1"		

The stratification of the program area began with the CALVEG 1998 WHR classification of the vegetation of the Mattole, which was obtained in GIS format from the Mattole Restoration Council who obtained it from Region 5 of the USDA Forest Service. The GIS data contained numerous classification systems within it. For purposes of this analysis, the WHR classification system as to the type of vegetation and the size of the vegetation was combined with the CALVEG classification of density to arrive at a WHR classification of the vegetation of the basin. The WHR density classification was not used, because it classified virtually everywhere as dense based on the crown cover of all layers of vegetation compared to the CALVEG density classification, which only classified the overstory density.

This dataset was intersected in ARCMAP with the Humboldt County GIS assessor parcel data so that each individual landowner in the basin had their ownership classified into specific vegetation types according to the WHR type and size classification system and the CALVEG density classification.

The CALVEG 1998 classification indicated that nearly 80% of the private commercial forestland belonged to the DFR type. This classification appeared to be at odds with the actual conifer-hardwood balance in the watershed, as most stands within the basin appear to have regenerated into more tanoak-dominated stands after the initial old-growth logging.

Fortunately, these remotely sensed GIS data were supplemented with inventory information provided by private landowners within the basin. Approximately 470 timber inventory plots measured between 1993 and 2005 were utilized to determine the final description of the vegetation within the basin and to model growth and harvest over time. Because the plot data included species-specific inventory information, it was possible to assign each plot to its actual WHR category. Since the locations of the plots were known, the actual WHR category of each plot could be compared with its remotely sensed WHR classification. The conclusion was that much of the remotely sensed Douglas-fir type (DFR) has substantially lower conifer stocking than this label indicates, and actually should have been classified as Montane Hardwood-Conifer (MHC). Some plots, however, did reflect the majority conifer overstory that characterizes the DFR vegetation type. Because of the heterogeneity within the DFR classes, clusters of plots were grouped for purposes of silvicultural modeling into two or three strata, each representing a

level of conifer stocking within that WHR class— high, low, and in some cases medium. The plot data were used to calculate average stand metrics for each of ten strata — three each for remotely sensed DFR3 and DFR4, two for remotely sensed DFR5, and one each for remotely sensed MHC5 and MHC4.

The plot analysis allowed adjustments to the overall proportion of the landbase ascribed to each WHR type — an analysis that is explained in fuller detail in Section 3.14-Vegetation. The proportional area of each stratum within a remotely sensed WHR class in a given sub-basin was estimated from the density classes found in the CALVEG GIS data for that subbasin. Growth and harvest projections for all ten strata were used in developing the projections of overall harvest under the program. This section presents in detail the results of modeling for five of those strata that comprised the great majority of the Program Area landbase. Table A-2 below lays out the correspondence between remotely sensed WHR classes, levels of conifer stocking, and actual WHR classes.

Table A-2 (also Table 3-62)
Correspondence of Timber Strata To WHR Type

Remotely sensed WHR category	Conifer Stocking	Actual WHR category
DFR 5	high	DFR 5D
DFR 5	low	MHC 4D
DFR 4	high	DFR 4D
DFR 4	med	
DFR 4	low	MHC 4D
DFR 3	high	DFR 3D
DFR 3	med	MHC 3D
DFR 3	low	
MHC 5	low	MHC 4D
MHC 4	low	MHW 4D

These 3 strata all fall into the MHC4D WHR classification.

Overall, analysis results indicate that only about 38,000 acres of the private commercial forest is true Douglas-fir type (meaning that more than 50% of the overstory canopy cover is Douglas-fir) and nearly 35,000 acres of the private commercial forestland is Montane Hardwood/Conifer type (MHC), where 50 to 75 percent of the overstory canopy cover is comprised of hardwoods, principally tanoak. This finding essentially confirms one of the hypotheses behind the Program goals outlined in chapter 1: that much of the forestland has become hardwood-dominated following the removal of valuable Douglas-fir from stands which previously had a minor tanoak component. The Program Area includes six WHR types. Their areas were calculated after shifting some of the strata acreages into the more appropriate WHR classes and are shown in the following table. Stand characteristics presented represent a weighted average of the inventory data for each of the strata comprising the WHR type.

Table A-3 (also Table 3-40)
Vegetation Type Condition Summary 2010

Actual WHR Type	Private Acres	Trees/ acre	Trees/ acre	Avg. diam. (inches)	Avg. diam. (inches)	Basal Area (ft2/acre)	Basal Area (ft2/acre)
		Conifer	HW	Conifer	HW	Conifer	HW
DFR3D	2,565	289	147	11.9	9.0	272	69
DFR4D	28,915	226	48	12.5	8.7	200	32
DFR5D	6,681	117	11	20.1	10.0	297	5
MHC3D	5,345	175	439	11.1	10.3	116	205
MHC4D	29,562	155	328	11.2	10.9	96	171
MHW4D	13,603	71	488	12.0	11.2	61	207
Total	86,671	168	237	12.4	10.0	147	116

Certain non-commercial types, such as Coastal Oak Woodland and Montane Hardwood, were eliminated from further analysis due to their lack of occupancy by commercial species. Other types were eliminated because of low stocking and/or low size class. After these areas were eliminated, approximately 86,671 acres within the Program landbase were considered occupied by vegetation types containing trees of the size, species, and density of stocking that potentially could support a commercial timber harvest during the 50-year planning horizon (potentially commercial types were "grown forward" in time using computer growth models to estimate their future merchantability). The number of acres of potential commercial vegetation type, once-determined, is not projected to change over the analysis period, although stocking by acre does vary due to stand growth and maturation, as well as from stand treatments including projected harvest removals.

2. Identify Available Landbase

Eliminating areas designated as no-harvest zones by either state regulation or to meet the goals of the Program or alternatives as described above then reduced the pool of potential acres based on timber type. No-harvest watercourse buffers and (for some alternatives) unstable slopes of certain classifications made up the bulk of the excluded acreage. After elimination of no-harvest areas, an available landbase was calculated for the Program and each alternative. For the proposed Program, the available landbase is estimated at 57,601 acres.

The procedure to accomplish the identification of the available landbase took the GIS database of combined WHR types and landownership and intersected these data with GIS shapefiles of the stream network obtained from NCWAP and the GIS shapefiles of the NCWAP landslide hazard. Depending on the requirements in each alternative, Class I or II watercourses were buffered to eliminate "no-harvest" areas. For landslide hazard, the NCWAP GIS landslide hazard shapefile was combined with the ownership, stream buffer, and vegetation type information to create a shapefile with each acre classified according to landowner name, vegetation type, no harvest stream buffer and whether the area was classified as extreme or high landslide potential. Total acres available were comprised of those areas that were designated as harvestable stream buffers, and 65% of all landslide areas classified as extreme and 80% of all landslide areas classified as

high hazard. The resulting data table for determining how much of the Program area was available for harvest comprised around 24,000 lines of data.

3. Identify Feasible Landbase

The identified available landbase was then subjected to a financial feasibility analysis to determine if particular landowners could likely conduct a viable economic timber harvest operation, considering the size of their timbered landbase, volume of harvestable timber, accessibility, etc. This analysis was conducted on a landowner-by-landowner basis using the available landowner dataset that was combined with timber volume estimates of stocking and harvest projected through time using the plot data described above.

Plots were grown forward from the time of initial measurement to 2010 in the US Forest Service's Forest Vegetation Simulator (FVS) program using the Klamath Mountains variant, which includes reference data from stands of similar species composition to much of the Mattole. Because the Mattole plot data was compiled from a variety of past projects, including an unsystematically selected assortment of landowners, the plot distribution is not a statistically valid sample. However, plots were located on sites throughout the basin, including lands in the extreme southern, northern and middle portions of the basin. These data provide a good representation of stand conditions within the primary WHR types, but should not be used to predict actual volumes that would be harvested. The per acre stand metrics in the tables below can serve to demonstrate that the Program prescriptions can achieve the target parameters from a variety of forest conditions, even though individual landowners filing PTHPs may or may not have stands that match those modeled for this EIR.

Each stratum has a site index determined by that particular set of inventory data. During growth and yield modeling, variations in site class within a stratum are accounted for since FVS growth is driven by the plot-specific site index. The resulting strata averages reflect a range of site indices from low site 2 to middle site 4. Strata with greater proportions of hardwood stocking in 2010 generally have more site 4 plot data.

Growth and harvest were simulated in each stratum for at least 60 years applying the most appropriate prescription based on the vegetation information. Simulations were extended beyond 60 years if necessary to demonstrate that the stand would reach the target conditions under the planned regime. The prescriptions were designed to achieve the goals of the Program in regard to increasing conifer stocking and size class and /or increasing the proportion of conifers to hardwoods, depending on the starting condition of each stratum. The selection prescription was modeled for all the strata included in WHR types DFR3D, DFR4D, and DFR5D. The all-aged prescription was modeled for all the strata included in types MHC3D, MHC4D, and MHW4D.

Assumptions and parameters of the silviculture modeling in FVS include:

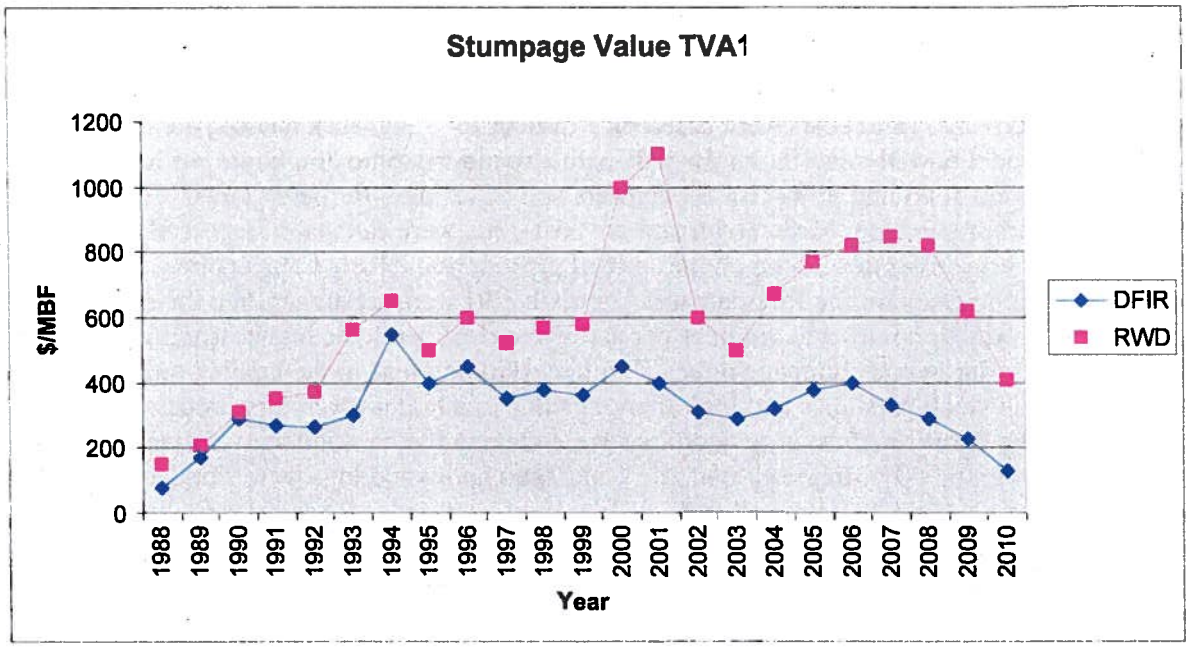
- Target conditions considered to meet Program goals are 150 ft^2 conifer stocking and >60% conifer composition by basal area.
- "Maximum harvest" means that the simulation represents the most intensive harvesting realistically allowed under the requirements of the PTEIR prescriptions.

- At each entry the maximum number of large trees allowed to be harvested under the PTEIR prescriptions would be harvested – stand data was carefully examined to create prescriptions that ensured FVS was retaining 1/2 the largest conifers in the diameter class representing the upper 30% of the basal area distribution.
- Stands were projected for 60 years or longer if necessary to achieve the target conditions.
- Group openings in the All-aged prescription are simulated separately from the individual tree selection occurring in the rest of the stand.
- Stocking data in the all-aged tables are weighted averages of the group openings and the individual tree selection areas of the stand.
- Initial stand entry occurs when there is sufficient volume to allow an economically feasible harvest – generally at least 20,000 board feet per acre of conifer stocking.
- Cutting cycle is 15 years for Selection and 20 years for the All-aged prescription.
- Group Openings: retain 15 ft^2 of basal area in large trees; 350 DF trees/acre are planted; natural sprouting of hardwoods is simulated in proportion to their presence in the pre-harvest stand; 50% of the tanoak sprouts are killed 5 yrs after harvest in a release treatment; and the regenerated stand is commercially thinned at age 40 and 60.
- Individual Tree Selection area: natural regeneration is simulated after each harvest with 100 trees/acre of DF and tanoak sprouting turned on.

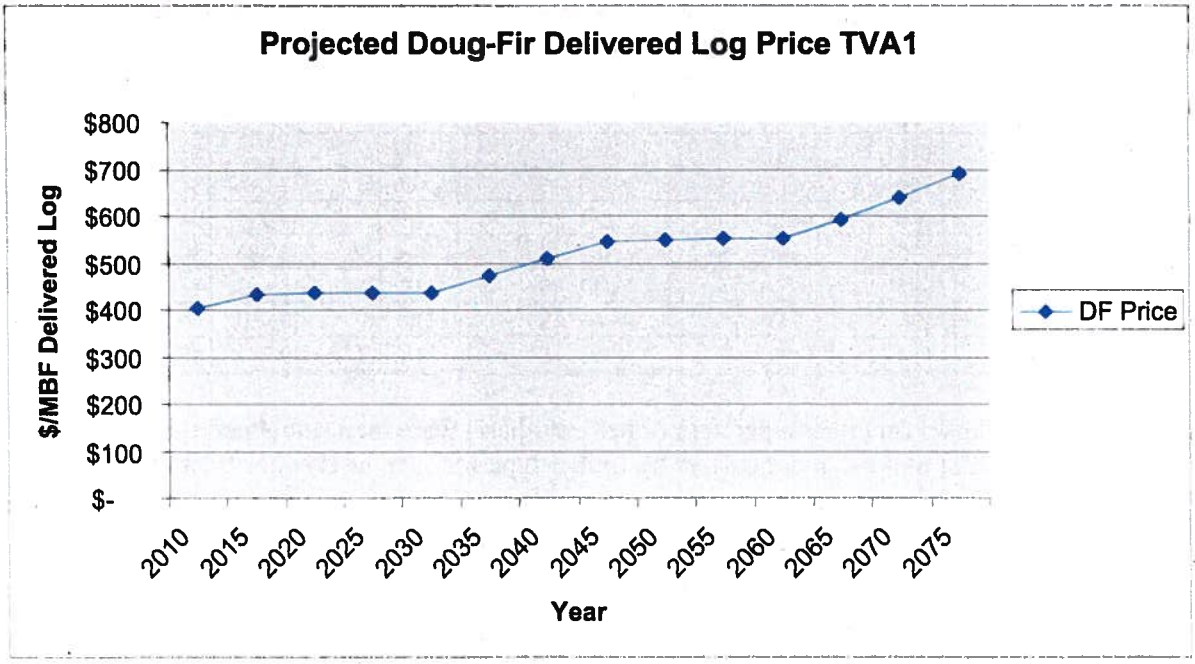
Once all of the modeling was complete, the FVS output of stand stocking and harvest volume classified according to conifer or hardwood volume was assigned to each of the 24,000 discrete available landowner polygons.

To determine feasibility of harvest required assessing the value of the harvest and cost of harvest over time. Variables that were considered in this analysis included timber prices and volumes projected over the planning horizon, logging systems appropriate to terrain, silvicultural systems assigned to various timber types, and variability in treatments between alternatives. Also at this time in the analysis, large landowners with more than 300 acres of commercial timber types were subdivided into tracts of around equal size, each no larger than 300 acres so that from a regulatory standpoint, a large landowner would not be modeled as filing one permit on 2,000 acres, for instance. Thus, every "harvest operation" required that a "new" permit be obtained for each tract of an ownership. For small ownerships less than 300 acres, no subdivision was required.

Prices were extrapolated through time based on an analysis of historic timber pricing in Humboldt County between 1988 and 2010. The stumpage price of Douglas-fir and redwood during the subject time frame for Timber Value Area 1(TVA1 - Humboldt County) is shown below:



Based on the trend line above, there is an approximate six-year periodicity between two highs (or two lows), e.g. a low in 2003 is followed by three up years and then three down years. This trend was modeled for Douglas-fir only by taking the past trend between 1988 and 2010, adding in logging costs and trends to produce a potential delivered log price through time. The graph below has been smoothed, eliminating the peaks and valleys in each 6-year cycle.



Logging costs were trended at a historic consumer price appreciation rate of 1%/year. Tractor logging costs in partial cuts started at $225/MBF and cable yarding costs at $275/MBF. Stump-to-landing hardwood falling and skidding costs were started at $289 and $354/MBF for cat and yarder, respectively. Haul costs were based on $75/hour for a log truck hauling 4.6 MBF/load for conifers and 3.6 MBF/load for hardwoods with a round trip time of 6 hours per load. Thus, haul costs started at around $97/MBF for conifers and $125/MBF for hardwoods. Costs for slash treatment, plan preparation, hardwood treatment costs, etc. were calculated separately for the Program or Alternatives depending on the suite of prescriptions likely to be applied. For example, logging costs for the Program and Alternative III were set higher than for Alternative I or II where production rates and volumes per acre were expected to be higher leading to lower logging costs. Hardwood stumpage prices all reflect skidding logs to the landing only and no trucking costs, which presumes that logs are not hauled to a biomass or other processing plant. However, only a portion of the hardwood logs were assumed to be skidded to the landing – in the case of the Program, 50%. In the case of Alt 1 and 2, no hardwood logs were skidded to the landing, in the case of Alternative III, 80% of logs were required to be skidded to the landing.

For the Program the various cost centers on a per acre or per landowner/tract were as follows:

Table A-4
Costs Per Acre Or Per Tract For Program Through Time

	Conifer stumpage	Hardwood stumpage	Road cost per acre	Hardwood treatment cost per acre	Cost of THP, per ownership	Cost of PTHP per ownership
P1_2010	$ 53	$ (311)	$ 185	$ 75	$ 25,000	$ 18,000
P2_2015	$ 81	$ (322)	$ 192	$ 78	$ 25,887	$ 18,639
P3_2020	$ 71	$ (333)	$ 198	$ 80	$ 26,806	$ 19,300
P4_2025	$ 60	$ (345)	$ 205	$ 83	$ 27,758	$ 19,985
P5_2030	$ 47	$ (357)	$ 213	$ 86	$ 28,743	$ 20,695
P6_2035	$ 66	$ (370)	$ 220	$ 89	$ 29,763	$ 21,429
P7_2040	$ 88	$ (383)	$ 228	$ 92	$ 30,819	$ 22,190
P8_2045	$ 113	$ (397)	$ 236	$ 96	$ 31,913	$ 22,978
P9_2050	$ 100	$ (411)	$ 245	$ 99	$ 33,046	$ 23,793
P10_2055	$ 86	$ (426)	$ 253	$ 103	$ 34,219	$ 24,638
P11_2060	$ 70	$ (441)	$ 262	$ 106	$ 35,433	$ 25,512
P12_2065	$ 95	$ (457)	$ 272	$ 110	$ 36,691	$ 26,418
P13_2070	$ 123	$ (473)	$ 281	$ 114	$ 37,993	$ 27,355
P14_2075	$ 154	$ (490)	$ 291	$ 118	$ 39,342	$ 28,326

Income and expenses on either a per acre or per tract basis were then calculated using the volumes per acre of harvest and the acres by timber type for each landowner/tract to arrive at total income.

A floor for economic feasibility for conducting a timber harvest operation was set at $30,000 net profit, which was considered the minimum economic gain a landowner would require in order to engage and comply with the harvest regulation process.

After elimination of non-commercial operations, a feasible landbase was calculated for each alternative. For the proposed project, the feasible landbase as of the beginning of the Program is 22,465 acres. Over time, more acres will grow into feasibility as they develop greater stocking. However, for many landowners, especially small landowners, their harvest does not start out positive. If a landowner did not have a positive harvest of $30,000 in the first period, then feasibility was ascertained in the second, third, or fourth period until a harvest became feasible. If a landowner's operation became feasible in any period, that landowner was then assigned that particular prescription and the growth and yield stream was then "hard-wired" to that landowner for the balance of the projection time span. If a landowner's operation did not become feasible by the fourth period, then it was assumed not to enter the pool of feasible acres, as a way of balancing out acreage that may drop out of the Program due to changes in ownership or landowner objectives.

4. Identify "Footprint" Landbase

In order to assess the landscape effects of implementing the program, the feasible landbase was reduced in accordance with the propensity of landowners to engage in timber harvest activities, as identified in the landowner opinion survey conducted during early PTEIR preparation. The "propensity to harvest" was estimated as a percentage of each landowner size class (e.g., 25% of landowners with <160 acres were estimated as likely to file a PTHP within the next 20 years, while 47% of larger landowners were likely to file PTHP's). In the survey, landowners also indicated how soon they were apt to harvest. For each of the first four five-year harvest periods, the "dice were rolled" for each feasible landholding to determine whether it would be modeled as being logged. The probabilities were calibrated to the survey results, so that over the first twenty years, an appropriate percentage of the landowners in each size class would be modeled as having logged. Additional variables included in projecting the non-industrial private forestland (NIPF) owner harvest included timing (larger landowners are more likely to conduct periodic harvests compared to smaller ones) and the fluctuation of projected future timber prices.

The process of rolling the dice was accomplished by assigning each landowner a random number between one and the total number of landowners in the simulation (e.g. in the Program or Alternatives). For each period the appropriate percentage of landowners likely to harvest was multiplied times the total number of landowners to arrive at a number of landowners who might harvest. This number was then set as the ceiling against which all landowners with a lower random number could be selected, but only if they had a feasible harvest value. Once a landowner was selected in period X, it was removed from the simulation and assumed to harvest at the hardwired rate described in section 3 above. Simulations were carried out for the first four periods, at which point landowners who had previously harvested in period one were beginning to harvest in the fifth period.

After the initial 20-year pool of landholdings likely to harvest was calculated, land that had not been "logged" was left out of the program, for purposes of this modeling. Although land would change hands and some new landowners would choose to enter the program later (and some younger forest would grow into feasibility), it was assumed in the model that these would be balanced out by land dropping out of the program as it was purchased by owners with different predilections. The landbase footprint for the proposed program is estimated at 15,038 acres.

5. Identify Projected Landbase

The final step involved calculating the total number of acres projected to be impacted by timber harvest over the entire period of analysis. While the footprint landbase represents each individual landholding projected to take part in the Program and harvested at least once, the projected landbase includes the total acres entered for harvest including multiple entries on the same property. The rationale for double- or triple-counting the same acres in order to analyze environmental effects is based on the recognition that each harvest entry results in impacts to resources. A primary goal of the Program is to establish silvicultural treatment regimes on acres harvested under the program such that it would be to the landowner's benefit to continue to apply the treatments over time, as the treated stands build volume and value from growing larger trees and increasing conifer stocking over time, consistent with Program goals. For NIPF landowners the Projected Landbase over the 50-year analysis period was estimated at 34,718 acres.

In addition to the NIPF data collected in the survey, Humboldt Redwood Company (HRC) provided an estimate of their likely harvest volume within the basin as well as their acreage by timber type. This information was used to derive an estimated HRC harvest of approximately 200 acres/year in the near future, of which approximately 70%, or 140 acres/year, could be filed as PTHP's. Over the 50-year analysis period, the total estimated acres HRC may potentially harvest under the program is therefore 7,000 acres, while their footprint acreage logged during the first 20 years is estimated at 2,800 acres. It is possible that HRC may choose instead to file some of its selection harvests as THPs instead, and this will represent a conservatism in projecting the environmental impacts of the Program, which in that case would include fewer acres than modeled.

Combining NIPF and HRC data as discussed above, the projected extent of harvest over the 50-year planning horizon of the Program is 41,718 acres, including two to three harvests on most footprint acres during the planning horizon.

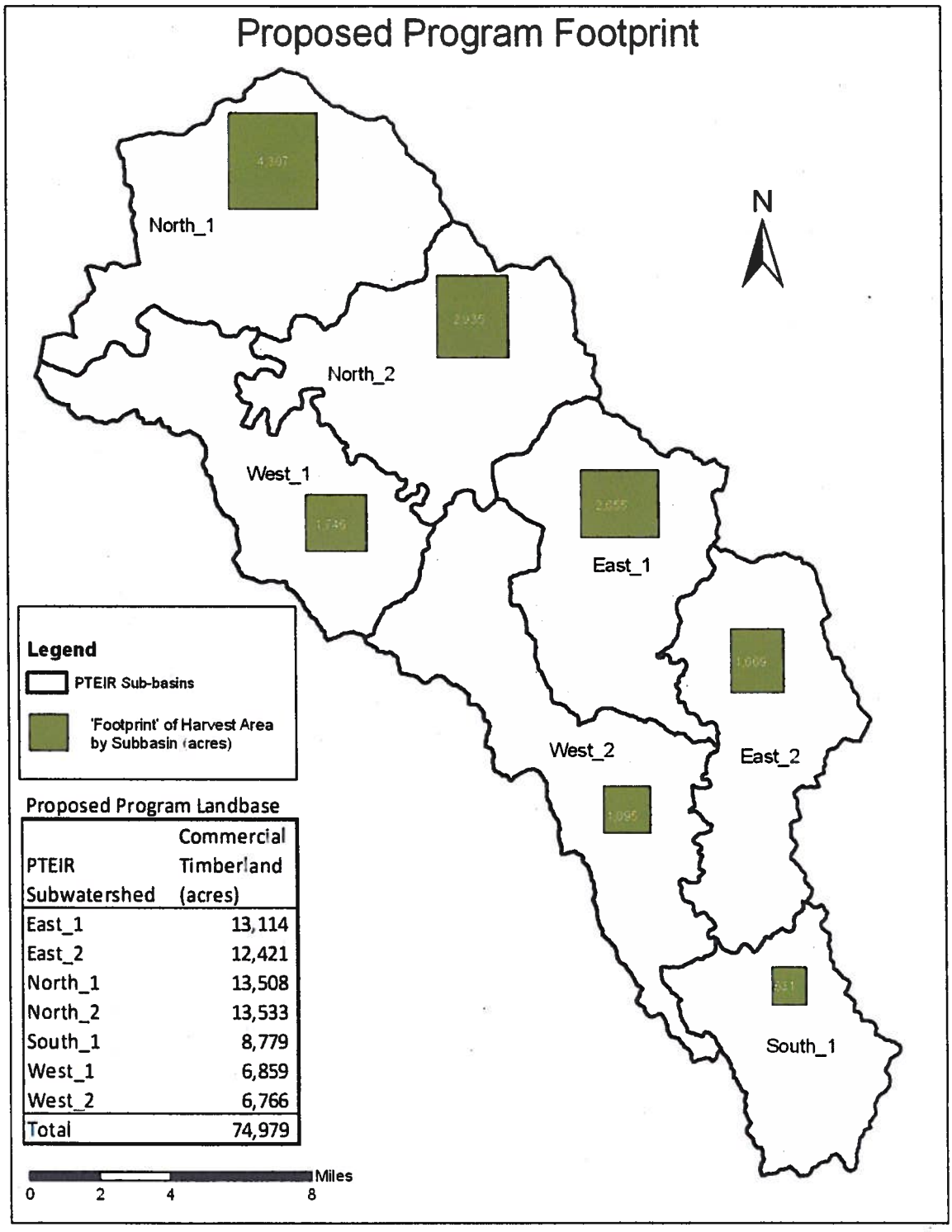
Table 2-2 below shows the breakdown by acres of landbases identified by application of the methodology described above, for the proposed project while Figure 2-1 shows the location of the potentially harvestable area in 2010.

To further determine the environmental effects of proposed treatments, the operational harvest landbase was further subdivided into areas projected for harvest using one of the allowed silvicultural prescriptions and related treatments (e.g., slash treatments, road crossing repair). These acres by treatment were analyzed over the 50-year planning horizon and include multiple harvest entries, regeneration and growth, and variability in timber prices projected over time.

Table A-5 (also Table 2-2)
Breakdown of Program Landbase by Acreage

Landbase	Area (acres)
Private land in watershed	156,484
Commercial Timberland (commercial forest type + adequate stocking)	86,671
Commercial Timberland outside of riparian buffers	74,979
Available Landbase (minus areas excluded from harvest because of geologic instability)	57,601
Feasible Landbase (commercial harvest >=$30,000 net profit)	22,465
Program "footprint" – Estimated harvest acres enrolled in program during analysis period	15,038* **Includes only first-time entries, and does not re-count acres that are reentered during the analysis period (see projected acreage below).*
Projected total acreage of harvest, based on propensity-to-harvest data from public survey). Acres harvested twice are counted twice.	41,718* ** Total acreage of harvest, counting acres with multiple harvests multiple times.*

Figure A-1 (also Figure 2-1)



Proposed Program Landbase

PTEIR Subwatershed	Commercial Timberland (acres)
East_1	13,114
East_2	12,421
North_1	13,508
North_2	13,533
South_1	8,779
West_1	6,859
West_2	6,766
Total	74,979

6. Distribution of Program Harvest Acres by Subbasin by Landowner Type

The distribution of likely harvest across the Mattole during the analysis period was allocated based on the amount of operationally harvestable land in each Program subbasin, and is shown in Table 2-3, for the proposed project.

Table A-6 (also Table 2-3)
Total Acres Projected to be Harvested and Harvest "Footprint" By PTHP's 2011-2060 Under The Proposed Program Acres By Ownership Type By Subbasin

	NIPF	Industrial	Total	"Footprint" 1/
East_1	8,094		8,094	2,655
East_2	5,149		5,149	1,669
North_1	7,594	3,500	11,094	4,307
North_2	3,492	3,500	6,992	2,935
South_1	1,777		1,777	631
West_1	5,007		5,007	1,746
West_2	3,605		3,605	1,095
	34,718	7,000	41,718	15,038

1/ See definition of footprint in Table A-5 above.

The total NIPF landbase in the proposed program is comprised of 57,601 acres. Out of this, it is projected that logging plans will total 34,718 acres during the 50-year analysis period. It should be noted, however, that many of these acres will represent re-entry harvests on the same acres and not previously unharvested acres brought into the program. The analysis recognizes that some landowners who employ the Program will not conduct subsequent harvests, but that some additional landowners who have not participated will enter the program during the analysis period; these effects are assumed to balance out over the analysis period.

In order to predict the future acreage of THPs and PTHP's, the 1993-2007-time period was used to estimate the acreage of each silviculture type for Non-Industrial Forest Landowners (NIPFs). NIPFs used even-aged methods on approximately 30% of the acres and uneven-aged or thinning methods on 70% of acres during this period. For analysis of the program it was assumed that all uneven-aged methods would convert over to PTHP's, while the 30% of even-aged harvests would still use THPs. (As noted, for HRC, data obtained directly from the company was used to estimate harvest for that ownership.)

Based on these assumptions, the 2011-2060 projected harvest level represents a 74% increase in harvest levels compared to the '93-'07 time period. This harvest acreage is projected to increase over time due to increased volume on WHR size class 4 and 5 stands (generally stands with diameters > 11" DBH). However, the projection also recognizes that some landowners who employ the Program will not conduct subsequent harvests; therefore, for analysis purposes the additional new acres and non-repeated PTHP acres are estimated to balance each other out, so

that the 11,239 acres harvested by 2034 is carried over as the analyzed landbase through the remainder of the analysis period (2060).

The projected NIPF harvestable acreage represents 71 ownerships that can support a feasible harvest, which were chosen randomly based on the propensity of landowners of their size class to conduct a timber harvest. Fifteen of these landowners own 160 acres or less and 56 own more than 160 acres. Table 2-4 below shows estimated harvest by subbasin by NIPF landowner class across the 50-year analysis period. *(Note: Wide fluctuations in totals by period shown in the table are related to the estimated volume of mature timber per modeled parcel combined with the estimated price of timber per period. Minor variations in numbers are caused by rounding).*

Table A-7 (also Table 2-4)
Projected PTHP Harvest 2011-2060
For The Proposed Program
NIPF Owners By Size Of Ownership By 5-Year Period

Analysis Period	Acres Harvest NIPF =<160 Acres	Acres Harvest NIPF >160 Acres	Total
2011-15	638	4,242	4,880
2016-20	145	1,196	1,341
2021-25	182	2,462	2,664
2026-30	598	4,178	4,776
2031-35	135	2,538	2,673
2036-40	143	2,052	2,196
2041-45	781	5,782	6,562
2046-50	0*	265	265
2051-55	134	3,395	3,528
2056-60	744	5,108	5,852
TOTAL	3,500	31,217	34,718

*Projected timber harvest prices for this period, based on past fluctuations in the log market, are too low to support commercial harvest. This 5-year period did not include one of the every-six-years peaks in timber prices used in the financial modeling.

**Please note that the acres projected to be treated under the Program (and Alternatives 2 and 3) are not directly comparable to treatment acres for Alternative 1 (see Table 2-5), since the Program includes 'off-Program' harvest, but Alternative 1, being entirely 'off-Program' includes no additional off-Program acres.

Appendix B.

Geologic Review Flow Charts

For use with
the Mattole
Program Timberland
Environmental Impact Report
(PTEIR)

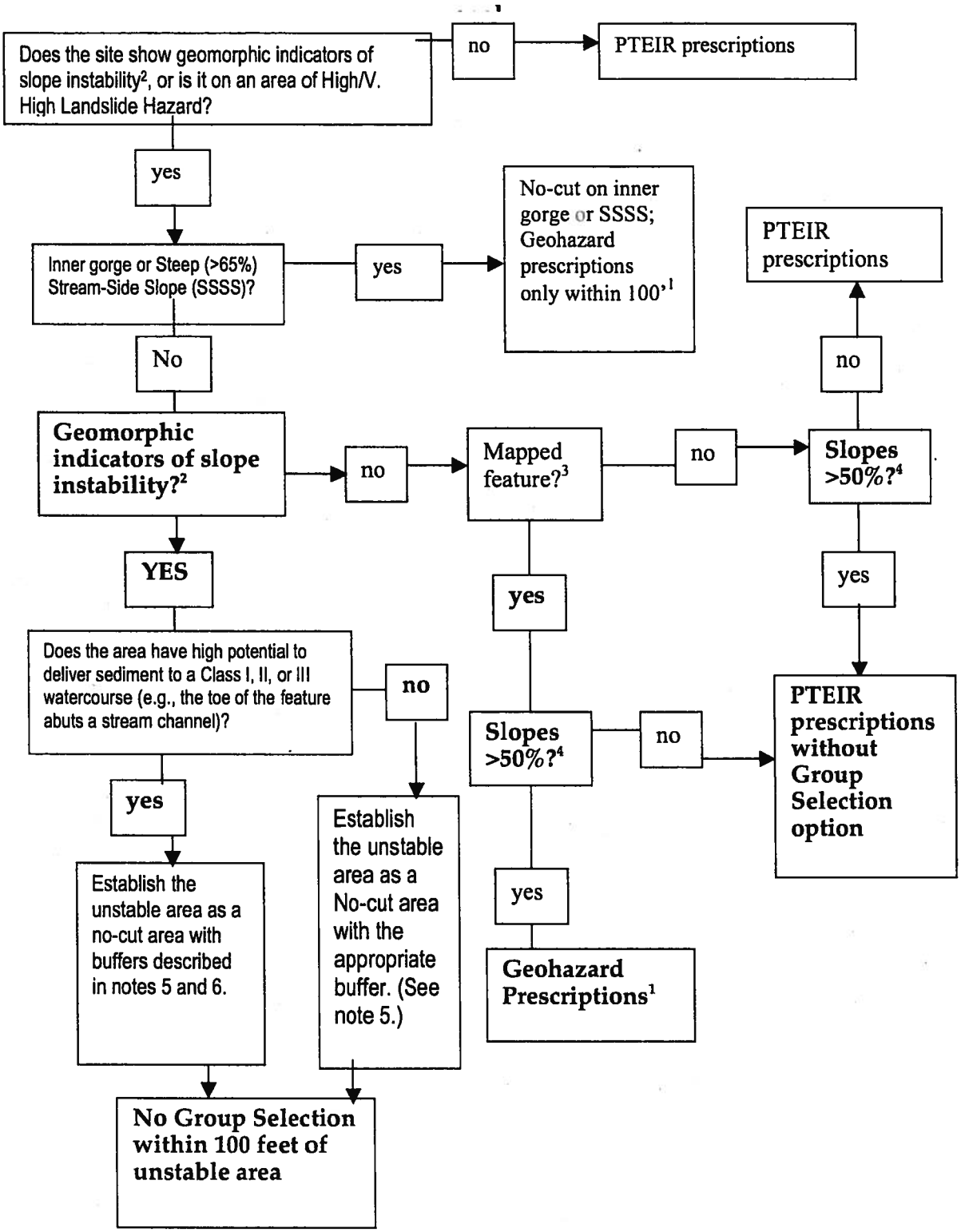
Prepared by
Gary Simpson,
SHN Engineering, Eureka
Oct. 14, 2008

in consultation with
BBW Associates,
California Geological Survey
and
the Mattole Restoration Council

Revised May 2010
in consultation with the Mattole Technical Advisory Committee

Silviculture Flow Chart

Any operations outside these prescriptions must be justified by a geologist's report.



If the prescription derived at the end of a path is unsatisfactory, retain a licensed geologist to consider whether a more aggressive prescription is warranted. If so, submit a suitable report explaining and justifying the proposed deviation.

Explanation of the Silviculture Landslide Hazard Flow Chart

- The Landslide Hazard Flow Chart is intended to provide RPF's with the means to determine an appropriate course of action regarding THP layout relative to potential unstable areas. It is the intent of this process that the RPF can develop appropriate silviculture to mitigate unstable areas within the THP without the need to retain a licensed geologist. By nature, because the process must account for all imaginable outcomes, a high level of conservatism is incorporated. Should the outcome of this flow chart be unacceptable to a landowner, they always have the option of hiring a licensed geologist to justify exceptions to the flow chart outcome.

- The Landslide Hazard Flow Chart should be applied to the largest area within a THP or individual THP unit to which it can be applied. Variables that modify the outcome of the flow chart for any one location are geology, presence or absence of mapped landslide features, and slope. Therefore, as an RPF lays out a THP, he/she must be aware of these three variables at all times; as they change, so may the appropriate silvicultural prescription.

- The mapped slope stability features noted on the flow chart are based on the North Coast Watershed Assessment Program's (NCWAP's) landslide mapping for the Mattole watershed (California Geological Survey, 2002). Pertinent maps within this series include the "geologic and geomorphic features related to landslides map", the geologic map, and the landslide hazard map. The RPF may petition CalFire to utilize another more specific map series.

Footnotes:

[1] **Geohazard Prescriptions**: For this PTEIR, "geohazard prescriptions" include Commercial Thinning and Individual Tree Selection options with a minimum of 100 sq. ft. ba/ac retention for both options.

[2] Were geomorphic indicators of unstable areas identified in the field? See the attached list of geomorphic indicators of unstable areas or refer to the CLFA Checklist.

[3] Mapped landslides are shown on the NCWAP geologic and geomorphic features maps.

[4] Slope gradient should be an average over an area, and should not be influenced by small topographic deviations of less than .25 acre.

[5] If the unstable area is 1 acre or less, establish a 75 foot buffer at the top of the slide and 50 foot buffers along the lateral margins; or extend it to the hydrologic divide, whichever is less. If the unstable area is larger than 1 acre, establish a 100 foot buffer at the top of the slide and 50 foot buffers along the lateral margins. The Geohazard Prescription (note 1) may be applied within the buffer, and all buffer zones should be established as Equipment Exclusion Zones per the Forest Practice Rules.

6 Additional measures: Retain all trees around the edge of the feature whose roots visibly contribute to the stability of the scarp. Within 50 feet of the edge, retain 75% canopy closure post-harvest.

Geomorphic Indicators of Unstable Areas (All Flow Charts)

The following list was modified after the California Licensed Foresters Association checklist of August 1999 (that is, the "Guide to Determining the Need for Input from a Licensed Geologist During THP Preparation"). This list is not exhaustive — other indicators may be present in the field.

- Hillslopes greater than 65%, including inner gorge slopes

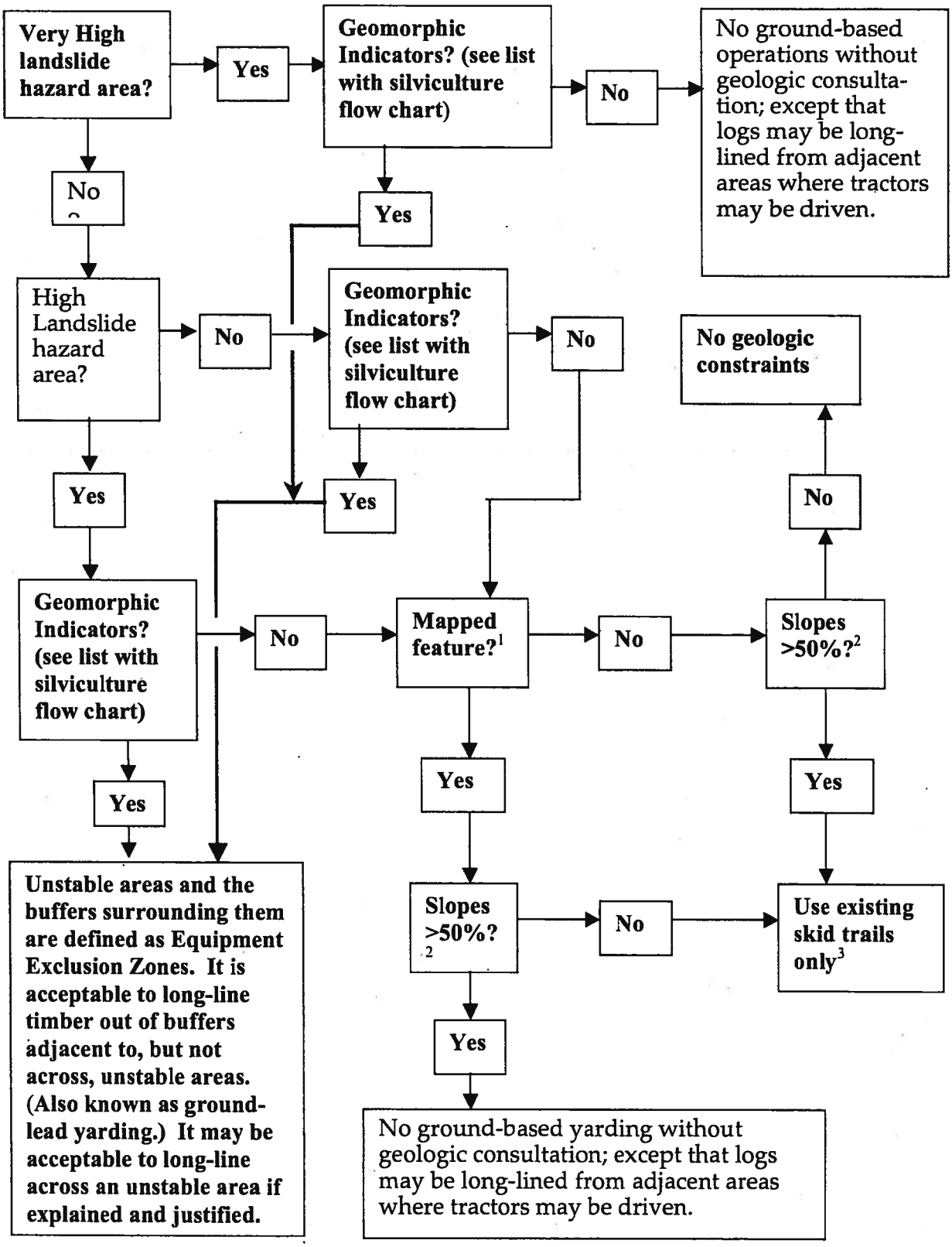
- Irregular topography
    1. Scarps
    2. Benches (usually located adjacent to and below a scarp)
    3. Hummocky ground (typical of prairie ground; in forested setting, hummocky ground associated with active mass wasting is typically coincident with leaning or deformed trees)
    4. Surface cracks, fissures (typically parallel or subparallel to slope contour; distribution pattern is more regular than shrinkage cracks, which are typically more chaotic)
    5. Bowl-shaped depressions
    6. Headwall swale/convergent slope areas
    7. Linear chutes leading out of headwall areas

- Vegetative indicators (if associated with landsliding, these indicators will typically be coincident with an irregular topographic feature listed above)
    1. Groups or concentrations of leaning conifer trees
    2. Hydrophytes
    3. Isolated patches of anomalous vegetation or abrupt contrast in timber type (especially where coincident with geomorphic indicators such as bowl-shaped depressions, etc.)

- Disorganized drainage (if associated with landsliding, these indicators will typically be coincident with an irregular topographic feature listed above)
    1. Sag ponds
    2. Seeps
    3. Watercourses diverted by geologic activity
    4. Concentrations of closely spaced Class III watercourses (e.g., "turkey foot" pattern)

- Concentrations of road cut-bank failures
- Road or landing fill failure

YARDING FLOW CHART



Explanation of the Yarding Flow Chart

- The Yarding Flow Chart is intended to provide RPFs with the means to determine an appropriate course of action regarding THP layout relative to potential unstable areas. It is the intent of this process that the RPF can develop appropriate yarding methods to mitigate unstable areas within the THP without the need to retain a licensed geologist. By nature, because the process must account for all imaginable outcomes, a high level of conservatism is incorporated. Should the outcome of this flow chart be unacceptable to a landowner, they always have the option of hiring a licensed geologist to justify exceptions to the flow chart outcome.

- The mapped slope stability features noted on the flow chart are based on the North Coast Watershed Assessment Program's (NCWAP's) landslide mapping for the Mattole watershed (California Geological Survey, 2002). Pertinent maps within this series include the "geologic and geomorphic features related to landslides map", the geologic map, and the landslide hazard map. The RPF may petition CalFire to utilize another more specific map series.

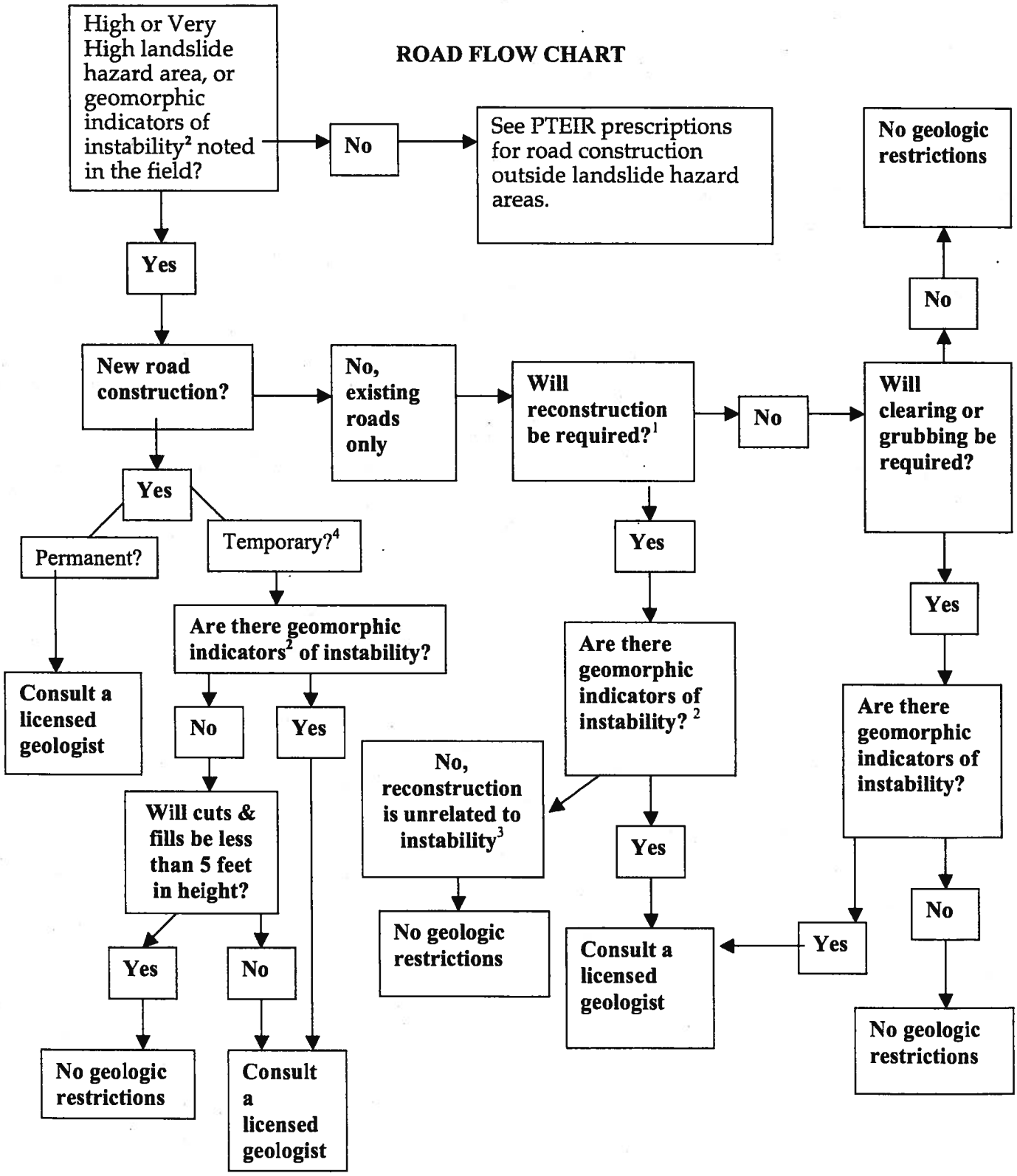
Footnotes:

[1] **Mapped landslides are shown on the NCWAP geologic and geomorphic features maps.**

[2] **Slope gradient should be an average over an area, and should not be influenced by small topographic deviations of less than .25 acre.**

[3] "Existing skid trails" are defined as those with in intact running surface adequate for use by heavy equipment after minor clearing and grubbing.

ROAD FLOW CHART



Explanation of the Roads Flow Chart

Footnotes:

[1] **"Reconstruction" is defined as cutting or filling involving >50 cu. yds/0.25 linear road miles.**

[2] **See the list of geomorphic indicators included with the Silviculture flow chart.**

[3] **This is intended to allow for upgrade or reconstruction of failed watercourse crossings unrelated to instability without necessitating geologic consultation.**

[4] **"Temporary" for this purpose applies to roads to be removed prior to the next rainy season; that is, they will not be allowed to persist through a wet weather cycle. The decommissioning of a temporary road will entail removal of watercourse crossings, outsloping of the road surface, and installation of water bars/breaks per the site's Erosion Hazard Rating.**

1.

Appendix C
Stand delineation and within-stand differentiation

A **stand** is a geographically identifiable contiguous group of trees that are sufficiently uniform in age class distribution, composition and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit. Forestry practices are carried out on a stand-by-stand basis, since the characteristics of a stand determine where specific silvicultural practices can logically be applied and where compliance with stocking regulations will be assessed. Because a forest stand represents the basic unit for silvicultural planning, care should be taken to ensure that each stand represents a uniform ecological unit, so that silvicultural opportunities and constraints are properly identified and addressed.

Delineation of forest stands across an ownership must be completed through the use of aerial photographs, forest reconnaissance, inventory sampling, and assessment of site factors. Unique **strata**, identified for silvicultural treatment purposes, may be comprised of a single geographically identifiable stand polygon <u>or</u> multiple polygons geographically distributed across an ownership. When a potential stratum represents 15% or more of the total PTHP area, it should be delineated separately from other strata existing on the PTHP area. The RPF shall evaluate stand conditions and develop a silvicultural prescription which is specific to the stratum and is designed to meet the goals and objectives of the Mattole Forest Futures Program. Aerial photographs utilized for stand and strata delineation shall be of sufficient quality and at a scale at which the stands and strata can be easily identified as described in this appendix.

The RPF shall designate stands down to a scale that is appropriate to the overall PTHP area and that results in an accurate portrayal of the major stand types that exist on the PTHP. When delineating polygons, it is important to consider that future PTHPs tiered to the PTEIR must be tied to conditions reported in previous PTHPs applied to the same stand. For this reason it is recommended that, whenever feasible, identifiable features such as roads, streams, ridges and property lines be used as polygon boundaries.

PTHPs which present inventory data from multiple stands proposed to be combined for treatment purposes, but which have individual compositions and/or structures dissimilar enough so that inventory data may compromise development of an accurate inventory estimate now and into the future, cannot be accepted into the Mattole Forest Futures Program. Coalescing minor stand types into larger types may be acceptable, provided that the inventory data from the minor type(s) does not compromise development of an accurate inventory estimate of the major type.

As an example of expectations for participants in the Mattole Forest Futures, basal area density is one of the more significant factors in a stand-typing key. Typically, with all other factors being equal, when average basal area density measures from two potentially different stands vary by 20% or more based on the higher density stand, planned silvicultural regimes and their corresponding growth and harvest levels will likely be sufficiently different such that combining both stands to reflect a single entity would not be justified. However, practical considerations such as terrain, logging systems, and road networks may occasionally justify inclusion of stands with differing basal areas into a single treatment unit.

Within-stand differentiation and the group selection prescription

Even within a stand of trees as defined above, variation in individual growth rates allows some trees to achieve competitive advantage and encroach upon the growing space of other trees. This redistribution of growing space is referred to as **differentiation** and is generally manifested first in diameter differences and then in height differences, since diameter growth has lower priority for allocation of photosynthate.

As some trees achieve various degrees of dominance or relative suppression the stand's appearance changes. Trees that do not achieve dominance, and are therefore smaller and less vigorous than their competitors, may persist as a size class of trees within a stand that can cursorily appear to represent a younger age class than the more dominant trees (Oliver, Chadwick; Larson, Burce. 1990. Forest Stand Dynamics, page #209. McGraw-Hill. New York. 467 p).

The intent of a group selection prescription is to create openings within a stand, within which trees of a younger age class are managed toward eventual harvest. These trees may be planted or naturally seeded in, or in some cases may be comprised of existing understory trees that are retained within the opening after harvest. If residual trees within the group opening are not actually young and vigorous but instead are weaker trees of the same age class as those harvested, they are unlikely to respond to release as desired for stand growth and future management. RPFs prescribing group selection prescriptions should make sure that any residual trees being counted for stocking within group openings have the potential to respond vigorously to removal of the overstory.

Appendix D: Methods Used to Predict Sediment Yield

Sediment Loading

Predicting the potential impacts of the Mattole Forest Futures Program for sediment related parameters in the Mattole River Watershed is considered to be one of the most important resource areas. This is due to the fact that the Mattole River is impaired by excess sediment and is currently on the 303(d) list of impaired watersheds for sediment. The primary sediment parameter associated with the TMDL listing is delivery of sediment to the watercourse, i.e. sediment yield. Thus, the analysis is necessarily structured around estimating the potential impacts to this parameter. The primary management related question that must be addressed in this analysis is: what is the net effect of decreasing sediment yield by upgrading roads and fixing legacy sediment sources as compared to the increasing sediment yield by installing new timber harvests and building new roads? The data and assumptions contained in the Mattole River TMDL were the basis for addressing this question.

A challenge inherent in the Mattole Forest Futures Program is that the exact timing, number and location of potential timber harvest activities expected to occur as a result of this project is unknown. This uncertainty is due to the fact that the Project is not a management plan for a defined landbase, but an optional permit that may be invoked by private landowners if they choose to do so. We have developed a methodology for predicting the approximate acreage of participating landowners for each sub-basin over the next 50 years, but it is not possible to predict which particular landowners will harvest which particular acres.

The lack of spatial specificity in defining the potentially effected environment provides a unique challenge for the analysis of potential impacts to sediment yield. Methods that rely on spatially specific information such as slope steepness, road location and configuration, landslide hazard, proximity to watercourses, etc. are all limited by lack of information in this particular analysis. The analysis must therefore rely on a generalized analysis of average conditions found in each sub-basin. Numerous analytical methods were reviewed in order to determine which method would be best suited for use in the Mattole Forest Futures Program, see below.

Summary of Methods That Were Evaluated

There are many methods and models that can be used to predict sediment loading. A method developed by the USFS known as Equivalent Roaded Area (ERA) is widely used. The ERA methodology is a "lumped, conceptual model that quantifies total disturbance in the watershed through the use of empirical coefficients and recovery curves for each activity (MacDonald and Coe 2004)". The primary limitations of the ERA model are: 1) it does not separate impacts on sedimentation from peak flows, 2) evaluation of recovery time is linked to causes of the impacts rather than the impacts themselves, 3) results are not spatially explicit (location of the project in the watershed is not accounted for) and 4) ERA describes a level of risk due to management activities but does not offer an index of actual impacts (Menning et.al. 1996, MacDonald and Coe 2004). Despite these shortcomings, ERA has proven to be a useful index of watershed activity (Reid 2010, McGurk and Fong 1995, USDA Forest Service 2003, USDA Forest Service 2005, USDA Forest Service 2007).

The North Coast Regional Water Quality Control Board suggested the use of the Disturbance Index (DI), which was used by Gualala Redwoods Inc. (GRI) in the Garcia River Watershed. The DI method is very similar to the ERA method but includes some additional terms to describe distance from stream, soil detachability and landslide risk for sediment sources. Like ERA, the DI method produces an abstract index of disturbance with relatively few data inputs. Interpretation is limited to comparison of relative disturbance indexes between sub-basins and/or analysis Alternatives. It is not possible to directly compare DI or ERA values with physical estimates of erosion and sediment transport in terms of actual rates or volumes (tons/sq. mile/year). The DI approach does not include background sediment production (earthflows, landslides, streambank erosion, etc.) in its current form (as described by GRI). Finally, the DI method, as well the methods described below, all require spatially specific information on the physical location of each harvest area, which is not available for the Mattole Forest Futures Program.

Of the many quantitative models that were considered (SEDMODL, WEPP, etc.), the one that appeared to be the most promising for the Mattole was NetMap. NetMap has the advantage of already having been applied to part of the Mattole watershed as part of a Pacific Lumber Company (PALCO) watershed analysis. NetMap uses a sophisticated GIS-based approach to determine sediment production for each area in which it is applied. We discussed the use of NetMap in the Mattole with one of its designers, Lee Benda, and reviewed the information produced by NetMap for the Mattole. We also reviewed the use of NetMap as applied to the Mad River TMDL (US EPA 2007). Based on this review we determined, in consultation with Lee Benda, that NetMap might not work well for the PTEIR in the Mattole for the following reasons.

First, there is no standardized way to model different sediment production rates from various silviculture and yarding techniques within NetMap, which is an essential component of the Mattole Forest Futures Program. Sediment production rates for various silviculture and yarding techniques were developed in the Mad River TMDL for each geologic type through extensive site-specific field work (see Appendix B of the Mad River TMDL). However, there is no budget to conduct this level of fieldwork within the Mattole Forest Futures Program. Second, in order for NetMap to accurately predict sediment loading from various parts of each sub-watershed, it would be necessary to measure or estimate sediment load values at multiple flow levels for each sub-watershed in order to give NetMap a reference value for total load expected to flow out of each sub-watershed. Again, this was done through extensive fieldwork in the Mad River TMDL but was not feasible in the Mattole. Third, NetMap produces estimates of fish habitat suitability for each stream segment, and this was done as part of the PALCO watershed analysis. Knowledgeable members of the Mattole Salmon Group reviewed the predicted habitat suitability maps and determined them to be of poor accuracy relative to what is known based on fish surveys that have been conducted in the Mattole. Finally, as with other methods, NetMap relies on spatially specific information to predict potential impacts. Based on these factors, we decided that NetMap was not suitable for use in the Mattole Forest Futures Program.

After consideration of ERA, DI, NetMap and others, we decided that a hybrid approach that utilized the existing data collected for the Mattole TMDL and modeled this into the future would be best. The hybrid approach used the sediment yield values estimated waste load allocations described in the TMDL as the basis for assessing future sediment loading in the Mattole using DI-type

multipliers for each silviculture and yarding type. The main advantages to this method are that the estimates of disturbance are produced in interpretable units of tons/sq. mile/year and the erosion estimates are based on data collected in the Mattole. Predicted sediment loading from various modeled activities may then be compared directly to sub-basin sediment yields generated in the TMDL and interpreted as a percentage of the total. Sediment loading estimates could then also be compared to sediment transport capacity of receiving waters in order to estimate potential impacts to channel condition. In particular, CGS has mapped aggradation/incision over time in various channels in the Mattole. It may be possible to use estimated sediment yields from management activities as the basis for predicting the sediment flux status of the channel, e.g. will harvest cause this channel to move from a condition where the amount of sediment in the channel is limited by supply, to a condition in which the level of sediment is limited by the channel's capacity to transport it onward to downstream reaches?

The primary limitation of the hybrid approach is that it is only as accurate as the TMDL data upon which it is based. Nineteen watersheds on the north coast of California have had rapid sediment budgets prepared as a part of the TMDL process (NCRWQCB 2009). The rapid sediment budget process is based upon aerial photographic analysis, GIS digital terrain models and limited field investigation. Due to these types of methods, in general, rapid sediment budgets can produce estimates only within a factor or two of actual sediment yield (Reid and Dunne 1996). Although the rapid sediment budgets upon which TMDL's are based have limited accuracy, they have been publically and peer reviewed and are the basis for regulation of landuse, e.g. Action Plan for the Garcia River Watershed Sediment TMDL (RWQCB 2001) and the Categorical Waiver (NCRWQCB 2009).

Despite the shortcomings of the Mattole TMDL analysis (and other TMDLs) it contains the only estimate of watershed wide sediment yield and is therefore the best available information from which to base an analysis of potential impacts on sediment yield due to management. Another advantage to using the TMDL sediment budget as the departure point for analysis of future activities is that the TMDL already includes a complete analysis of all past sediment sources, i.e. it is a cumulative watershed impacts analysis for sediment that is current through the year 2002.

Description of Approach used in Mattole Forest Futures Program

The overall method of the hybrid approach is to develop mini-sediment budgets for each harvest area evaluated in the PTEIR, then account for these within the larger status quo sediment yield values described in the TMDL (Table 1). Conceptually the method is to clip out Harvest Area polygons from TMDL sediment budgets, modify the numbers to simulate road upgrades and new timber harvest and re-insert them into the overall sediment budget, then review the results at the subbasin scale.

Table D-1.
Sediment Yield Values From the Mattole River TMDL by Subbasin*

	Tons/acre/year			
Budget item	**North**	**East**	**South**	**West**
Natural Mass Wasting	5.78	2.50	2.50	3.28
Stream Bank Erosion	1.23	0.42	0.27	0.56
Other Harvest Related Delivery	0.94	0.22	0.23	2.34
Skid Trail Related Erosion	0.92	1.09	1.19	1.33
Road Related Gullying	0.16	0.30	0.45	0.31
Road Related Mass Wasting	3.13	9.22	0.70	3.28
Road Related Surface Erosion	0.56	1.05	1.22	0.88
Road Stream Crossing Failures	0.08	0.06	0.25	0.06

***Sediment yield values in the TMDL were originally calculated on a per square mile basis, but were converted to an acreage basis to facilitate analysis of future timber harvest, which occurs on an acreage basis.**

The only quantitative studies of sediment yield from roads and harvest areas that have been carried out in the Mattole watershed are the TMDL from 2002 and the PALCO Watershed Analysis (WA) for the Northern subbasin (NCRWQCB 2002, PALCO 2006). The TMDL is the only *watershed wide* sediment budget that exists for the Mattole watershed. The TMDL is based on a combination of field investigations and aerial photo interpretation and has been publicly and scientifically reviewed. The sediment budget period for the TMDL was 1984 to 2002. The Watershed Analysis (WA) completed by PALCO in 2006 examined only commercial timberlands owned by PALCO in the Northern sub-basin. The sediment budget period for the WA was from 1988 to 2003. The WA was also subject to public and scientific review.

In order to make comparisons of potential changes in sediment yield values at the subbasin scale that may be expected to occur as a result of implementing each Alternative within the Mattole Forest Futures Program the following steps were performed:

1. An estimate of the acreage that is likely to be harvested within each subbasin within each Alternative was generated. The methods for estimating potential harvest are described in Chapter 2 of the PTEIR.

2. New, smaller subbasins were defined for the PTEIR. The sub-basins used in the PTEIR were divisions of the 4 sub-basins used in the TMDL and NCWAP analyses. Specifically the Northern, Eastern and Western sub-basins were split approximately in half, so that there were 7 PTEIR sub-basins, each approximately 20-30,000 acres in size. CALFIRE recommended this as an appropriately sized analytical unit.

3. The appropriate mixture and proportion of silviculture types was assigned to each Alternative. It was *not* necessary to define the actual location of each harvest area in each subbasin, as the TMDL sediment values were based on average yield values for each subbasin. Each PTEIR subbasin was assigned the average sediment yield values assigned to them the original, larger TMDL sub-basins (North, East, South, West).

4. Activities that occur outside of Alternatives were added to the sediment yield values estimated for each Alternative. The primary, non-program cumulative impacts analyzed were THPs and other harvest types that occur outside of the harvest activities analyzed within each Alternative.

5. For each Alternative analyzed within the PTEIR, an estimate of the annual sediment yield (SY) over the next 50 years for each subbasin was developed using a Microsoft Access database, which employed the same basic methodology used in the TMDL (essentially summing road, harvest and natural sediment yields for each subbasin). For each subbasin, there is an estimate of the number of acres that will be harvested in 5 year blocks for the next 50 years (see Chapter 3), for each harvest area the following assumptions were employed to simulate potential changes to the sediment yield of that harvest area:

   a. **Roads:** Reductions of the sediment yield originating from existing roads for each new harvest area based on the following assumptions:
      i. Landowners filing PTHPs, THPs or NTMPs (collectively "harvest plans") will be required to upgrade roads as necessary to meet standards described in the Anadromous Salmonid Protection Rules (ASP), as described within the 2010 Forest Practice Rules (FPRs). In addition, PTHPs and those THPs seeking a waiver of the NCRWQCB's wastewater discharge permit requirements will be required to stay within limits described in RWQCB Order No. R1-2009-0038.
      ii. Road upgrades implemented under harvest plans are capable of meeting the TMDL load reduction targets, which range between 80 and 95% for road related parameters (NCRWQCB 2002).
      iii. Assume that all roads within each harvest plan area will be upgraded during the life of the plan during the first entry.
      iv. Assume that 25% of those filing PTHPs will opt to construct the maximum amount of new road permissible, 1,000 feet. Newly constructed road will be assumed to meet TMDL reduction targets. The forested areas of the Mattole were roaded extensively in the first round of logging in the watershed from 1950 to 1990. Thus, relatively little new road construction is expected. Most new roads that would be constructed would likely be on ridges and away from streams.
      v. No decay of sediment yield over time, as roads are constant sediment sources.
      vi. For uneven-aged silviculture harvests the road upgrades were assumed to occur during the first entry and the decreased sediment yield from the newly upgraded roads was effective at that point; for subsequent re-entries it was assumed that roads were maintained and would continue to produce lower sediment yields attained during the first entry, but no additional decreases in sediment yield were assumed to occur. For even-aged harvests, there is only one entry during the analysis period (2010-2060) and road upgrades were assumed to occur every time an even-aged harvest occurred. The result of these assumptions is that more acres of roads are upgraded using even-aged

silviculture than uneven-aged silviculture, because every even-aged harvest encounters un-upgraded roads whereas in uneven-aged silviculture the harvest only encounters un-upgraded roads on the first entry, re-entries occur on upgraded roads.

b. **New Harvest Areas:** For each simulated harvest area a new component was added to the sediment budget to account for additional sediment generated by the harvest. The sediment yield from new harvest was assumed to persist for 15 years.

c. **Legacy Harvest Areas:** Assume that each harvest plan filed will identify and fix legacy sediment sources, such as diverted streams, unstable landing fills, failing inner-gorge roads, etc. (see details, next section) during the life of the plan. As explained above (item a.(xi)) every acre of even-aged harvest was assumed to occur on land that had no previous efforts to fix legacy sediment sources ('new' ground), whereas uneven-aged harvest only fixed legacy sediment sources on the first entry and no further fixes were assumed on re-entries. Areas where no new management occurs over the next 50 years were assumed to have a sediment yield that declined by 75% over the next 50 years.

d. **Background Sources:** Natural rates of mass wasting and streambank erosion were assumed to persist at levels estimated in the TMDL for harvested and un-harvested areas.

6. **Status Quo and non-PTHPs (Cumulative Impacts)**
   a. All areas not-explicitly within a post 2010 harvest plan were assumed to generate sediment yields based on TMDL figures for each sub-basin.
   b. The acreage of standard harvest permits (THPs, NTMPs, etc.) were estimated for each sub-basin 50 years into the future. A distribution of silviculture types were estimated for these other permit types. These non-program harvest plans were be added to the impacts estimated for in-program impacts in each Alternative to arrive at an estimate of Cumulative Impacts for sediment yield.

7. **PTEIR Sub-Basin Analyses**
   a. Sum sediment yield values from each Alternative for each sub-basin and compare to total annual sediment yields for each sub-basin to determine magnitude of effect. Total sub-basin sediment yield was estimated based on likely harvest acres assumed for each sub-basin under PTEIR and non-PTEIR harvest scenarios. Sediment yield values for each sub-basin were calculated annually over the next 50 years in order to estimate cumulative changes in sediment yield due to implementing each Alternative over time.

8. **PTEIR Planning Watershed Analyses**
   a. Within each sub-basin, the planning watersheds (PWS) that are likely to receive the greatest harvest impacts under either the PTEIR or normal THP process will be identified. A combination of available timber volume, extent of private land base, harvest feasibility and parcel size among other variables will be used to identify areas where harvest is most likely. Also, PWS specific factors such as fish habitat abundance or geologic stability will be considered to determine where harvest impacts would be most likely to negatively influence existing conditions. The PWS's that are most

sensitive or most likely to be impacted will be singled out for greater analysis, particularly using PWS specific qualitative information, where available.

Comparison of TMDL and PALCO WA Sediment Budgets

A unique and valuable (from the perspective of available data) situation has occurred within the Mattole Watershed. The Northern subbasin has had two, recent, independently prepared, rapid sediment budgets developed. The first was developed by the NCRWQCB for the TMDL and the other was prepared by the Pacific Lumber Company (PALCO) for its ongoing watershed analysis (WA) efforts. The WA focused on the lands covered by the Company's Habitat Conservation Plan (HCP) and included approximately 2,900 acres of forests that were subject to timber harvest within the past 20 years. The PALCO WA area was located in the Northern subbasin area as analyzed in the TMDL. The sediment budget for the TMDL was focused on the time period from 1984 to 2002, while the WA covered the entire photo record from 1947-2003. However, the WA did report sediment values from two distinct time periods; 1947-1987 and 1988-2003 in order to separate out legacy from recent harvest and management related activities. The TMDL sediment budget from 1984-2002 and the WA sediment budget from 1988-2003 are temporally comparable. In general, the PALCO WA was a more focused effort on a smaller landbase with a greater proportion of field verification and review of aerial photographs than the TMDL.

The TMDL calculated a total sediment budget for the Northern sub basin of 8,200 tons/mi^2/year, of which 54% was derived from natural sources. The PALCO WA calculated a total sediment budget of 6,723 tons/mi^2/year, of which 85% was derived from natural sources (Table 2). An independent review of the TMDL by Bedrossian and Custis (2002) also came to the conclusion that the TMDL underestimated the natural/background rates of sediment yield.

Essentially, the TMDL reported higher values for all management related categories (roughly four times as high, in aggregate) and the PALCO WA reported higher values for natural categories (about 25% higher). The differences in surface erosion values for roads and harvest areas were particularly high.

A potentially significant difference between the TMDL and the WA is that the landbase in the WA was exclusively industrially managed timberland, while the TMDL also includes lands managed as ranches, rural sub-divisions and public lands. It is possible that the lower rates of road and harvest related erosion reported in the PALCO WA (73-94% lower) were due to conducting the study on roads and harvests that have been subject to recent regulatory requirements in terms of road upgrades and post harvest erosion control measures. Despite the differences, both sediment budgets reported that road and harvest related mass wasting were the dominant management related sediment sources.

Table D-2. Comparison of TMDL and PALCO Sediment Budgets for Northern Subbasin*

	Road Density (mi/mi2)	Road Surface Erosion Yield (tons/road mile/year)	Road Surface Erosion Yield (tons/mi2/year)	Road related Stream Crossing Washouts and Road Gullies (tons/mi2/year)	Natural Mass Wasting (tons/mi2/year)	Mass Wasting-Road Related (tons/mi2/year)	Mass Wasting-Harvest Related (tons/mi2/year)	Surface Erosion-Harvest Area (tons/mi2/year)	Legacy Mass Wasting (tons/mi2/year)	Skid Trail Related Erosion (tons/mi2/year)	Harvest Related Sediment Yield (tons/mi2/year)
TMDL North Subbasin	2.3	156	360	150	3,700	2,000	600	10	**	590	1,200
PALCO HCP Area	3.4	8.6	29	31	5,664	526	207	2.3	395	***	604

* The Analysis period for the TMDL was 1984-2002, the PALCO WA period was 1988-2003.

** The TMDL included surface erosion from large un-revegetated landslides from the pre-1984 time period into the category titled "Mass Wasting- Harvest Related", whereas PALCO separately categorized landslides that originated prior to the sediment budget time period as "Legacy" sediment sources.

*** The PALCO WA included skid trail related erosion in the "Surface Erosion-Harvest Area" field whereas the TMDL included landslides originating from skid trails in the "skid trail related erosion" category

Sediment Yield Reductions Expected due to Road Upgrading and Modified Harvest Practices

Road Surface Erosion

The Mattole TMDL (NCRWQCB 2002) estimated that reductions of 90-95% for road surface sediment delivery were possible using current road upgrade techniques, which would result in values of 36 tons/mi^2/year from upgraded roads in the Northern subbasin (Table 2). The estimates of sediment yield from road surface erosion reported in the PALCO WA were 94% less than those reported in the TMDL at 29 tons/mi^2/year (Table 2). The estimates of sediment yield from road surface erosion in the WA were derived from Water Erosion Prediction Project (WEPP) model runs of roads upgraded/constructed to modern standards – including outsloping, adequate drainage, rock surfacing, etc.

K. Sullivan and B. Weaver both described their own unpublished studies of the effectiveness of hydrologically disconnecting road networks from stream networks using road upgrade techniques such as outsloping road surfaces, installing rolling dips, increasing cross-drain frequency, etc. Weaver noted that for private roads on average, approximately 50% of the road surface is hydrologically connected prior to road upgrade practices. After road upgrades are completed hydrologic connectivity is typically reduced to about 10-15%, which is approximately a 70- 80% reduction in road connectivity. K. Sullivan described the exceptional practices underway on Humboldt Redwood Company (HRC) to disconnect road surfaces, which includes additional rock surfacing at all stream crossing locations and noted that she has observed that many upgraded road reaches on HRC property are only 2-5% hydrologically connected.

A study was recently conducted in Washington State on forestlands that have been undergoing widespread road upgrade practices as a result of regulatory requirements to reduce hydrologic connectivity of roads (Martin 2009). Martin found that approximately 12% of the surveyed road network was hydrologically connected following road upgrade treatments. Martin's results are consistent with Weaver's observations (see above).

The results from Martin, Weaver and Sullivan all corroborate the 90% estimate of potential reductions in sediment loading from road surface erosion due to road upgrading contained in the TMDL. <u>Therefore we will assume that upgraded roads will attain the 90% reduction in sediment yield from road related surface erosion described in the TMDL.</u>

Road-Related Mass Wasting

The Mattole TMDL (NCRWQCB 2002) estimated the potential reduction in road related mass wasting due to road upgrading as follows, "Other road-related mass wasting features, which are greatly influenced by their geologic terrane, may be more difficult to control, so a loading reduction of 80-85 percent may be a more realistic target." The PALCO WA estimated road-related mass wasting values that were 73% lower than those reported in the TMDL (Table 2).

Results from comparing roads constructed in the 1970s to those constructed in the 1990s in Caspar Creek indicates that modern roads tend to produce fewer and smaller road associated landslides than those constructed prior to implementation of the California Forest Practices Act (Cafferata and Spittler 1998). However, this study did not directly address the potential sediment yield reductions

that would occur due to upgrading existing roads that were originally constructed in the 1950s through 1970s.

In nearby Bear Creek watershed Pacific Watershed Associates characterized the occurrence of road related mass wasting as follows (PWA 1998),

> *Road-related landsliding* - Road-related landslide frequency peaked in the 1966 aerial photo period and has continued to diminish over time (Figure 5). The 1966 storm generated 23 identifiable landslides along roads in the basin, whereas the 1996/97 storm produced only three new road-related landslides. Four factors are likely responsible for this: 1) the 1964 storm, by all accounts, was of greater magnitude than the 1996/97 event, and thereby produced a larger number of failures, 2) a large number of roads had recently been constructed (and had not been storm tested) by 1964, and these susceptible sites failed in the 1964 event, 3) prior to the 1964 storm harvesting and yarding practices were not protective of water quality or slope stability, and 4) roads built following the 1964 storm were confined to upland areas and ridge-top hillslopes which are less susceptible to debris landsliding. With time, as unstable fills and hillslope areas fail, the number of potentially unstable areas which remain along the road system diminish in number. Likewise, much of the pre-1966 road network was upgraded during the 1990s, and this may have contributed to the reduction in landslide risk and sediment production during the 1996/97 storm.

Therefore we will assume that upgraded roads will attain the 80% reduction in sediment yield for road related mass wasting described in the TMDL.

Road-Related Crossing Failures

The Mattole TMDL (NCRWQCB 2002) estimated the potential reduction in road related crossing failures due to road upgrading as follows, "Estimates that 95 percent of road-stream crossing failures are controllable (Hagans, et al. 1986), are reflected by a reduction of 90-95% from the current estimated loading rate." The PALCO WA estimated road related "stream crossing washouts and road gullies" were 80% lower than those reported in the TMDL.

Cafferata and Munn (2006) reported that 18 percent of crossings inspected after completion of THPs had minor or major deviations from the Forest Practice Rules, most commonly regarding insufficient treatment of diversion potential. While there is no data regarding the actual performance of upgraded crossings in terms of frequency or magnitude of failure relative to un-upgraded crossings, Hagans, et al. (1986) estimated that 95% of road-steam crossings failures are controllable.

Therefore we will assume that upgraded roads will attain the 90% reduction in sediment yield for road related crossing failures described in the TMDL.

Road-Related Gullies

The Mattole TMDL (NCRWQCB 2002) estimated the potential reduction in sediment yield originating from road related gullies due to road upgrading as follows, "techniques are available to greatly reduce sediment delivery from roads (Weaver and Hagans, 1994); therefore, the load allocation for road-related sediment (including road-related gullying, and surface erosion) reflects a reduction of about 90-95 percent from the estimate of the current loading rate." The PALCO WA

estimated road related "stream crossing washouts and road gullies" were 80% lower than those reported in the TMDL.

Therefore we will assume that upgraded roads will attain the 90% reduction in sediment yield from road related gullying described in the TMDL.

Legacy Harvest Impacts

The Mattole TMDL (NCRWQCB 2002) estimated the potential reduction in sediment yield originating from harvest areas as follows, "The best conservation and land management measures to control sediment associated with landsliding in timber harvest areas are expected to be about as effective as those to control road-related sediment. Therefore, the load allocations for sediment delivery from timber harvest, such as skid trail related erosion and other harvest-related delivery reflect 85-90 percent reductions from the estimate of current loading."

Fixing legacy sediment problems such as diverted stream channels, filled crossings, non-water-barred skid trails, etc. is a requirement of modern timber harvest in California. Therefore it is reasonable to expect that sediment yields originating from legacy harvest impacts will be addressed when land is subject to timber harvest for the first time since the original, pre-FPR logging occurred.

Based on this rationale, it is assumed that for each acre subject to new harvest there will be an 85 percent reduction in legacy harvest related sediment yield compared to current conditions described in the TMDL. The reduction will be achieved during the life of the harvest plan.

Future Harvest Impacts

This component of the sediment budget was difficult to estimate based on the TMDL data alone because the sediment yield originating from harvest (Table 1) was calculated as an average value across each subbasin (including harvested and un-harvested areas), rather than per harvested acre. It is necessary to calculate sediment yield per harvested acre in order to predict sediment yield from a specified rate of future timber harvest. The sediment yield on a per harvested acre basis was approximated from the Mattole TMDL data as follows, using the Northern subbasin data as an example:

1. Annual sediment yield values from the two sediment budget categories in the TMDL (Table 1) related to harvest ("skid trail related erosion" and "other harvest") were summed to estimate total annual sediment yield from timber harvest, 590 and 600 tons/sq. mile/year, respectively. This equates to a harvest related sediment yield of 1,190 tons/sq. mile /year for the sediment budget period of 1984 to 2002. Both categories of harvest related erosion were used because each category included a mass wasting a component and mass wasting was the largest contributor to sediment yield from harvest units (NCRWQCB 2002).

2. The annual sediment yield from harvest areas was then multiplied by the duration of the TMDL sediment budget period of 18 years and the watershed area of the North subbasin of 99 square miles, which equaled 2,120,580 tons delivered during the sediment budget period form harvest related sources.

3. The next step was to identify the total harvested acreage that contributed to the sediment yield for the sediment budget period. The 1941, 1965, 1984, 1996 and 2000 aerial photos were used in the TMDL analysis to identify landslides from harvested areas. The greatest number of landslides occurred in the 1965 and 1984 photo years, though only landslides from the 1984 and more recent photo years were included in the 1984 to 2002 sediment budget period (NCRWQCB 2002). The common practice in aerial photo interpretation is to include landslides from areas that were harvested 15 years prior and more recently into the 'management' related sediment yield component, which in this case would be harvests beginning in 1970. This is based on the concept that root strength in harvested units declines to its minimum 10-15 years after harvest and landslide risk peaks at this point (O'Louglin 1974). Based on this same root strength concept it is conservative not to include harvests that are less than 10 years old, because their susceptibility to landslide risk has not peaked yet. Since the last photo set used was from the year 2000, no harvests after 1990 were included in the acreage assumed to contribute to the sediment yield for the sediment budget period. So, the harvest years 1970 to 1990 were used to approximate the harvested acres that contributed to the sediment yield estimated in the TMDL sediment budget.

4. The total acreage harvested from 1970 to 1990 for each subbasin was derived from a harvest history analysis performed by the Mattole Restoration Council for CAL FIRE (MRC 2001). The acreage harvested, mostly by clearcut and tractor yarding, for each subbasin was as follows:

Table D-3 Estimate of Harvest Acreage for TMDL Sediment Budget Period

TMDL Subbasin	Acres harvested 1970-1990
North	5,435
East	6,471
South	1,263
West	3,592

5. The total volume delivered during the sediment budget period (2,120,580 tons) was then divided by the number of acres of timber harvest that would have produced the sediment yield, which for the North subbasin was 5,435 acres. The result of this division equals 391 tons/acre for the 5,435 acres that were harvested from 1970-1990.

6. Dividing this value sediment budget period of 18 years equals a sediment yield rate of 21.7 tons/harvested acre/year for the Northern subbasin from timber harvest.

7. Finally, the TMDL Load Allocation included an estimate that future timber harvest could be expected to produce sediment yields that were 85-90% lower than current loading estimates contained in the TMDL (RWQCB 2002), which would result in an expected sediment yield of **2.2 to 3.3 tons/acre/year** for the North subbasin from future timber harvest. The preceding calculations carried out for all subbasins yields the following results (Table 4):

Table D-4 Estimate of Sediment Yield From Each Harvested Acre, Derived from Mattole TMDL Data

Subbasin	Sed yield for 1970-1990 era harvest (tons/acre/year)	TMDL reduction 85%	TMDL reduction 90%
North	21.7	3.3	2.2
East	10.3	1.5	1.0
South	19.9	3.0	2.0
West	59.0	8.9	5.9

As expected, the estimated sediment yield values for each harvested acre (Column 2, Table 4) are much higher than the sediment yield values presented in Table 1, which are values averaged across each subbasin including harvested and non-harvested areas.

The Mattole TMDL (NCRWQCB 2002) estimated the potential reduction in sediment yield originating from newly harvested areas as follows, "The best conservation and land management measures to control sediment associated with landsliding in timber harvest areas are expected to be about as effective as those to control road-related sediment. Therefore, the load allocations for sediment delivery from timber harvest, such as skid trail related erosion and other harvest-related delivery reflect 85-90 percent reductions from the estimate of current loading." Therefore the per harvested acre sediment yield values that can be expected for new timber harvests in the Mattole watershed that utilize, "the best conservation and land management measures" are included in Table 4, and **range from 1.0 to 8.9 tons/acre/year.**

Comparison of Mattole Harvest SY to Other Regional Values

In order to determine if the estimates of future sediment yield from timber harvest made in the TMDL were reasonable, other studies were reviewed as follows.

The North Fork of Caspar Creek was 50% clearcut from 1985-1990 in order to study the impacts of modern timber harvest on sediment yield. The harvested areas were subject to the 1996 storm event and in 1998 it was reported that the North Fork of Caspar Creek yielded 25.2 cubic yards per acre from the 1,169-acre watershed (Cafferata and Spittler 1998). In order to convert these data into values comparable to Table 4 it was necessary to convert cubic yards to tons using a rate of 1.4 tons/cubic yard and divide the total sediment yield by the time period over which the sediment was delivered (1985-1998), which resulted in a value of 1.9 tons/acre/year from a 50% clear cut watershed. To account for the fact that half of the watershed was not harvested that sediment yield value could be doubled to estimate sediment yield that originated only from the harvested area,

which would result in a value of 3.8 tons/acre/year. The range of sediment yield values from **Caspar Creek was (1.9-3.8 tons/acre/year).**

The Critical Sites Erosion Study conducted by Rice and Lewis (1991) calculated the sediment yield from Timber Harvests Plans (THPs) conducted in 1978 and 1979. They conducted their fieldwork approximately 10 years after the harvests were installed and reported an average sediment yield from harvested areas of 3.2 cubic yards/acre. As with the Caspar Creek data it was necessary to convert these values into tons/acre/year required converting cubic yards to tons and dividing by the time period over which sediment was delivered. These calculations resulted in a value of **0.42 tons/acre/year from harvested acres in Northern California.**

A sediment budget prepared for the Bear Creek Watershed on Pacific Lumber Company property in Humboldt County provided another reference point for per harvested acre sediment yield values (Pacific Watershed Associates 1998). PWA reported that 228,500 cubic yards of sediment were delivered to the stream from landslides originating from 1,900 acres of land that had been harvested within the previous 15 years. Converting these data into values comparable to Table 4 resulted in a per harvested acre sediment yield rate of **11.2 tons/acre/year for the Bear Creek watershed.**

The PALCO Watershed Analysis for their privately owned lands within the North Fork of the Mattole River developed an analysis of mass wasting that separated the impacts of recent logging (post 1974) from legacy harvest practices (pre-1974). The sediment budget time period of 1988-2003 was chosen as the time period that reflected current harvest practices. The mass wasting analysis defined "management related" landslides as follows:

1. landslides occurring on hillslopes that have been clear cut harvested (>50% canopy removal) less than 20 years prior (typically relative to the air photo date);
2. Landslides occurring on hillslopes partially harvested (<50% canopy removal) less than 15 years prior;
3. Road-related landslides associated with any roads subject to the 1999 PALCO Habitat Conservation Plan (HCP) (generally any roads within PALCO's GIS system).

The WA relied on the 1997 and 2003 aerial photos for their analysis of mass wasting from 'recent' harvest practices. Using the similar methods as described above under "Future Harvest Impacts" to derive a per harvested acre sediment yield required development of an estimate of the harvest area over which the observed landslides originated from; twenty years prior to 1997 was 1977 and ten years prior to 2003 is 1993, so the time period 1977 to 1993 was established as the harvest window. For the 1977-1993 time period 2,178 acres of harvest occurred on PALCO land in the study area. During the 16-year sediment budget period (1988 to 2003) 61,773 cubic yards of sediment were delivered to watercourses from non-road related, management (harvest) sources, which equates to 94,512 tons (using a 1.53 tons/cy bulk density value cited in Simpson 2006). So dividing the landslide volume (94,512 t) by the acreage harvested (2,178 acres) equals 43 tons/acre/16 years, which results in an estimate of **2.7 tons/acre/year** due to mass wasting from recent harvest units.

There has been one recent effort by PALCO to develop rates of expected sediment yield from upgraded roads, newly constructed roads and modern timber harvest practices for the Elk River Watershed. The effort is based on sediment budgeting principles similar to those used in the

Mattole TMDL and N. Fork Mattole WA, also done by PALCO. The Report of Waste Discharge (ROWD) Elk River (PALCO 2004) analyzed sediment yield from a range of recent timber harvests and upgraded road segments and developed a detailed rate of expected future sediment yield that is used by PALCO to calculate the necessary sediment offsets required to compensate for any increases in sediment yield originating from planned timber harvests. This ROWD is very similar to the analysis being prepared for this PTEIR for the Mattole Forest Futures Program, in that it quantitatively predicted how future timber harvest activities along with sediment source treatments would affect net sediment yield.

The ROWD estimated that the sediment yield from each harvested acre due to elevated rates of mass wasting and associated in-unit roads would be 0.0613 cubic yards/acre/year **(0.0858 tons/acre/year)**[1]**.** In order to calculate future sediment yield from new harvest these rates were assumed to persist for 15 years post harvest for hillslope features and 5 years post harvest for in-unit roads, the product of these sediment rates multiplied by the time periods were then multiplied by 1.2 to account for a margin of safety and the final, total landslide rate offset for harvested acres was 0.408 cy/acre (~0.57 tons/acre). This value is lower than the other values cited above by two orders of magnitude. PALCO asserted that the reported rates were an accurate reflection of their post HCP land management style and represent the best estimate of expected sediment delivery from future timber harvest conducted under recently enacted, very stringent rules.

The ROWD also addressed the issue of stream bank erosion originating from headward extension and enlargement of low order streams caused by timber harvest (Lewis 1998). PALCO used two independent methods to calculate potential sediment yield from this source and chose the higher of the two results, which was **0.117 cy/acre/year (~0.164 tons/acre/year).** The impacts were assumed to persist for 15 years post harvest and yield 1.76 cy/acre/15 years.

Table D-5 Comparison of Per Harvested Acre Sediment Yield Rates reported for Northern California

Study Location (Author)	Description	Sediment Yield Rate (tons/acre/year)
Mattole TMDL (NCRWQCB 2002)	Derivation of sediment yield per harvested acre from logging conducted 1970-1990	**10.3-59.0**
Mattole TMDL (NCRWQCB 2002)	Estimated sediment production from future harvest activities (85-90% reduction)	**1.0-8.9**
Caspar Creek (Cafferata and Spittler 1998)	Sediment yield from 50% clearcut watershed 1985-1990	**1.9-3.8**
Bear Creek (PWA 1998)	Sediment budget for harvest related mass wasting from harvests that occurred in 1980s and 1990s	**11.2**

[1] The bulk density of soil in the Elk River Watershed was assumed to be 1.4 tons/cubic yard (Stillwater Sciences 2007).

North Coastal California (Rice and Lewis 1991)	Critical Sites Erosion Study of harvest conducted in 1978-1979	**0.42**
North Fork Mattole Watershed Analysis (Simpson 2006)	Sediment yield due to non-road related mass wasting for harvest conducted 1977-1993	**2.7**
Elk River ROWD (PALCO 2004)	Estimate of sediment yield per harvested acre for future timber harvest	0.0858 mass wasting + 0.164 channel enlargement =**0.2498**

The only source of information in Table D-5 that included an estimate of sediment yield from future timber harvest governed by current forest practice rules (plus additional HCP regulations) was the PALCO ROWD report for Elk River (PALCO 2004). In order to gauge the comparability of the Elk River ROWD sediment yield estimates to the Mattole TMDL estimates it was useful to compare their total sediment budgets, using the North subbasin as an example. The Mattole TMDL calculated a total sediment budget for the Northern sub basin of 8,200 tons/mi^2/year, of which 54% was derived from natural sources (Table 2). The Sediment budget for Elk River from the time period of 1988-1997 for all sources was 924-tons/ mi^2/year (using 1.4 tons/cubic yard bulk density estimate), of which 48% originated from natural sources. The total sediment yield in the North subbasin as calculated in the TMDL was 8.9 times higher than sediment yield in Elk River, and the estimate of sediment yield from future timber harvest in the Northern subbasin of the Mattole (Table 4) was 8.8 to 13.2 times higher than the estimate of future timber harvest sediment yield calculated in the Elk River ROWD. So the estimate of sediment yield from future timber harvest in the North subbasin of the Mattole River represents approximately the same proportion of the sediment budget as the value calculated for the Elk River ROWD.

The NCRWQCB (2002) did not explicitly define the terms of "best conservation and land management measures" when they made their estimate that sediment loading from harvested areas could be reduced by 85-90% from historic levels. However, it seems reasonable to assume that the provisions governing timber harvest included in the 2009 Categorical Waiver (Order No. R1-2009-0038) would be consistent with "best conservation and land management measures" cited in the Mattole TMDL (NCRWQCB 2009) since item 15 of the Order includes the following statement, "This Order furthers the objectives defined in the TMDL Implementation Policy and Work Plan". All timber harvests conducted under the Mattole Forest Futures Program will meet the terms of the Categorical Waiver and should therefore achieve the sediment yield reduction targets established in the TMDL.

For Alternatives analyzed under the Mattole Forest Futures Program PTEIR a Disturbance Index approach will be used to increase the expected sediment yield that would occur from standard THPs using the full range of silvicultural options. Adjustment factors in North Coast Regional Water Quality Control Board Order No. R1-2006-0039 (North Coast Regional Water Quality Control Board, 2006), were used, where each clearcut, right-of-way, and rehabilitation cut acre was accounted for on a one-to-one basis but acreages with lighter silvicultural methods were reduced by the factors given (e.g., 0.75 for shelterwood and seed tree removal, 0.5 for selection, commercial thin, etc.). Timber harvests conducted under the Mattole Forest Futures Program are limited to selection, group selection or commercial thinning type harvests and will therefore be expected to

produce the per acre sediment yield values under the 85% reduction column of Table 4. And based on the Disturbance Index factors contained in Table D-6, we will assume that sediment yields from clearcut areas would be double those in selection harvested areas (DI factor of 1.0 versus 0.5).

Table D-6: Disturbance Index Factors for Various Silvicultural Prescriptions

Silviculture Type and GIS Code	Adjustment Factor
CLCT = Clearcut	1.00
CMTH = Commercial Thin	0.50
GSLN = Group Selection	0.50
REHB = Rehabilitation of Understocked Areas	1.00
ROAD = Road Right of Way	1.00
SASV = Sanitation Salvage	0.75
SHPC = Shelterwood Preparation Cut	0.75
SHRC = Shelterwood Removal Cut	0.75
SHSC = Shelterwood Seed Cut	0.75
SLCN = Selection	0.50
STRC = Seed Tree Removal Cut	0.75
STSC = Seed Tree Seed Cut	0.75
ALPR = Alternative Prescription	*0.75*
NHRV = No Harvest Area	*0.00*
OUT = Not Part of THP	*0.00*
TRAN = Transition	*0.25*
VRTN = Variable Retention	*0.50*

Table D-6. Silvicultural Disturbance Index Factors from NCRWQCB 2006

A caveat to modeling sediment yield for future timber harvest in the Mattole Forest Futures Program is that the particular types of light touch silvicultural prescriptions that are proposed have not been quantitatively evaluated for sediment yield anywhere, let alone in the Mattole watershed. Most studies of sediment yield (and other resource areas) are derived from studies that compare uncut forests to clear-cut forests, or unroaded areas to those with a road network (e.g. Cafferata and Spittler 1998, Grant and Wolf 1991). However the approach typically used in the ERA and DI methods of assigning 'factors' to various silviculture and yarding techniques will be used as an approximation. The light touch silviculture options contained in the Mattole Forest Futures Program are most similar to Selection or Commerical Thinning.

Rate of Decay for Future Harvest Related Sediment Yield

The dominant components of sediment yield that originate from harvested areas reported in the Mattole TMDL were (apart from roads) mass wasting, surface erosion and gully and rill erosion; with landslides contributing the vast majority of harvest related sediment (NCRWQCB 2002). The primary causal mechanism for increased landsliding rates after clear cut timber harvest is the loss of root strength in the soil (O'Loughlin 1974). The loss of root strength is greatest 3-15 years after harvest, before the regenerated stand is able to re-establish a dense network of roots to stabilize the soil. Surface and rill erosion are strongly correlated with the amount of vegetation on the site, which recovers quickly after harvest and thus these impacts are not expected to persist for more than 1-5 years post harvest (Larson and Sidle 1980). In a study of landslide rates in harvested stands after the 1996 storms in Oregon Robison (1999) found that the rate of landslides/acre occurred in stands 0-9 years old, the next highest frequency was found in stands >100 years old and was lowest in stands in 30-100 years of age. In summary, consider the following statement from Beschta et. al. (1995), "Recovery of vegetative cover is generally considered a sufficient condition for the recovery from surface erosion and leaching, and to a lesser extent, mass movement. This recovery typically occurs rapidly, often within 5-10 years, if site conditions and disturbance are not too severe."

Based on the concepts summarized above, a value of 15 years is often used as a recovery period for modeling sediment yield after logging from hillslope sources. Two recent approaches to modeling the sediment yield due future timber harvest used a value of 15 years as the time period over which sediment yield originating from timber harvest declines to zero; the PALCO ROWD (PALCO 2004) and the Gualala Redwood Company's Watershed Wide Waste Discharge Report. Menning et al. (1996) described a modified Equivalent Roaded Area (ERA) model that used a recovery rate that varied by practice, but generally showed 90%+ decline in cumulative watershed impacts (including sediment yield) 15 years after logging.

Based on the research and modeling efforts cited above, we made the assumption that the vast majority of sediment yield was delivered within 15 years after harvest and therefore applied the calculated per acre sediment yield values (Table 4) at a constant rate for 15 years to each harvested acre. We used the more conservative estimate of 85% reduction in sediment yield contained in the TMDL for estimates of future erosion and DI values from Table D-6 for various silvicultural styles. For example, in the North subbasin of the Mattole each clearcut acre is expected to produce 6.6 (3.3 times 2 because of clear cut silviculture) tons/acre/year for 15 years or a total of 99 tons/acre per harvest.

The recovery period of 15 years for harvest related sediment yield is only meant to characterize average annual delivery of sediment to watercourses, not gauge impacts within the stream channel. There is evidence that elevated levels of sediment transport and suspended sediment loads in the stream channel may persist after timber harvest for 10-30+ years (Keppeler et al. 2003, Grant and Wolf 1991). For example, the Mattole River mainstem and larger tributaries have still not recovered to their pre-management channel form 50+ years after the 1965 storm event.

It is also important to note that the average sediment yield values predicted for future timber harvest in this analysis are only an index to relative impacts of timber harvest in the Mattole. Actual

sediment yields will depend on the size and number of large storm events that occur 10-15 years after harvest and sediment yield is likely to be episodic, rather than evenly distributed as an average annual value.

Rate of Decay for Legacy Harvest Related Sediment Yield

The Mattole TMDL calculated a value of 1,410 tons/mi^2/year for sediment yield from non-road, harvest related sources across the entire watershed (NCRWQCB 2002). This was an average value for the 1984-2002 time period, but cannot be expected to continue undiminished for the next 50 years. Though not precisely quantified in the TMDL, the vast majority of sediment from legacy harvests appears to have originated from mass wasting. Surface erosion from non re-vegetated landslides was quantified at 9% of the sediment yield from harvested areas (Table 3.14 "soil erosion"), thus the other 91% percent is presumed to have originated from landslides or perhaps gullies and rill erosion, though it was not mentioned directly in the TMDL for harvest related impacts. The TMDL contains descriptions of ongoing surface erosion from non re-vegetated landslides that originated from harvest conducted in the 1950-1970 time period and, "many legacy problems associated with management practices pre-dating the Z'Berg-Nejedly Forest Practices Act" (NCRWQCB 2002).

Data from the TMDL on landslide frequency indicate that rates have continuously declined since 1965 (See Figure 3.8, from the TMDL).

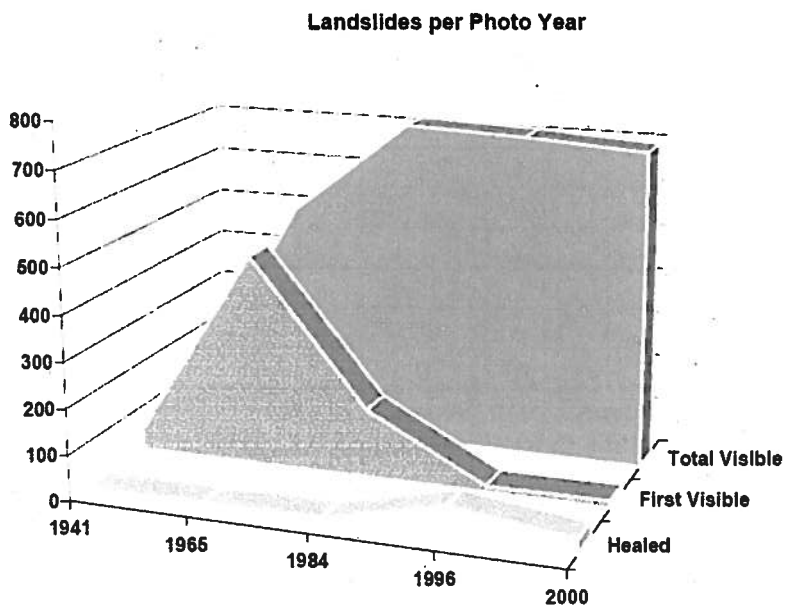


Figure 3.8 Total number of landslides per photo year analyzed in the Rainbow Ridge, Squaw Creek, Bridge Creek, Dry Creek, and Cow Pasture Opening planning watersheds combined.

Final Estimates of Sediment Yield for New Harvest Areas

The TMDL sediment budget includes mass wasting events observed on the 1984 aerial photographs, which appear to be the vast majority of landslides accounted for the in 1984-2002 sediment budget period (see Figure 3.8). The landslides observed on the 1984 photo set likely originated from harvests conducted during the 1970-1984 time period. Very few additional landslides were detected in the 1996 and 2000 aerial photo sets indicating that the landslide rate originating from the 1970's era harvest has declined dramatically. And since landslides observed in the 1984 photo set constituted the majority of sediment yield for the category of harvest related sediment yield in the TMDL, we will assume that total sediment yield for legacy harvest will decline significantly over the next 50 years as well.

Table D-2
Sediment Yield Values for New Harvest Areas
(Tons/acre/year)

General Category	Sediment Budget Item	TMDL Subbasin			
		North	East	South	West
Natural	Natural Mass Wasting	5.78	2.50	2.50	3.28
	Stream Bank Erosion	1.23	0.42	0.27	0.56
Legacy Harvest	Other Harvest Related Delivery	0.14	0.16	0.18	0.20
	Skid Trail Related Erosion	0.14	0.03	0.04	0.35
New Harvest*	New Harvest- Selection	3.30	1.50	3.00	8.90
	New Harvest- Clear Cut	6.60	3.00	6.00	17.80
Upgraded Roads	Road Related Gullying	0.02	0.03	0.05	0.03
	Road Related Mass Wasting	0.63	1.84	0.14	0.66
	Road Related Surface Erosion	0.06	0.10	0.12	0.09
	Road Stream Crossing Failures	0.01	0.01	0.03	0.01
New Roads (tons/linear mile)	Road Related Gullying	3.33	3.17	3.19	3.23
	Road Related Mass Wasting	133.33	196.67	9.89	67.74
	Road Related Surface Erosion	12.00	11.17	8.57	9.03
	Road Stream Crossing Failures	1.67	0.67	1.76	0.65

Given that the TMDL analysis reported evidence of ongoing erosion from the legacy harvested areas we will not assume that sediment yield will decline as rapidly as for future timber harvests (see above). In the cumulative watershed impacts analysis for sediment yield we will assume that, in the absence of active treatment of legacy sediment sources, a conservative estimate of the rate of decline in sediment yield from timber harvests conducted in the 1970-1990 time period is 75% over the next 50 years.

As with the discussion above regarding sediment yield from future timber harvest, our assumption that sediment yield from legacy harvest will decline dramatically over the next 50 years does not mean that the impacts of the sediment that has already been delivered to the channels will decline at the same rate. Hillslope sediment yield from legacy harvests is likely to decline dramatically over the next 50 years, however in-stream stored sediment from these historic sediment delivery episodes may take decades to centuries to move through the channel network.

Sensitivity Analysis

The North_1 sub basin (34,414 acres) will be used as the subject of a sensitivity analysis of the hybrid modeling approach used to predict sediment yield due to timber harvest in this PTEIR analysis. The North_1 sub basin was selected for the following reasons:

1. It has abundant, recent and intensive timber harvest and road upgrading activity,
2. It is amongst the least stable areas geologically within the Mattole watershed,
3. There are two recent independent sediment budgets for this sub basin, and;
4. Future timber harvest is projected to be high within the Mattole Forest Futures Program.

The base scenario used for this sensitivity analysis was Mattole Forest Futures Program projected harvest using data and assumptions contained in the Mattole TMDL as described above. The sensitivity analysis will be used to explore the assumptions inherent in this base scenario. The following questions will be tested using the sensitivity analysis:

1. What is the effect of the Mattole Forest Futures Program on the net sediment budget from management related sources using TMDL data and assumptions (base scenario)?
2. What if road upgrading and treating legacy harvest related sediment sources was 20% less effective than estimated in the TMDL (-20%)?
3. What if future harvest related sediment yields were 20% higher than those estimated in Table 4 (+20%)?
4. What if 50% of new harvests constructed maximum road extent (1,000 ft.) rather than 25%?
5. What if the silviculture used in the Program were clear-cut rather than selection?

The metric used to evaluate the various scenarios in the sensitivity analysis was net sediment yield due to management activities expressed in tons/50 years/subbasin. In order to gain some context the net sediment values were also expressed as a percentage natural sediment yield for the basin, based on TMDL values (NCRWQCB 2002).

Answers to the sensitivity analysis questions:

Table D-7 Sensitivity Analysis of Modeling Assumptions for North 1 Subbasin Proposed Program						
	Sediment Production (tons/50 years)		**Sediment Savings (tons/50 years)**		**Net Effect (tons/50 years)**	**Change as % of Natural Erosion Total (tons/50 years)**
Scenario	New Harvest	New Roads	Fix Legacy Harvest Sources	Upgrade Roads	All Harvest and Roads	12,098,250
Proposed Program	516,767	18,428	(286,244)	(583,146)	(334,195)	-2.76%
Roads Upgrades and Legacy Harvest -20%	516,767	36,204	(203,655)	(410,247)	(60,931)	-0.50%
Future Harvest +20%	620,120	17,128	(266,300)	(542,502)	(171,554)	-1.42%
Roads and Legacy -20% and New Harvest +20%	620,120	36,204	(203,655)	(410,247)	42,422	0.35%
New Roads 50% of plans	516,767	34,256	(266,300)	(542,502)	(257,779)	-1.16%
Program Footprint with Clear Cuts	408,095	18,424	(286,244)	(583,146)	(442,871)	-3.66%

* Sediment yield from Natural Erosion (Natural Mass Wasting and Stream Bank Erosion) for the North subbasin was estimated at 4,500 tons/mi^2/year X 53.8 mi^2 X 50 years = 12,098,250 tons

Sediment Yield data was estimated for the 1984-2002 time period in the Mattole TMDL (NCRWQCB 2002), all values were assumed to be constant for the next 50 years for the calculations shown above.

Sensitivity Analysis Results

According to the modeled results based on TMDL data and assumptions, the Proposed Program results in a net decrease in sediment yield over a 50-year time frame. Essentially fixing bad roads and legacy harvest related sediment sources 'saves' more sediment than new harvest produces. If the assumptions in the TMDL regarding the effectiveness of road upgrades and fixing legacy sediment sources were low by 20%, the net effect would still be a decrease in sediment yield. Similarly, if the assumptions contained in the TMDL regarding the sediment yield from future timber harvest underestimate future sediment yield by 20%, the net effect would still be a decrease in sediment yield. It would be necessary for the assumptions in the TMDL to be off by 20% in both directions for new harvest to have a net positive effect on sediment yield.

Due to the high density of existing roads in the Mattole our best estimate was that only 25% of landowners filing PTHPs would opt to construct 1,000 feet of road. Even if this estimate was doubled to 50% of landowners, the net effect of the Program would still be a decrease in sediment yield.

Finally, the impacts of silvicultural choice were explored. The Program requires the use of uneven-aged, Selection style silviculture. After initial harvest Selection silviculture was expected to produce about half as much sediment as if Clear-Cut style silviculture were employed (see above for discussion of DI values). However, Selection silviculture requires re-entry about every 10-20 years, whereas Clear-Cut silviculture typically ranges from 50-80 years between re-entries. Thus, if each silviculture type were practiced on the same 4,307 acre 'footprint', the model results indicate that over the 50 year analytical period the sediment yield reductions due to road upgrading were the same while the increases in sediment yield due new harvest were greater for selection because of the re-entries required to practice selection silviculture.

A fundamental weakness of the comparison of silviculture types is the lack of data from experimental watersheds on the impacts modern selection silviculture on sediment yield. The 'modern' logging implemented in the North Fork of Caspar Creek only included clearcutting (except for higher retention in the buffers) (Ziemer 1998). The assumption that canopy cover is approximately linearly related to changes in hydrology and sediment yield is what has given rise to the use of Disturbance Index and Equivalent Clearcut Area coefficients like those used in this analysis and contained in PALCO (2004) and Menning (1996). Given this assumption, it may be reasonable to assume that sediment yields from the type of selection silviculture prescribed in the Program are in fact only 20-30% of those of clear-cutting rather than the 50% assumed for this analysis. The reason the lower sediment yield values may be more accurate is that average canopy cover across PTHP harvest areas will not be less than 70% in most cases.

Assumptions for Alternatives

All even-aged acres harvested are first entries (Alt 1 and 2), with associated road upgrading and new road construction. Off program harvests (Alt 1) assume that 50% of landowners install 1,000 of road per harvest rather than the 25% assumed for Program harvests and Alts II and III.

Alternative II which has bigger buffers and more restricted MW avoidance also has all silvicultural options in the FPRs available so we assumed 30% install even-aged harvest and 70% go uneven-aged; which is the same assumption as the Status Quo based on harvest history.

Road upgrades for Program and non-Program harvests are assumed to meet the 85-90% sediment yield reduction targets described in the TMDL because the regulations governing both are very similar. Program harvests are subject to the Waiver requirements (NCRWQCB 2008) and status-quo harvests are subject to the GWDR requirements- and both are subject to the Anadromous Salmonid Protection Rules (ASP Rules) described in the Forest Practice Act. All harvests (Program and non-Program) are required to produce an inventory of controllable sediment sources and a timeline for fixing them for every acre harvested and the appurtenant road network. It is possible that non-Program road upgrade and legacy sediment source treatments would be less effective than Program related road upgrades, but there is no data to test this assumption. For an estimate of what the potential impacts would be see the "Sensitivity Analysis" section in Appendix D, where an estimate of road upgrades being 20% less effective is analyzed.

References For Water Quality/Quantity Section and Appendix D

Bedrossian, T.L. and K. Custis. 2002. Review of July 2002 EPA Analysis of Impacts of Timberland Management on Water Quality. Memorandum dated November 22, 2002 and sent to Mr. Ross Johnson, California Department of Forestry and Fire Protection. California Geological Survey. Sacramento, CA. 23 p.

Beschta, R.L. et.al. 1995. Cumulative Impacts of Forest Practices in Oregon: Literature and Synthesis. Prepared for the Oregon Department of Forestry. Salem, Oregon.

Cafferata, P. and J. Munn. 2006. Modified Completion Report Monitoring Program. Monitoring Study Group California State Board of Forestry and Fire Protection, Sacramento California.

Cafferata, P. and T. Spittler. 1998. Logging impacts of the 1970's vs. the 1990's in the Caspar Creek Watershed. USDA Forest Service Gen. Tech. Rep. PSW-GTR-168.

CalFire. 2007. RECIRCULATED DRAFT Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan Alternative G. Prepared by the California Department of Forestry and Fire Protection, Sacramento, CA.

Elliot, W.J. and S. Miller. 2002. Estimating Erosion Impacts from Implementing the National Fire Plan. ASAE Meeting Paper No. 02-5011. St. Joseph, Michigan: ASAE.

Grant, Gordon E.; Lewis, Sarah L.; Swanson, Frederick J.; Cissel, John H.; McDonnell, Jeffrey J. 2008. Impacts of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.

Grant, G.E. and A.L. Wolff. 1991. Long-Term Patterns of Sediment Transport After Timber Harvest, Western Cascade Mountains, Oregon, USA. Sediment and Stream Water Quality in a Changing Environment: Trends and Explanation. Proceedings of the Vienna Symposium, August 1991, IAHS Publ. No. 203, 1991.

Grant, G., W. Megahan, and R. Thomas. 1999. A re-evaluation of peak flows: do forest roads and harvesting cause floods? Paper presented at the 1999 NCASI West Coast Regional Meeting, Portland, OR. National Council for Air and Stream Improvement. P. 5

Gucinski, H., M.J. Furniss, R.R. Ziemer, M.H. Brookes. 2001. Forest roads: A synthesis of scientific information. Gen. Tech. Rep. PNW-GTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.

Hatchet, B., M. Grismer and M. Hogan. 2004. Impacts of Mechanical Mastication on Soil Compaction and Runoff in the Lake Tahoe Basin. Integrated Environmental Restoration Services, Inc.

Hope, D. 2008. Personal Communication at Mattole Restoration Council Technical Advisory Committee Meeting. Eureka, California.

Keppeler, E.T., J. Lewis, and T.E. Lisle. 2003. Impacts of forest management on streamflow, sediment yield, and erosion, Caspar Creek Experimental Watersheds. In: Renard, Kenneth G.; McElroy, Stephen A.; Gburek, William J.; Canfield, H. Evan; Scott, Russell L., eds. First Interagency Conference on Research in the Watersheds, October 27-30, 2003. U.S. Department of Agriculture, Agricultural Research Service; 77-82. Available at: http://www.fs.fed.us/psw/publications/keppeler/Keppeler_Lewis_Lisle_ICRW.pdf

Klein, R.D, W.J. Trush and M. Buffleben. 2008. Watershed condition, turbidity, and implications for anadromous salmonids in the north coatal California streams. Report to North Coast Regional Water Quality Control Board, Santa Rosa, CA.

Larson, K.R. and R.C. Sidle. 1980. Erosion and sedimentation data catalog of the Pacific Northwest. *In* R6-WM-050-1981. USDA Forest Service Pacific Northwest Region. Portland, Oregon 64.p

Lewis, J. (1998). Evaluating the impacts of logging activities on erosion and suspended sediment transport in the Caspar Creek watersheds. Conference on coastal watersheds: the Caspar Creek Story, Albany, CA, Pacific Southwest Research Station.

MacDonald, L.H., D. Coe and S. Litschert. 2004. Assessing cumulative watershed impacts in the central Sierra Nevada: Hillslope measurements and catchment scale modeling. USDA Forest Service General Technical Report. PSW-GTR-193

MacDonald, L.H. and J.D. Stednick. 2003. Forests and Water: a state-of-the-art review for Colorado. Colorado Water Resources Research Institute Rep. No. 196, Fort Collins, CO: Colorado State University, 65 p.
Martin, D. 2009. Forest Road Runoff Disconnection Survey of Private Timberlands inWashington. *Unpublished report.* Washington Forest Protection Association 724 Columbia Street NW, Suite 250 Olympia, WA.

Mattole Restoration Council. 2001. Report to the California Department of Forestry (CDF) Digitization of Forest Harvest History maps from Elements of Recovery. Petrolia, California.

Mattole River and Range Partnership. 2010. Draft Mattole Coho Recovery Strategy. Petrolia, California.

McGurk, B.J. and D.R. Fong. 1995. Equivalent Roaded Area as a measure of cumulative effect of logging. Environmental Management, 19(4), 609-621

Megahan, W.F., J.G. King. 2004. Erosion, sedimentation and cumulative impacts in the Northern Rocky Mountains, In: Ice, G.G., J.D. Stednick (eds.) A Century of Forest and Widland Watershed Lessons. Bethesda, MD: Society of American Foresters, Chapter 9, 201-222

Menning, K.M., D.C. Erman, K.N. Johnson and J. Sessions. 1996. Modeling aquatic and riparian systems, assessing cumulative watershed impacts and limiting watershed disturbance. Sierra Nevada Ecosystem Project: Final report to Congress, Addendum. Davis: University of California, Centers for Water and Wildland Resources. pp. 33-50

Moser, E. 2007. Personal Communication. USFS Hydrologist TEAMS member, Oregon.

Mount, J. 1995. California rivers and streams: the conflict between fluvial process and land use. Berkeley: University of California Press.

Murphy, M.L. 1995. Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska- requirements for protection and restoration. Decision Analysis Series No. 7. National Oceanographic and Atmospheric Administration. Silver Springs, MD.

North Coast Regional Water Quality Control Board. 2002. Mattole River watershed Technical Support Document for Sediment and Temperature. North Coast Regional Water Quality Control Board, Santa Rosa, California.

North Coast Regional Water Quality Control Board. 2009. Order No. R1-2009-0038 Categorical Waiver of Waste Discharge Requirements For Discharges Related to Timber Harvest Activities on Non-Federal Lands in the North Coast Region.

Pacific Lumber Company (PALCO). 2004. Report of Waste Discharge Elk River. *Submitted to the North Coast Regional Water Quality Control Board.* Scotia, California.

Pacific Watershed Associates. 1998. Sediment Source Investigation and Sediment Reduction Plan for the Bear Creek Watershed, Humboldt County, California. prepared for the Pacific Lumber Company Scotia, California. Pacific Watershed Associates, Arcata, California. April, 1998.

O'Louglin, C.L. 1974. A study of tree root strength deterioration following clearfelling. Canadian Journal of Forest Research. 4:107-113

Reid, L.M. and T. Dunne, 1996. Rapid evaluation of sediment budgets. Reiskirchen: Germany, Catena Verlag (GeoEcology paperback). 164 p.

Reid, L.M. 2010. Understanding and evaluating cumulative watershed impacts. Pgs. 277-298 in: W.J. Elliot, and L.J. Audin (editors), CWE for fuels management in the Western U.S. USDA Forest Service RMRS-GTR-231. Available online at: http://www.fs.fed.us/rm/pubs/rmrs_gtr231/rmrs_gtr231_277_298.pdf

Regional Water Quality Control Board. 2001. ACTION PLAN FOR THE GARCIA RIVER WATERSHED SEDIMENT TMDL. http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/garcia_river/

Rice and Lewis. 1991. Estimating Erosion Risks Associated with Logging and Forest Roads in Northwestern California. Water Resources Bulletin vol. 27 no. 5. American Water Resources Association.

Robichaud, P.R., L.H. MacDonald and R.B. Foltz. 2007. Fuel Management and Erosion. Cumulative Watershed Impacts of Fuels Management: A Western Synthesis. RMRS....

Robichaud, P.R., J.L. Beyers and D.G. Neary. 2000. Evaluating the effectiveness of post fire rehabilitation treatments. USDA Forest Service General Technical Report. RMRS-GTR-63. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p.

Robison, E.G., K. Mills, J.T. Paul, L. Dent, and A. Skaugset. 1999. Oregon Department of Forestry 1996 Storm Impacts Monitoring Project: Final Report. Forest Practices Technical Report # 4. Oregon Department of Forestry, Salem, Oregon. 141 pp.

Simpson, G. 2006. Mattole River Watershed Analysis Mass, Wasting Assessment, Signatory Review Team Draft Report. SHN Consulting Engineers and Geologists, Eureka California.

Spence, B.C., G.A. Lomnicky, R.M. Huges, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. Mantech Environmental Research Services Corp., Corvallis, OR.

Stednick, J.D. 1996. Monitoring the impacts of timber harvest on annual water yield. Journal of Hydrology. Vol. 176(79-95)

Stillwater Sciences. 2007. Landslide hazard in the Elk River Basin, Humboldt County, California. Prepared for the North Coast Regional Water Quality Control Board by Stillwater Science, Arcata, California.

Tiedemann, A. R., and D. A. Higgins. 1989. Impacts of management strategies on water resources. In: T. M. Quigley, H. R. Sanderson, and A. R. Tiedemann, Managing interior Northwest rangelands: The Oregon Range Evaluation Project. USDA Forest Serv. Gen. Tech. Rep. PNW-GTR-238. p. 56-91.

USDA Forest Service. 1988. Chapter 20 – Cumulative Off-Site Watershed Impacts Analysis. Soil and Water Conservation Handbook. USDA Forest Service Region 5

USDA and USDI. 1994. Record of decision for amendments to forest service and bureau of land management planning documents within the range of the northern spotted owl. April 1994.

USDA Forest Service. 2003. Herger-Feinstein Quincy Library Group Final Supplemental Environmental Impact Statement. USDA Forest Service, Plumas National Forest. Quincy, California

USDA Forest Service. 2005. Final Supplemental Environmental Impact Statement: Empire Fuels Management Project. USDA Forest Service, Plumas National Forest. Quincy, California

USDA Forest Service. 2007. Environmental Assessment, North Fork of the San Jacinto Healthy Forest Project. San Jacinto Ranger District, San Bernadino National Forest. Riverside County, California.

US Environmental Protection Agency. 2007. Mad River Total Maximum Daily Loads for Sediment and Turbidity. US Environmental Protection Agency, Region IX. San Francisco, California.

US EPA. 1993. Grazing Management Measures, section E. *in* Guidance specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. EPA 840-B-92-002, January 1993.

Welsh, H.H., G.R. Hodgson and N.E. Karraker. Influences of the vegetation mosaic on riparian and stream environments in a mixed forest-grassland landscape in "Mediterranean" northwestern California.

Appendix E: Mattole Planning Documents

1. Upper Mattole Fire Plan, 2004 – prepared by Mattole Restoration Council and ForEverGreen Forestry Consultants

The Upper Mattole Fire Plan was drafted in 2004 and contains guidance regarding PRC 4291 on fire safe clearing distances and on SB 1369 requirements which require that land owners obtain a certificate of compliance from a local building official in order to obtain homeowner's insurance when the structure is located in very high fire hazard locations (as determined by CAL FIRE and FRAP). In addition, the Fire Plan contains a map of the local CAL FIRE protection districts, a list of priority projects including creation of defensible space around structures and creation of shaded fuel breaks, increasing water supply/storage for fire fighting purposes, education and continued community meetings. The Plan also contains a map of existing shaded fuel breaks.

2. Lower Mattole Fire Plan, 2002– prepared by Mattole Restoration Council

The Lower Mattole Fire Plan was drafted in 2002 (before the requirements of SB 1369) and contains guidance regarding PRC 4291 fire safe clearances among other suggestions. A list of priorities for the area includes 1) increasing water supply, 2) fuels reduction, 3) education, and 4) continued neighborhood meetings.

3. Humboldt County Master Fire Protection Plan (MFPP), 2006 – prepared by Humboldt Fire Safe Council.

On August 16, 2006, the Humboldt County Board of Supervisors approved the Humboldt County Master Fire Protection Plan and certified that it met the requirements for a Community Wildfire Protection Plan (CWPP). The MFPP is intended to serve as the guiding document for reducing the risk of fire to Humboldt County communities. Policy recommendations from the MFPP will supplement the Natural Resources and Hazards Report that supports the preparation of the Humboldt County General Plan, thus influencing future development patterns. Additionally, the MFPP is designed to meet Healthy Forest Restoration Act criteria for Community Wildfire Protection Plans (CWPP) by engaging in a collaborative process, prioritizing fuel reduction activities, and recommending treatments for reducing structural ignitability, by

- Incorporating wildland fire safety measures, fire hazard mitigations, accessible roads data, emergency water supply locations, flammable vegetation clearance for defensible space techniques, and other fire safety techniques, into local community planning
- Updating Humboldt County Fire Safe Standards to identify specific hazard zones and improve fire safe measures

A high priority finding and recommendation applicable to the Mattole is the recommendation on risk reduction to, "*Develop a biomass utilization program to develop commercially-viable*

markets for fuel reduction project wood byproducts and residue such as slash, small diameter logs, foliage, wood chips, etc."

4. Humboldt County General Plan Update – 2008 – prepared by Humboldt County Planning Department

A draft of the Humboldt County General Plan Update was provided to the Humboldt County Planning Commission on 11/20/08. Within the 331-page plan are proposed policies regarding forest land use in the Natural Resource Element of the Plan and fire hazard mitigation in the Safety Element of the plan. Several policies in the Safety Element are applicable in the Mattole including:

- Subdivisions within SRA high and very high fire severity classification areas shall explicitly consider designs and layout to reduce the risks of fire and improve defensibility; for example, through clustering of lots in defensible areas.
- Proposed development within SRA high and very high fire severity classification areas shall be serviced by adequate water supplies for fire protection consistent with state or local CAL FIRE protection agency requirements.
- Development shall conform to Humboldt County SRA Fire Safe Regulations.
- Encourage the use of prescribed burning as a management tool for hazardous fuels reduction, timber management purposes, livestock production, and enhancement of wildlife habitat

Several policies in the Natural Resources Element are applicable in the Mattole including:

- Defer to CAL FIRE on timber harvest reviews; comment only where county land-use patterns have significantly contributed to use conflicts at issue and where the County can assist in dispute resolution.
- Support fewer, more effective and lower cost timber management regulations as a strategy to maintain timber production as the primary use of forestlands. Coordinate county policies so they are compatible with the State Forest Practice Act and State Forest Practice Rules.
- Parcels of Timber Site Quality III or higher shall be planned to maintain timber production as the primary use.
- Require continued viability of timber production on TPZ zoned parcels containing residences by mitigating the impacts of residences on timber harvesting, water resources, biological resources, wildland fire potential and public services.
- The County shall provide incentives to maintain large-scale land ownerships for commercial timber production.

5. Humboldt Del Norte Fire Plan, 2005 – prepared by CAL FIRE

The Humboldt Del Norte Fire Plan contains a list of the communities at risk within the Unit Plan boundaries which includes the Mattole watershed communities of Petrolia, Ettersburg, Honeydew, Briceland and Whitethorn. In addition, the plan describes completed fuel reduction projects within the Unit including the Mattole Valley/Prosper Ridge/Wilder Ridge

fuel break, which was completed in 2003. The Unit Plan indicates several projects in Southern Humboldt were planned for 2004-2006 but withdrawn for various reasons.

6. Resource Management Plan for the King Range Resource Area, 2005, prepared by USDI Bureau of Land Management (hereafter KRNCA) USDI BLM, 2005.

The King Range Conservation Area Resource Management Plan Record of Decision (ROD) was signed on May 17, 2005, which approved management standards and guidelines for about 62,000 acres of BLM lands within the King Range and for grazing and campground use at a limited number of acres outside of the King Range. A large portion of the King Range Conservation Area lands lies within the Mattole Watershed. Although this PTEIR affects only the management of private lands, the management of KRNCA holdings in the Mattole affects the foreseeable cumulative effects of timber harvest elsewhere in the watershed. The KRNCA standards and objectives include:

- Maintain and restore habitat necessary to support healthy riparian, aquatic and wetland ecosystems. This ROD clarifies that watershed restoration activities will be focused on Mattole River tributaries containing federally listed species and critical habitat (coho and Chinook salmon and steelhead trout). Restoration activities in other watersheds are not precluded by the RMP, but will not be the management focus.
- Establish sufficient northern spotted owl habitat to support 20 breeding pairs within the King Range NCA.
- Manage migratory bird, herpetofauna, and game species habitat to host natural population levels of these species.
- Manage vegetation types to produce a mosaic of plant communities that existed prior to the era of mechanized logging and exclusion of fire regimes in the region (approximately 1945).
- Maintain and develop forest vegetation based on historical conditions prior to 1945 (approximately 60 percent late successional, 20 percent mid mature, and 20 percent early successional stands).
- Maintain undisturbed late-successional forest habitat by keeping those stands intact.
- Backcountry Zone: Manage fuels to allow various intensity wildfires and to create a landscape resistant to damages associated with large high intensity wildfires.
- Front country and Residential Zones: Use prescribed fire and mechanical fuel reduction to reduce potential for high intensity fires.
- Develop a shaded fuel break system to provide a defensible perimeter around the Backcountry Zone and minimize the need for construction of bulldozer lines during fire events.

7. Mattole River Watershed Assessment Report, 2003. North Coast Watershed Assessment Program, 441 p. plus Appendices, prepared by California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

The North Coast Watershed Assessment Program's (NCWAP, 2002) Mattole River Watershed Assessment Report was an interagency effort between the California Resources Agency and Cal EPA, established to provide a consistent body of information on North Coast

watersheds (in this case the Mattole) for use by landowners, stakeholders, and collaborative watershed groups. The Assessment was completed in March of 2003.

Each of the NCWAP's participating departments developed data collection and analysis methods used in their basin assessments. This information provided guidance for developing restoration, management, and conservation recommendations. Of the five participating agencies:

- CDFG compiled, developed, and analyzed data related to anadromous fisheries habitat and populations.
- CAL FIRE compiled, developed, and analyzed data related to historical land use changes in the watersheds. It also led preparation of reports that synthesize information, findings, and recommendations, and developed a framework for assessing cumulative impacts.
- DOC/California Geologic Service (CGS) compiled, developed, and analyzed data related to the production and transport of sediment. Tasks included baseline mapping of landslides, landslide potential, and instream sediment, as well as an analysis of stream geomorphology and sediment transport.
- NCRWQCB compiled, collected, and analyzed water quality data for the assessment. The assessment included comparison of recently collected and past available information comprised predominately of a robust water temperature data set, and some limited sediment data.
- DWR installed and maintained stream monitoring gages where needed to develop and analyze stream flow information.

The Mattole Assessment reached conclusions about a number of issues including the following, which relate directly to the proposed program described in this PTEIR:

- Land use, including road construction and use, timber harvesting, and grazing, have added excess sediment to the fluvial system. Many of the effects from these activities are spatially and temporally removed from their upland sources. Excess sediment remains in the Mattole mainstem despite decades of low timber harvesting activity;
- Currently, roads are a major land use contributor of sediment (CAL FIRE, 2002). Large storms or other catastrophic events combined with poor road location and construction practices have the potential to deliver large and adverse amounts of sediment into stream systems;
- Large woody debris recruitment potential is limited by the low percentage of near-stream forest stands containing trees in large diameter classes;

Based on available information for the Mattole Basin, the NCWAP team found that salmonid populations are currently being limited by:

- Impacted estuarine conditions;
- General basin-wide lack of habitat complexity;
- High instream sediment levels;
- High summer water temperatures;
- Reduced basin-wide coho and Chinook meta-populations.

The Assessment Team made the following recommendations, which apply basin-wide:

- Reduce sediment deposition to the estuary by supporting a basin-wide road and erosion assessment/control program such as the Mattole Restoration Council's Good Roads Clear Creeks effort. Continue to conduct and implement road and erosion assessments such as the ongoing efforts in the Dry and Westlund planning watersheds in the Eastern Subbasin. Expand road assessment efforts because of the potential for further sediment delivery from active and abandoned roads, many of which are in close proximity to stream channels, especially in the Bridge and Thompson planning watersheds in the Southern Subbasin;
- Consider the nature and extent of naturally occurring unstable geologic terrain, landslides and landslide potential (especially Categories 4 and 5, page 89) when planning potential projects in the subbasin;
- At stream bank erosion sites, encourage cooperative efforts to reduce sediment yield to streams. CGS mapping indicates eroding banks are not a significant basin wide issue, but may be of localized importance. They occur in isolated, relatively short reaches distributed throughout the Mattole Basin;
- Based on the high incidence of unstable slopes in the Northern Subbasin, any future sub-division development proposals should be based on an existing county-imposed forty acre minimum parcel sub-division ordinances;
- Encourage the use of appropriate Best Management Practices for all land use and development activities to minimize erosion and sediment delivery to streams. For example, low impact yarding systems should be used in timber harvest operations on steep and unstable slopes to reduce soil compaction, surface disturbance, and resultant sediment yield.
- Where current canopy is inadequate and site conditions, including geology, are appropriate, initiate tree planting and other vegetation management to hasten the development of denser and more extensive riparian canopy, especially in the Northern Subbasin;
- Landowners and managers in the Northern and Western subbasins should work to add more large organic debris and shelter structures to streams in order to improve channel structure, channel function, habitat complexity, and habitat diversity for salmonids;
- Ensure that stream reaches with high quality habitat in the Mattole Basin are protected from degradation. This is especially important in the Southern Subbasin. The best stream conditions as evaluated by the stream reach EMDS (Ecological Management Decision Support tool, NCWAP 2002) were found in the South Fork of Vanauken Creek, Mill Creek - at Mattole river-mile 56.2 (RM 56.2), Stanley Creek, Thompson Creek, Yew Creek, and Lost Man Creek Tributary in the Southern Subbasin, and in Harrow Creek in the Eastern Subbasin. Refugia investigation criteria, which include biological parameters, indicated Bear Creek was the best stream evaluated in the Mattole Basin.

8. Mattole Watershed Plan Landscape Conservation Strategy by Eric Goldsmith, Sanctuary Forest, 2/4/05.

This plan, which is a portion of a larger document, describes priorities for conserving each of the subbasins, generally from a fisheries and old growth habitat standpoint. Priorities for each of the subbasins include:

- Estuary subbasin – protecting and enhancing salmonid fisheries
- Northern subbasin – protect remaining old-growth forests, 2) protection of salmonid refugia in priority tributary subbasins; 3) maintaining ranchland; 4) protecting native grasslands; and 5) conserving open space.
- Eastern subbasin - 1) protection of remaining unconserved old-growth forests; 2) protection of salmonid refugia in priority tributary sub -basins; 3) enhancing conservation connectivity and open space; and 4) maintaining ranchland.
- Southern subbasin - 1) maintaining summertime flows, with particular attention to the relationship of river flows to subdivision and rural residential development; 2) maintaining or enhancing connectivity of high quality fisheries habitat; 3) maintaining or enhancing connectivity of habitat for wide-ranging species, by connecting with SWSP and KRNCA; and 4) maintaining or enhancing the scenic road corridor.
- Western subbasin - protecting salmonid refugia, especially in coho streams; 2) protecting old-growth forest habitat; 3) enhancing connectivity within high-quality refugia tributaries, and externally with the Redwoods to the Sea Corridor and the Upper Mattole River and Forest Cooperative; and 4) conserving ranchlands.

9. Upper Mattole River and Forest Cooperative Coordinated Resource Management Plan, prepared by Sanctuary Forest, 4/27/06.

The Upper Mattole River and Forest Cooperative was created in 1999 through signing an MOU between Sanctuary Forest, Save the Redwoods League, Restoration Forestry, California State Parks, California Coastal Conservancy, CA Departments of Forestry and Fire Protection and Fish and Game, and the USDI Bureau of Land Management. The purpose of the MOU is to coordinate management of conserved lands in the Mattole headwaters as old growth forest and salmonid refugia across ownerships. The parties to the MOU own approximately 5,277 acres and there is an additional 713 acres that are conserved by cooperating landowners including Redwoods Monastery and the Northcoast Regional Land Trust.

The primary forestry goals for these lands are shown below. Projects to be implemented to achieve these goals include thinning to promote late seral characteristics, monitoring the spread of sudden oak death (SOD), implementing the Upper Mattole Fire Plan system of fuel breaks, and promoting a demonstration prescribed burning project.

- Protect ecological functioning of existing old-growth

- Promote development of old-growth forest characteristics.
- Restore native species diversity.
- Promote development of riparian shade
- Promote projects demonstrating ecologically compatible forestry practices.
- Promote projects supporting local capacity to produce sustainable forest products
- Protect surrounding communities from threat of wildfire
- Promote reintroduction of fire as an essential ecosystem element.

The primary watershed and fisheries goals for these lands include, 1) restoring, maintaining and enhancing the ecological health of watersheds, protecting and restoring native runs of coho, chinook and steelhead and maintaining and enhancing healthy water flows and high water quality to benefit aquatic species.

The primary wildlife habitat goals for these lands include; 1) protecting and restoring native biodiversity and sustaining natural processes, 2) protecting and conserving habitat of all rare, threatened and endangered species, 3) containing and removing non-native invasive species, and 4) promoting the abandonment of homesteads in important wildlife areas. Projects to implement these goals include updating wildlife surveys of sensitive species to determine current status, implement the Mattole Watershed Plan invasives species control projects and identify and designate critical wildlife habitat areas.

10. Foresight 2020: Mattole Integrated Coastal Watershed Management Plan, prepared by MRC, Mattole Salmon Group, and Sanctuary Forest, 8/31/09.

Since the late 1970s, local citizens have worked to remediate environmental damage in an attempt to restore the Mattole's salmon runs and forests. These efforts have coalesced into a team of three nonprofit conservation organizations which together lead watershed management and restoration in the Mattole, where there are no municipalities and limited government agency presence. The three nonprofits are the Mattole Restoration Council, Mattole Salmon Group, and Sanctuary Forest, together known as the Mattole River and Range Partnership (MRRP). Each organization takes responsibility for different aspects of watershed management and recovery, working closely with County, State and Federal government partners.

Foresight 2020 describes MRRP's plan for watershed restoration and water quality management in the Mattole between 2010 and 2020. It identifies eight specific goals to be achieved during the decade. These goals are approached through eight Key Management Areas, or program types. For each management area, the plan identifies a series of strategies, each of which lead to a number of specific tasks for implementation by the MRRP. Additionally, the Plan describes prioritization and monitoring approaches to enhance management and restoration actions. MRRP's ultimate goals for the Mattole are abundant, native salmon runs along with healthy, productive upslope ecosystems and sustainably integrated human communities.

This Plan builds upon previous Mattole watershed planning documents including the North Coast Watershed Assessment Program, Mattole Basin Plan and the 2005 Mattole Watershed

Plan, as well as broader planning documents such as the California Ocean Plan, North Coast Integrated Water Management Plan, and California's Sediment Master Plan.

Despite the relatively short time since the 2005 Plan, there were a number of reasons to create another. Based on feedback received on *Mattole Watershed Plan*, MRC identified several areas in need of further planning including monitoring, interim goal-setting, and coverage of recently developed or improved programs such as grassland restoration, working lands stewardship support, estuary restoration, riparian forestry, and stream flow enhancement.

Forestry management goals outlined in the plan that are relevant to this PTEIR are listed in section 3.4.4, and include:

- Conserve remaining old-growth and mature forests on the scattered industrial and private lands in the watershed.
- Promote the development of late successional forest characteristics in second growth forests.
- Reduce forest densities to improve forest health, reduce fire hazard, improve ecological resiliency to disturbance and pathogens, and improve habitat.
- Support the development of a light touch forestry and value added forest products industry.
- Improve forest practices throughout the watershed with the eventual goal of reducing clear cutting and herbicide use watershed wide.
- Promote carbon sequestration for Mattole landowners by pursuing relationships with groups such as California Climate Action Registry (CCAR).

According to the authors, "Implementing the actions described in this plan can be expected to accelerate the recovery of the Mattole watershed and protect its regionally important contributions to salmonid habitat and the conservation of California's biodiversity."

Appendix F:

Contents of a Sediment Prevention Plan (SPP) and Erosion Control Plan (ECP)

The following definitions and descriptions were taken directly from the document titled:

California Regional Water Quality Control Board
North Coast Region
ORDER NO. R1-2009-0038
Categorical Waiver of Waste Discharge Requirements
For
Discharges Related to Timber Harvest Activities
On Non-Federal Lands in the
North Coast Region

Sediment Prevention Plan -SPP

Definition:

"Sediment Prevention Plan" (SPP) means a plan designed and implemented to prevent and minimize the creation of new sites that discharge sediment to waters of the State. The Sediment plan is submitted by a discharger seeking coverage for a Project under Categorical Waiver F: Other Projects (THPs and Other Timber Harvesting Projects). The SPP must be developed by a qualified professional. The Sediment Prevention Plan (SPP) must include, but not be limited to, a map clearly showing the location(s) of the site(s) that could discharge sediment, and site-specific designs and/or management measures to prevent and minimize the discharge of sediment.

Description:

A Sediment Prevention Plan must be designed and implemented to prevent and minimize the discharge of sediment to waters of the State and submitted as part of a Project seeking coverage under the Categorical Waiver. A Sediment Prevention Plan differs from an Erosion Control Plan in that it is intended to prevent and minimize creation of *new* sources of sediment discharge from operations conducted under the current Project, while an ECP is intended to prevent and minimize sediment discharge from *existing* sources.

The Sediment Prevention Plan (SPP) shall be developed by a qualified professional. The Sediment Prevention Plan (SPP) shall include site specific measures that can reasonably be expected to prevent and minimize creation of new sediment discharge sources from proposed timber harvest activities. The sediment prevention plan must include a map clearly showing the location(s) of the site(s) where prevention and minimization measures described in the plan will be implemented.

Erosion Control Plan- ECP

Definition: "Erosion Control Plan" (ECP) means a plan designed and implemented to prevent and minimize the discharge of sediment from existing sites to waters of the state in violation of water quality requirements or other conditions of this Order and submitted with the Project seeking coverage under the Categorical Waiver E: Nonindustrial Timber Management Plans (NTMPs) and Categorical Waiver F: Other Projects (THPs and Other Timber Harvesting Projects). The Erosion Control Plan (ECP) must be developed by a qualified professional. The ECP must include but is not limited to, a map clearly showing the location(s) of the site(s) that could discharge sediment, site specific designs and/or management measures to prevent and minimize the discharge of sediment, and a time schedule for implementation of site specific designs and/or management measures. Specific instructions to complete an ECP are included in below (originally Appendix B of ORDER NO. R1-2009-0038).

Contents of an Erosion Control Plan (ECP)

An Erosion Control Plan, must be developed and implemented for timber harvesting, including the logging area, roads and skid trails used to access or haul timber harvesting materials that are owned by or under the control of the Discharger. The ECP must be designed to prevent and minimize the discharge or threatened discharge of sediment from existing Controllable Sediment Discharge Sources into waters of the state in violation of water quality requirements or other provisions of this Order. The Discharger must develop and submit an ECP for coverage under the Categorical Waiver E: Nonindustrial Timber Management Plans (NTMPs) and Categorical Waiver F: Other Projects (THPs and Other Timber Harvesting Projects) as follows:

CSDS are defined as sites or locations, within the Project area that meet all the following conditions:

1. is discharging or has the potential to discharge sediment to waters of the state in violation of water quality requirements or other provisions of these General WDRs,
2. was caused or affected by human activity, and
3. to the maximum extent practicable may feasibly and reasonably, respond to prevention and minimization management measures.

Controllable sediment discharge sources include, but are not limited to, failing or failed watercourse crossings, road failures, road surfaces, landslides, unstable features discharging to or near watercourses, unstable watercourse banks, soil stockpiles, storage of waste, skid trails, landings, exposed harvest units, or any other location discharging or threatening to discharge waste or earthen materials. The ECP shall be amended and revised, when necessary, to meet this standard. No Project may conduct activities that can reasonably be expected to create new sediment discharge sources where none previously existed.

The ECP may be included with the initial submittal of a project, in which case it can be reviewed concurrently with the project, or separately as part of the application for a Categorical Waiver.

Contents of an ECP

a) An Inventory and Treatment of Controllable Sediment Discharge Sources within the logging area.

The inventory must identify controllable sediment discharge sources and inform the development of a time schedule for implementation of prevention and minimization management measures. The inventory must include an on-the-ground survey and site evaluations, and may be Order No. R1-2009-0038 -30- Categorical Waiver augmented by additional information sources such as aerial photographs or previously prepared reports. Any method or model used to develop the inventory must be briefly described and must be reasonably expected to detect sediment discharge sources and to effectively prevent and minimize sediment discharge. The inventory must include:

i. A brief description of the method(s) used to conduct the inventory. This description provides the reviewer with an understanding of the thoroughness of the survey method and the likelihood that CSDSs have been identified. For example, the description identifies any aerial photographs used, and whether the Discharger inventoried all watercourses and skid trails,

ii. A description of each site, including sufficient information to provide the reviewer with an understanding of current conditions and why the site meets the definition of a CSDS,

iii. i. A topographic map, at a scale of 1:12000 or greater (e.g. 1:6000) with no greater than 80' contours, showing the logging area and the location of all controllable sediment discharge sources included in the inventory,

iv. An estimate of the potential deliverable sediment volume for each inventoried site. The potential deliverable sediment volume represents an estimate of the maximum volume of sediment that could discharge to waters of the state in the event of complete failure of a site,

v. narrative description of the site-specific prevention and minimization management measure(s) prescribed for each controllable sediment discharge source identified in the inventory. Prevention and minimization management measures must be reasonably expected to effectively prevent and minimize specific sediment discharge sources in the logging area. The description must provide sufficient design and construction specifications, including but not limited to diagrams, minimum rock size, or performance standards as needed, to allow on site personnel to implement prevention and minimization measures as intended,

vi. Priority for implementation of prevention and minimization measures. The priority must be used to develop the time schedule for implementation and must be based on the potential impacts to the beneficial uses of water. The priority must consider at a minimum the estimate of the deliverable volume of sediment, the imminence of failure,

and the sensitivity of beneficial uses of water in receiving streams. In general, the highest priority is assigned to sites with large sediment discharge sources that show an imminent risk of failure and that will discharge to waters that support domestic water supplies or fish. Priority may be indicated as low, medium, or high,

vii. A time schedule for implementation of prevention and minimization management measures contained in the ECP that provides for timely implementation to prevent and minimize sediment discharge from sites in the order of priority. For THPs, implementation must be during the time an individual THP is active, or during the NTO covering the area in which a CSDS is located, unless an alternative time schedule is agreed to in writing by the Executive Officer. The schedule may specify a time range for implementation, for example the plan may state that a site shall be completed during the first two years of operations on the plan, as long as the schedule includes a final completion date. The time schedule for implementation may be revised as warranted by changed conditions if agreed to in writing by the Executive Officer.

b) Inspection Plan and Reporting Requirements

For each Project enrolled in Categorical Waivers E and F, Dischargers must follow the Inspection Plan detailed below for evaluating the implementation and effectiveness of the management measures in the Erosion Control Plan, to determine if any new controllable sediment discharge sources have developed within the Project area, and to ensure that all drainage facilities and erosion control structures are functioning properly in order to prevent sediment discharge to waters of the state.

The Inspection Plan must include a narrative discussion of the program to inspect and maintain all identified management measures designed to prevent and minimize sediment discharge throughout the duration of the Project. A site map that depicts the inspection locations to be visited before and after the winter period must be included in the Inspection Plan. Inspections must include, at a minimum, logging area roads that could discharge sediment, sites and locations addressed in the sediment prevention plan, and controllable sediment discharge sources contained in the ECP.

Each CSDS must be inspected during each required inspection. Additionally, inspectors should strive to inspect all accessible portions of the road system that have the potential to discharge sediment to watercourses to ensure roads are draining adequately and watercourse crossings are functioning properly and indentify any new CSDS sites that may have developed. Inspectors must note the conditions of CSDS sites and any failures or ineffectiveness of management measures.

Inspections conducted prior to the winter period must be designed to assure that management measures are properly installed and maintained. Post-winter period inspections must be designed to assure that the management measures have functioned adequately and to determine whether any new controllable sediment discharge sources have developed. Management measures must be evaluated for adequacy and proper implementation and

whether additional management measures are required in accordance with the terms of this Order.

Landowners and Qualified professionals must conduct all specified inspections of the Project site to identify areas causing or contributing to a violation of applicable water quality requirements or other provisions of the Categorical Waiver. The name(s) and contact number(s) of the assigned inspection personnel must be listed in the Inspection Plan.

The following inspection requirements begin once the startup of timber harvest activities begin within Project areas:

i. Inspections must be conducted as follows:
   - By November 15 to assure Project areas are secure for the winter; and
   - After April 1 and before June 15 to assess the effectiveness of management measures designed to address controllable sediment discharges and to determine if any new controllable sediment discharge sources have developed.
   - For THPs and other non-NTMP projects, inspections must be conducted each year according to the schedule specified above until the Project has been completed and the Discharger has submitted a Notice of Termination.

ii. Projects for which Timber Harvest Activities have not yet Commenced: No inspections are required.

iii. If any new controllable sediment discharge sources are identified during inspections, prevention and minimization measures must be implemented as soon as is feasible. New controllable sediment discharge sources shall be evaluated and addressed in accordance with the provisions described above, and included in a revised ECP. The revised ECP must be submitted to Regional Board staff with the annual summary inspection report.

iv. Equipment, materials, and workers must be available for rapid response to failures and emergencies, and implement, as feasible, emergency management measures depending upon field conditions and worker safety for access.

c) Reporting Requirements

Discharger must submit an inspection summary report to the Executive Officer by June 30th for each year of coverage under these Categorical Waivers and upon termination of coverage. The inspection summary report must include the following information, at a minimum:

- the date of each inspection,
- the inspector's name,
- the location of each inspection,
- the title and name of the person submitting the summary report,
- a brief narrative description of observed conditions,
- a description of any new controllable sediment discharge sources identified during inspections or throughout the course of routine timber harvest activities, a description of any corrective action taken to prevent and minimize sediment

discharge as a result of observations made during the inspections, as well as the date the corrective action was taken,

- a description of prevention and minimization measures contained in the ECP implemented up to the date of submission of the report, the date those measures were implemented, and an evaluation of the effectiveness of those measures,
- a description of where management measures have been ineffective and when the Discharger will implement repairs or design changes to correct management measure failures.

A final inspection summary report shall be submitted with the final Certification Notice.

Appendix G: EIR Preparers

Name	Organization	Education and qualifications	Years Experience	Chapters
Greg Blomstrom	Baldwin, Blomstrom, Wilkinson and Associates, Inc., Consulting Foresters, Arcata, Calif.	Registered Professional Forester (RPF). B.S., Forest Management, Humboldt State University	36 years, forestry and consulting forestry experience	Air Quality, Green House Gases, Geology and Soils, Noise, Population and Housing, Utilities, Transportation, Wildfire, modeling of feasibility and footprint
Jared Gerstein	Baldwin, Blomstrom, Wilkinson and Associates, Inc., Consulting Foresters	RPF. B.A. from UC Santa Cruz and an M.S. from Oregon State University	16 years forestry and consulting forestry experience	Aquatic Resources, Water Quality, Hazards and Hazardous Materials, GIS including available landbase
Paul Harper	Baldwin, Blomstrom, Wilkinson and Associates, Inc., Consulting Foresters	RPF. B.A. from Duke University and an M.S. from UC Berkeley	14 years forestry and consulting forestry experience	Vegetation, Timberland Resources, FVS modeling of prescriptions, volumes, GHG's and wildfire
Bill Wilkinson	Baldwin, Blomstrom, Wilkinson and Associates, Inc., Consulting Foresters	RPF. M.S. in Forest Resources from the University of Idaho and a B.S. in Forestry from the University of Tennessee	38 years forestry and consulting forestry experience	Cultural/Archaeological Resources, Visual/Aesthetics, Recreation, Wildlife
Gary Simpson	SHN Engineering, Eureka, Calif.	Registered Geologist, Certified Engineering Geologist. B.A. and M.S. in Geology from Humboldt State University	20 years experience in forestry-related geological analysis	Geologic Flow Chart

Appendix H: Mattole Forest Futures Project

Program Timber Harvesting Plan Checklist

NOTE: What follows are a number of questions that allow CAL FIRE to determine whether the timber operations proposed under the PTHP are within the scope of the environmental analysis contained in the PTEIR. A negative response (except for Questions 9, 10, 11, 11(c), 11(q), 12, 20, 32, 34, 35, 36, 42, 43, 63, and 73) indicates a potential conflict with the environmental analysis, specifications and protection measures contained in the PTEIR. When a question is answered in the negative, some additional information (e.g., a report by a Licensed Geologist, an explanation, etc.) may be required. *If there is a negative answer to a question (except those noted previously), the PTHP shall explain and justify the proposed practice and how it is within the scope of the environmental analysis contained in the PTEIR.* If the proposed practice is not within the scope of the environmental analysis contained in the PTEIR, a PTHP may not be used, and preparation of a THP, NTMP, etc. may be necessary for the project to move forward.

Questions that contain requirements for mapping, additional plan addenda and descriptions of applicable protection measures or other information contain portions that are *underlined, bolded and italicized* with directions on what information is needed and where to place such information in the PTHP.

Stand Typing and Inventory

1. Has the registered professional forester (RPF) delineated stands to be managed for which individual inventory data will be collected per the guidance contained in 2.1.A.4 and PTEIR Appendix C? ☐ ☐ ☐

2. Does the inventory data have a standard error no greater than +/-15% based on total stand basal area? ☐ ☐ ☐

3. At the time of the inventory, was each cruise plot temporarily identified at least with flagging at plot center? ☐ ☐ ☐

4. Have (1) areas in which no harvesting is allowed under the Mattole Forest Futures Project due to watercourse or geologic restrictions been excluded in calculating the average stand metrics and any inventory plots landing in these zones have been either offset or dropped; (2) areas of group openings, if applicable, within a stand been included in calculating the average stand metrics? ☐ ☐ ☐

5. Does ***the PTHP provide an addendum*** that describes the inventory sampling scheme that was employed to establish the pre-harvest conditions, including a description of the instruments used in the cruise, plot layout (fixed, variable, or strip, and spacing), variables measured, how borderline trees were addressed, and a cruise plot map consisting of either a topographic or planimetric map that identifies plot locations and stand type boundaries? ☐ ☐ ☐

6. Does ***the PTHP provide an addendum*** that includes stand tables that provide estimates of the pre- and post-harvest stocking and basal area per acre for each stand for trees over 5 inches dbh, including for conifers, tables showing trees per acre by 2-inch diameter class, and basal area per acre by 2-inch diameter class, and for hardwoods, tables showing the total basal area per acre? ☐ ☐ ☐

7. Does the PTHP describe the diameter above which 30% of the conifer basal area exists, per silvicultural unit? ☐ ☐ ☐

<u>If yes, the diameter(s) above which 30% of the conifer basal area exists per silvicultural unit are</u>:

8. Does the PTHP describe the diameter above which 15% of the conifer basal area exists per silvicultural unit? ☐ ☐ ☐

<u>If yes, the diameter(s) above which 15% of the conifer basal area exists per silvicultural unit are</u>:

Silviculture

<u>Single Tree Selection</u>

9. Does the PTHP propose the use of individual tree selection? ☐ ☐ ☐

   a. If yes to (9), will the conifers retained in individual tree selection areas be phenotypically superior trees that are free-to-grow (i.e., their crowns must be above the level of hardwood competition and show a rate of growth indicating that they will eventually move into overstory stocking), not over-topped by hardwoods, and with little or no logging damage? ☐ ☐ ☐

<u>Group Selection</u>

10. Does the PTHP propose the use of group selection? ☐ ☐ ☐

    a. If yes to (10) and if group openings between one and 2.5 acres will be created, will 15 ft^2/acre of structural stand elements, such as snags, wildlife habitat trees, legacy trees (of Group A or B species), and patches of advance reproduction of Group A species, be retained in those openings with these retention elements dispersed across the opening and clearly within the polygon boundary where appropriate and feasible? ☐ ☐ ☐

All-Aged Prescription

11. Does the PTHP propose the use of the all-aged prescription? ☐ ☐ ☐

    a. If yes to (11), is the conifer basal area less than 50 percent of the total basal area in the proposed PTHP unit, and the total basal area of conifers over 5 inches in diameter less than 150 ft^2/acre? ☐ ☐ ☐

    b. If yes to (11), upon completion of operations, outside of group openings (or throughout the unit if trees will be removed individually and not in small groups), will at least 100 ft^2/acre total be retained, including at least 50 ft^2/acre of conifers, or all conifers if the pre-harvest conifer stocking was less than 50 ft^2/acre? ☐ ☐ ☐

    c. If yes to (11), will trees be removed in small groups? ☐ ☐ ☐

    d. If yes to (11) and (11)(c), within group openings will planted conifers be used to meet stocking following the procedure found in 14 CCR § 913.5? ☐ ☐ ☐

    e. If yes to (11) and (11)(c), will stocking be measured using the standards described in 14 CCR §§ 1070-1075 and be basal area, 300 point-count or a combination of both? ☐ ☐ ☐

    f. If yes to (11) and (11)(c), will stocking plots not be offset to avoid group openings? ☐ ☐ ☐

    g. If yes to (11) and (11)(c), after harvest, will not more than 20% of the harvest area be occupied by small group openings? ☐ ☐ ☐

    h. If yes to (11) and (11)(c), will each small group opening be 2.5 acres in size or smaller? ☐ ☐ ☐

    i. If yes to (11) and (11)(c), will groups be separated by logical logging areas (un-harvested areas or areas treated by individual ☐ ☐ ☐

tree selection)?

j. If yes to (11) and (11)(c), will group openings greater than one acre in size retain at least 15 ft^2/acre of structural stand elements, such as snags, wildlife habitat trees, legacy trees (of Group A or B species), and patches of advance reproduction of Group A species? ☐ ☐ ☐

k. If yes to (11) and (11)(c), will areas outside of group openings retain 15 ft^2/acre of seed trees >12 inches dbh, including seed trees in the 18-inch or greater diameter classes, if enough are present to meet the basal area requirement and, if not, retain all trees >18 inches dbh, along with enough trees >12 inches dbh to fill out the seed tree basal area requirement? ☐ ☐ ☐

l. [Grp B species managed, Grp B species maintained] If yes to (11), will application of the all-aged prescription increase the proportional stocking of Group A versus Group B species by means of leave-tree retention and post-harvest regeneration and does ***the PTHP provide an addendum*** that explains what methods will be used to ensure that the all-aged prescription results in a substantially greater proportion of Group A versus Group B species? ☐ ☐ ☐

m. If yes to (11)(l), if necessary, will Group B species be removed in order to meet this requirement with those removals and occur at the same time as the conifer harvest? ☐ ☐ ☐

n. If yes to (11), will competition be controlled such that all Group A trees counted toward stocking can achieve a free-to-grow condition (i.e., their crowns must be above the level of hardwood competition and show a rate of growth indicating that they will eventually move into overstory stocking)? ☐ ☐ ☐

o. If yes to (11) and this is the second or third all-aged harvest entry, will the post-harvest ☐ ☐ ☐

conifer % of basal area be 10% higher than the pre-harvest proportion from the previous entry, and if it appears during or after the harvest that the stand will not meet the +10% standard, will the situation be remedied by cutting additional hardwoods?

p. If yes to (11), has each all-aged unit been cut with the all-aged prescription fewer than three times (not including the currently proposed harvest)? ☐ ☐ ☐

q. If yes to (11), has sudden oak death disease killed more than 80% of tanoak on 35% or more of the acres in any of the sub-basins where harvest is proposed under this plan? ☐ ☐ ☐

r. If yes to 11(q), will the practices associated with the all-aged prescription be modified to mitigate for the loss of hardwood canopy and mast, including retaining at least 50 ft^2/acre of hardwood basal area if healthy hardwoods are present on site post-harvest (openings may be created, but stocking levels will be averaged across the entire unit) and retaining at least 90 percent of the hardwoods other than tanoak or bay laurel to count toward that hardwood minimum leave requirement, up to an average of 50 ft^2/acre, with only healthy live hardwoods apparently free from disease being countable towards meeting stocking targets? ☐ ☐ ☐

<u>Commercial thinning, individual tree selection, and group selection prescriptions</u>

12. Will the PTHP propose the use of the commercial thinning, individual tree selection, or group selection prescriptions? ☐ ☐ ☐

a. Under the commercial thinning, individual tree selection, and group selection prescriptions, if this is the first PTHP on the site and pre-harvest conifer basal area is less than 140 ft^2/acre, will at least 70% of pre-harvest conifer basal area be retained? ☐ ☐ ☐

b. Under the commercial thinning, individual tree selection, and group selection prescriptions, if this is the first PTHP on the site and pre-harvest conifer basal area is between 140 to 165 ft^2/acre, will at least 100 ft^2/acre conifer basal area be retained? ☐ ☐ ☐

c. Under the commercial thinning, individual tree selection, and group selection prescriptions, if this is the first PTHP on the site and pre-harvest conifer basal area is greater than 165 ft^2/acre, will at least 60% of pre-harvest conifer basal area be retained? ☐ ☐ ☐

d. Under the commercial thinning, individual tree selection, and group selection prescriptions, if this is not the first PTHP on this site, will 20% more conifer basal area than was left after the previous entry, or 150 ft^2/acre of conifer, whichever is less, be retained? ☐ ☐ ☐

e. Under the commercial thinning, individual tree selection, and group selection prescriptions, if this is not the first PTHP on this site, will at least 60% of the conifer basal area present before the current harvest be retained post-harvest even if this is greater than 150 ft^2/acre? ☐ ☐ ☐

f. Will the levels of retention per silvicultural unit meet or exceed the post-harvest stocking levels required by 14 CCR §§ 913.2(a)(2) and 913.3(a)(1)? ☐ ☐ ☐

g. ***Have the minimum levels of retention in each silvicultural unit (per the PTEIR requirements contained in Questions (12(a)-(e) above) been stated on the PTHP form under Item 8(b)?*** ☐ ☐ ☐

h. Under the commercial thinning, individual tree selection and group selection prescriptions, will stocking be met immediately post-harvest and be assessed ☐ ☐ ☐

using the sampling methods described in 14 CCR §§ 1070-1075?

i. Under the commercial thinning, individual tree selection and group selection prescriptions, will application of the prescription maintain or increase the proportional stocking of Group A versus Group B species immediately post-harvest? ☐ ☐ ☐

j. [Grp B species managed, Grp B species maintained] Under the commercial thinning, individual tree selection and group selection prescriptions, if group B species need to be removed in order to meet the requirement of (12)(i), will those removals occur at the same time as the conifer harvest? ☐ ☐ ☐

k. Under the commercial thinning, individual tree selection and group selection prescriptions, if the post-harvest stand is considered "obviously stocked," will the post-harvest inventory (data-collection) survey not be required? ☐ ☐ ☐

All Silvicultural Prescriptions

13. Under all silvicultural prescriptions, will at least 50% of the those trees whose diameters are within the upper 30% of the conifer basal area by diameter class distribution be retained? ☐ ☐ ☐

14. Under all silvicultural prescriptions, will at least 25% of the trees within the top 15% of the basal area distribution be retained? ☐ ☐ ☐

15. If the answer to (13) or (14) is no and concentrating large tree removals in the largest size classes is considered an appropriate application of the Mattole Forest Futures Project, does ***the PTHP provide an addendum*** that includes a clear explanation and justification why the PTHP proposes such a practice? ☐ ☐ ☐

16. If timber operations will occur on geologically sensitive areas (slides and unstable areas that ☐ ☐ ☐

have been mapped as high or very high hazard by the California Geological Service (2002)), has the RPF (1) used the Silviculture Flow Chart contained in PTEIR Appendix B to evaluate the need for operational limitations, (2) ***described all prescriptions derived from the flowchart in the PTHP***, (3) ***included the flowchart in the PTHP, and*** (4) ***shown the slides or unstable areas on the plan maps***?

If yes, the following prescriptions derived from the flowchart shall apply:

17. If timber operations will occur on geologically sensitive areas (slides and unstable areas that have been mapped as high or very high hazard by the California Geological Service (2002)), if indicated by the Silviculture Flow Chart, ***does the PTHP provide an addendum*** that includes a Geologic Report? ☐ ☐ ☐

18. Does the timberland owner agree to forgo the use of synthetic herbicides to suppress native vegetation during implementation of the PTHP? ☐ ☐ ☐

19. Has the RPF designated cut or leave trees for each harvest entry? ☐ ☐ ☐

Pests

20. [Pests Insect or disease buildup] Are there significant adverse insect or disease build-ups on the PTHP that require measures to address the problem? ☐ ☐ ☐

If yes, the significant adverse insect or disease build-up and the measures to address the problem are as follows:

21. In order to prevent the spread of sudden oak death (SOD), will the mitigation measures contained below apply, and does the PTHP (1) list the species within the PTHP area that are known hosts for SOD based on a query of the APHIS website and (2) describe the destination for all products to be removed from the PTHP area? ☐ ☐ ☐

SOD Mitigation Measures

a. The RPF shall inform personnel that they are working in an area with SOD, unauthorized movement of plant material is prohibited, and the intent of mitigation measures is to prevent disease spread (14 CCR 1035.2).

b. The following practices and standard best management practices to minimize the spread and potential impacts of SOD during PTHP implementation shall be followed:

   i. Host material shall not be removed outside of the regulated area without amendment of appropriate state and federal permits into the PTHP.

   ii. The PTHP shall serve as a compliance agreement for movement of host material within the regulated area:

      I. Firewood in the form of rounds or split bolts shall not be transported out of the regulated area.

      II. Material smaller than 4" in diameter must be moved in a closed container except split firewood bolts.

      III. Material greater than 4" in diameter does not require a closed container.

   iii. The licensed timber operator shall take reasonable steps to check and remove any host plant debris from log trucks, crummies, loaders, pickup trucks, etc., leaving the plan area to ensure that host plant material does not move from the site. This includes branches, limbs, leaves, etc. stuck in log loads as well as leaves of hosts encased in mud.

   iv. To the extent practical and feasible, route equipment away from host plants and trees, especially in areas with disease symptoms. Locate landings, log decks, logging roads, tractor roads, and other sites of equipment activity away from host plants, especially in areas with disease symptoms.

   v. After working in an infested area, remove or wash off accumulations of soil, mud, and organic debris from shoes, boots, vehicles and heavy equipment, etc. before traveling to an area that is not infested with SOD.

   vi. If water is drafted and used for dust control, draft water from areas upstream of known infestations or from uninfested drainages.

   vii. If drafting from known infested watercourses, do not water roads with that source in areas that are not known to be infested.

   viii. Approaches to drafting sites shall be sufficiently rocked to minimize

accumulating infested soil on drafting vehicles.

If yes, the species within the PTHP area that are known hosts for SOD are:

If yes, the destination for all products to be removed from the PTHP area are:

Erosion Hazard Rating

22. Will timber operations be prohibited that result in a soil erosion hazard rating of extreme (EHR), or in the upper half of high, labeled for the purposes of this PTEIR as "very high," and the removal of vegetative cover will be limited so that the sum of factors contributing to the EHR remains at 70 or below? ☐ ☐ ☐

Logging Systems

23. Will ground-based heavy equipment operations on slopes greater than 50% be prohibited unless ***the PTHP provides an addendum*** containing a sediment prevention plan (SPP) that addresses such operations? ☐ ☐ ☐

If yes, the following SPP provisions (see PTEIR Appendix F) shall apply to those operations:

24. Will construction of new skid trails on slopes over 40% within 200 feet of a watercourse be prohibited unless ***the PTHP provides an addendum*** containing an SPP that addresses such operations? ☐ ☐ ☐

If yes, the following SPP provisions (see PTEIR Appendix F) shall apply to those operations:

25. Will ground-based yarding be prohibited during the winter period (November 15 to April 1), except for erosion control maintenance of existing roads and watercourse crossings and timber falling? ☐ ☐ ☐

26. Will ground-based equipment and other heavy equipment use be prohibited in a WLPZ or ELZ, except for use and maintenance of existing permanent roads (not requiring reconstruction ☐ ☐ ☐

according to standards in the Road Flow Chart), use of existing bridges and culverts as skid trail crossings, maintenance of associated drainage facilities or structures, and upgrading of roads to permanent standards by rocking, paving or other suitable surfacing materials to establish a stable operating surface prior to the start of hauling operations, unless ***the PTHP provides an addendum*** containing an SPP that addresses such operations?

If yes, the following SPP provisions (see PTEIR Appendix F) shall apply at those locations (see 14 CCR §§ 914.8(c) and (e)):

27. Has the Yarding Flow Chart (PTEIR Appendix B) prepared for the PTEIR by a Professional Geologist been utilized by the RPF in determining the location and treatment of skid trails, and ***does the PTHP provide an addendum*** that includes the completed Yarding Flow Chart? ☐ ☐ ☐

If yes, the treatment of such skid trails shall be:

28. Will heavy equipment use be prohibited during measurable rain events (defined as greater than 0.25" in a 24-hour period), except for non-mechanized timber falling, fuels treatment such as hand piling and burning, hand fire line construction, other activities that do not involve the use of heavy equipment or timber hauling, and maintenance of existing roads and watercourse crossings? ☐ ☐ ☐

29. If timber operations will occur on geologically sensitive areas (slides and unstable areas that have been mapped as high or very high hazard by the California Geological Service (2002)), has the RPF (1) used the Yarding Flow Chart contained in PTEIR Appendix B to evaluate the need for operational limitations, (2) ***described all prescriptions derived from the flowchart in the PTHP***, (3) ***included the flowchart in the PTHP***, and (4) ***shown the slides or unstable areas on the plan maps***? ☐ ☐ ☐

If yes, the following prescriptions derived from the flowchart shall apply:

Soil Stabilization

30. Do the CFPRs require specific soil stabilization measures be applied to any areas of the PTHP (see 14 CCR §§ 916.9(n), 916.9(o), 923.2(m), 923.5(f), and 923.9(d))? ☐ ☐ ☐

If yes, the following soil stabilization measures shall be applied:

Extended Wet Weather Period Operations

31. Will timber operations occur during the extended wet weather period (October 15 to May 1) (see 14 CCR §§ 914.7(a) and 916.9(l))? ☐ ☐ ☐

If yes, the following complete winter period operating plan addresses such timber operations:

Roads and Landings

32. [Road construction] Will any roads be constructed? ☐ ☐ ☐

33. If road construction will be greater than 1000 linear feet, does ***the PTHP provide an addendum*** that includes an SPP that addresses such construction and justifies it as having less impact than the re-use of existing roads? ☐ ☐ ☐

If yes, the following SPP provisions (see PTEIR Appendix F) shall apply to such road construction:

34. [Road reconstruction] Will any roads be reconstructed? ☐ ☐ ☐

35. [Landing construction] Will any landings be constructed? ☐ ☐ ☐

36. [Landing reconstruction] Will any landings be reconstructed? ☐ ☐ ☐

37. If use or construction of roads or temporary crossings will occur in a WLPZ or ELZ, does ***the PTHP provide an addendum*** that includes an SPP that addresses such use or construction? ☐ ☐ ☐

If yes, the following SPP provisions (see PTEIR Appendix F) shall apply to use or construction of roads or temporary crossings in a WLPZ or ELZ:

38. Will road construction, road reconstruction, road rocking and log hauling be prohibited during the winter period (November 15 to April 1), except for erosion control maintenance of existing roads and watercourse crossings and log hauling from rocked permanent roads that will not generate waterborne sediment in amounts sufficient to cause a turbidity increase in downstream Class I, II, III, or IV waters, or in amounts sufficient to cause a turbidity increase in drainage facilities that discharge into Class I, II, III, or IV waters or that is visible or would violate applicable water quality requirements? ☐ ☐ ☐

39. Will road and landing construction and reconstruction and log hauling be prohibited during measurable rain events (defined as greater than 0.25" in a 24-hour period), except for erosion control maintenance of existing roads and watercourse crossings? ☐ ☐ ☐

40. If road and landing construction and reconstruction will occur on geologically sensitive areas (slides and unstable areas that have been mapped as high or very high hazard by the California Geological Service (2002)), has the RPF (1) used the Road Flow Chart contained in PTEIR Appendix B to evaluate the need for operational limitations on road and landing construction and reconstruction, (2) ***described all prescriptions derived from the flowchart in the PTHP***, (3) ***included the flowchart in the PTHP***, and (4) ***shown the slides or unstable areas on the plan maps***? ☐ ☐ ☐

If yes, the following prescriptions derived from the flowchart shall apply:

41. If road and landing construction and reconstruction will occur on geologically sensitive areas (slides and unstable areas that have been mapped as high or very high hazard by the California Geological Service (2002)), if ☐ ☐ ☐

indicated by the Road Flow Chart, does ***the PTHP provide an addendum*** that includes a Geologic Report?

42. Will road and landing construction and reconstruction proposed under the PTHP be subject to other requirements of the CFPRs (see 14 CCR §§ 923.9(a)-(c))? ☐ ☐ ☐

If yes, the following requirements shall apply:

43. Will logging road watercourse crossing construction or reconstruction proposed under the PTHP be subject to other requirements of the CFPRs (see 14 CCR §§ 923.3(a), (c), (e) and (g))? ☐ ☐ ☐

If yes, the following requirements shall apply:

Erosion Control Plan

44. Has an Erosion Control Plan been developed in which ***the PTHP shows the location of each point where methods to control erosion will be implemented on the plan maps***, and does ***the PTHP provide an addendum*** that describes each point, including the potential sediment yield, erosion potential, priority for treatment, the treatment or mitigation to be applied to each point, and a time frame to complete the work? ☐ ☐ ☐

If yes, the treatment or mitigation to be applied to each point, and the time frame to complete the work are as follows (see PTEIR Appendix F):

Watercourse and Lake Protection Measures

45. [Watercourses [I-IV]] For timber operations in the Class I WLPZ, will harvest be prohibited within 75 feet of the watercourse or lake transition line or within the channel migration zone? ☐ ☐ ☐

46. [Watercourses [I-IV]] For timber operations in the Class I WLPZ, will at least 80 percent overstory canopy be maintained within the remainder of the WLPZ out to 100 feet, or to the ☐ ☐ ☐

edge of the flood prone area (defined in 14 CCR § 895.1), whichever is greater?

47. [Watercourses [I-IV]] For timber operations in the Class I WLPZ, for the first 50 feet beyond the edge of the WLPZ, will openings greater than 0.25 acre be prohibited? ☐ ☐ ☐

48. [Watercourses [I-IV]] For timber operations in the Class I WLPZ, will the overstory canopy within the WLPZ be composed of at least 25 percent overstory conifer canopy post-harvest, if there was at least 25% conifer canopy prior to harvest? ☐ ☐ ☐

49. [Watercourses [I-IV]] For timber operations in the Class II WLPZ, will harvest be prohibited within 30 feet of the watercourse and lake transition line? ☐ ☐ ☐

50. [Watercourses [I-IV]] For timber operations in the Class II WLPZ, has the RPF distinguished between Class II-Standard (S) and Class II-Large (L) watercourses according to 14 CCR § 916.9(g)(1) to determine protections in the remainder of the WLPZ? ☐ ☐ ☐

51. [Watercourses [I-IV]] For timber operations in the Class II WLPZ, will a Class II-S WLPZ retain at least 70 percent overstory canopy outside the no-cut buffer, and will operations in a Class II-L WLPZ retain at least 80 percent overstory canopy outside the no-cut buffer? ☐ ☐ ☐

52. [Watercourses [I-IV]] For timber operations in the Class II WLPZ, will conifers account for at least 25% of the post-harvest overstory canopy, if there was at least 25% conifer canopy prior to harvest? ☐ ☐ ☐

53. [Watercourses [I-IV]] For timber operations in the Class II WLPZ, will trees whose roots visibly contribute to bank stability be retained? ☐ ☐ ☐

54. [Watercourses [I-IV]] For timber operations in the Class II WLPZ, in addition to information ☐ ☐ ☐

found in 14 CCR § 916.5 TABLE I, has the RPF used the presence of the following indicators to guide the delineation of Class II watercourses, along with additional guidance, if available, from the Department of Fish and Game: (a) Free water during the dry season; (b) Aquatic plants; (c) Water-dependent stages of aquatic insects; (d) Physical characteristics of the channel (e.g., pools, substrate); and (e) Position of the watercourse in the landscape?

55. [Watercourses [I-IV]] For timber operations in the Class III ELZ, in addition to the provisions of 14 CCR § 916.9(h), within 30 feet from the high water mark, to protect bank stability, will 50% canopy closure be retained when slopes are 50% or less, and 75% canopy closure be retained for slopes 50-65%? ☐ ☐ ☐

56. [Watercourses [I-IV]] For timber operations in the Class III ELZ, in addition to the provisions of 14 CCR § 916.9(h), is cutting prohibited on slopes greater than 65% leading directly to a watercourse until the break in slope? ☐ ☐ ☐

57. [Watercourses [I-IV]] For timber operations in the Class III ELZ, in addition to the provisions of 14 CCR § 916.9(h), will at least 50% of pre-existing understory be retained? ☐ ☐ ☐

58. [Watercourses [I-IV]] For timber operations in the Class III ELZ, in addition to the provisions of 14 CCR § 916.9(h), are small group openings > 0.25 acre prohibited within the 30- to 50-foot ELZ? ☐ ☐ ☐

59. Will timber harvest be prohibited on inner gorges as defined in the CFPRs: "a geomorphic feature formed by coalescing scars originating from landsliding and erosional processes caused by active stream erosion," as well as a category defined as "Steep Stream-Side Slopes," which includes any slope of 65% or greater rising directly from a stream channel? ☐ ☐ ☐

60. Will the no-cut zone at the head-wall of an inner ☐ ☐ ☐

gorge extend 10 feet beyond the break in slope?

61. Have seeps and springs been evaluated based on similar criteria as are used to determine whether a watercourse should be categorized as a Class II? ☐ ☐ ☐

62. Will seeps or springs that meet the Class II criteria receive the same protections of no-cut buffer and equipment exclusion as if they were part of a watercourse? ☐ ☐ ☐

<u>If yes, the following protection measures shall apply to seeps and springs on the PTHP</u>:

63. <u>[Watercourses [I-IV]]</u> Will watercourses on the PTHP be subject to other requirements of the CFPRs or the Fish and Game Code (FGC) (see 14 CCR §§ 916.4(a)(2), 916.4(b)(1), 916.4(c)(2), 916.5(e), 916.9(d)(1), 916.9(e), 916.9(f)(2), 916.9(f)(3), 916.9(g)(1)(D), 916.9(g)(2)(B)(1.)-(2.), 916.9(h), 916.9(r)(2), FGC § 1602(a)(1), and FGC § 1611(a))? ☐ ☐ ☐

<u>If yes, the following requirements shall apply (if such information is better placed in a plan addendum, include it there and attach it to the PTHP)</u>:

Hazard Reduction

64. <u>[Hazard reduction required]</u> After operations, will slash not exceed 36" in height across 90% of the harvest area? ☐ ☐ ☐

Biological Resources

65. Will the most current northern spotted owl survey protocol be used? ☐ ☐ ☐

66. Will large down wood that can provide denning cover for animals be retained? ☐ ☐ ☐

Snags

67. Will all snags be retained unless they are a hazard to the operator's safety? ☐ ☐ ☐

Old Growth Trees and Late Succession Stands

68. Will all trees present on the landscape in 1850 and meeting certain minimum diameters (42 inches for coast redwoods, 40 inches for Douglas-fir and grand fir, and 32 inches for hardwoods) be retained? ☐ ☐ ☐

69. [Late Successional Forest Stand] Will stands of trees that meet the definition of late seral habitat per 14 CCR § 895.1 be managed to maintain or enhance the late seral nature of the stand during the application of the PTHP? ☐ ☐ ☐

Rate of Harvest

70. In order to comply with the cumulative impact limit rate of harvest restriction, is the average annual rate of harvest less than 1.5% of the watershed area within the sub-basin where the PTHP is proposed? ☐ ☐ ☐

71. Has the method for calculating the rate of harvest followed the Clear Cut Equivalent area method described by Klein et al. (2008), and does ***the PTHP provide an addendum*** including the calculations and current cumulative decadal rate of harvest? ☐ ☐ ☐

Compliance With CFPRs

72. Unless otherwise allowed by the environmental analysis, specifications and mitigation measures contained in the PTEIR and reflected by the questions in this checklist, per 14 CCR § 1092(b) will the operational standards of the CFPRs apply to timber operations conducted under the PTHP? ☐ ☐ ☐

Mitigation Points

73. Does the PTHP ***show the location of site-specific mitigation points for areas including, but not limited to, roads, crossings erosion sites and special treatment areas for sensitive species, on the plan maps***, and does ***the PTHP provide an*** ☐ ☐ ☐

addendum that describes all such site-specific mitigation points and the work to be performed at each location?

If yes, in addition to those listed previously, the following site-specific mitigation points and the work to be performed at each location shall be completed as part of timber operations: