SECTION IV

Cumulative Impacts Assessment

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Regulatory Background

Forest Practice Act and Forest Practice Rules

The Z'berg-Nejedly Forest Practice Act of 1973 (FPA) establishes a comprehensive system for regulating timber harvesting on private lands. (See Pub. Resources Code [PRC] § 4511 et seq.) This regulatory regime is implemented through the Forest Practice Rules (FPRs), developed and adopted by the State Board of Forestry and administered by CalFire. The FPRs impose detailed requirements that control all aspects of timber harvesting. The 2023 FPRs span nearly 400 pages. The FPA requires landowners to submit a THP prepared by a Registered Professional Forester (RPF) before harvesting. CalFire works with a multi-agency "Review Team" to evaluate, revise, and refine the THP. (See PRC §§ 4581-4583.5; 14 Cal. Code Regs. [CCR] §§ 1037-1037.1) CDFW and the Regional Water Boards—the agencies with primary responsibility for protecting the State's fish, wildlife and water resources—are Review Team members, as is the California Geological Survey (CGS), which scrutinizes THPs for slope stability (PRC § 4582.6; 14 CCR § 1037.3.). CalFire next circulates the THP for public comment along with rafts of supporting technical information. Its "Official Response" responds to the public comments and sets forth its decision whether to approve or deny the THP. (See PRC §§ 4582.6-4582.7; 14 CCR §§ 1037.1, 1037.8.)

Cal Fire cannot approve a THP if "[i]mplementation of the plan as proposed would cause a violation of any requirement of an applicable water quality control plan adopted or approved by the State Water Resources Control Board." (14 CCR § 898.2, subd. (h).) Nor can CalFire approve a THP if its implementation may result in "take" or cause significant harm to a listed species under state or federal law, e.g., the federal Endangered Species Act. The FPRs have an article that imposes requirements to ensure harvesting activities, road or landing construction, and other timber operations have no adverse effects on water quality, aquatic and riparian species, or riparian ecological functions, including from sediment and temperature. (See 14 CCR §§ 936-936.12 [Water Course and Lake Protection].) The designation of a watercourse class is dependent on the presence or potential presence of fish or the capability to support other aquatic life, or to transport sediment to fish-bearing waters. The Board of Forestry has continuously updated the FPRs to make them more protective of the environment. In 2009, it adopted the Anadromous Salmonid Protection (ASP) Rules (see 14 CCR § 936.9), and in 2014 adopted the "Road Rules," a set of regulations to increase sediment control requirements. (See 14 CCR § 943 et seq.)

Cumulative Impacts Analysis under CEQA and the FPRs

The THP review and approval process is a certified regulatory program for the purposes of CEQA (PRC § 21080.5; 14 CCR. § 15251, subd. (a)), and a THP is deemed to comply with CEQA's requirements for preparation of an EIR. (*Ebbetts Pass II*, supra, 43 Cal.4th at 943-44.) Although a THP differs from an EIR due to the prescriptive requirements of the FPRs, a THP still must include an evaluation of the project's contribution to potential cumulative impacts. (See 14 CCR. §§ 898, 932.9; see also *East Bay Mun. Util. Dist. v. Dep't of Forestry & Fire Prot.* (1996) 43 Cal.App.4th 1113, 1127 (*EBMUD*).) The FPRs require those impacts to "be assessed based upon the methodology described in Board Technical Rule Addendum Number 2 "Cumulative Impacts Assessment"] … [and] be guided by standards of practicality and reasonableness." (*Ebbetts Pass II,* supra, 43 Cal.4th at 944 [quoting 14 CCR § 898].) The FPRs limit the assessment "to closely related past, present and Reasonably Foreseeable Probable Future Projects within the same ownership and to matters of public record." (14 CCR § 898.) CalFire must also "supplement the information provided by the ... Plan submitter when necessary to ensure that all relevant information is considered." (Id.) "[CalFire], as lead agency, shall make the final determination regarding assessment sufficiency and the presence or absence of significant adverse Cumulative Impacts . . . based on a review of all sources of information provided and developed during review of the Plan." (14 CCR § 932.9, Add. 2.) Technical Rule Addendum No. 2 (TRA 2) provides a comprehensive checklist that RPFs must follow for the cumulative impacts assessment. First, the THP must "establish and briefly describe the assessment area within or surrounding the Plan for each resource subject [to be assessed] and shall briefly explain the rationale for establishing the resource area." (14 CCR § 932.9, Add. 2; see 14 CCR § 898.) The eight mandatory resource subjects to be evaluated range from Watershed to Biological to Greenhouse Gases to Wildfire Risk and Hazard. (14 CCR § 932.9, subd. (c).) The planning watershed maps distributed by CalFire must be used to evaluate impacts absent explicit approval by

the Director. (14 CCR § 895.1 [defining "Planning Watershed"].) The THP must identify and briefly describe "past, present, and Reasonably Foreseeable Probable Future Projects," and describe "any continuing significant adverse impacts from past land use activities within the assessment area(s) that may add to the impacts of the proposed project." (14 CCR § 932.9.) Finally, the Appendix to TRA 2 provides extensive guidelines for the RPF's evaluation of whether the THP will "cause or add to significant adverse Cumulative Impacts."

Introduction & Plan Overview

The Little Pepperwood Timber Harvest Plan is approximately 269 acres in size and is located approximately 4 miles east of Gualala, CA in both southern Mendocino County and northern Sonoma County. The THP is situated within the Big Pepperwood Creek and Lower Rockpile Creek CAL WATER Planning Watersheds (PWS) (collectively the Watershed Assessment Area, WAA). Both planning watersheds drain into the Gualala River and contain designated ASP (Anadromous Salmonid Protection) streams. The Gulala River is 303(d) listed for Aluminum, Temperature and Sedimentation/Siltation Impairment.

The forested areas of the WAA are composed primarily of coast redwood, mixed conifer (redwood, Douglas-fir, sugar pine) and hardwood forest (tanoak, madrone, golden chinquapin) habitats, which is representative of the THP area. The coastal portion of Big Pepperwood Creek Watershed contains bishop pine/shore pine and grand fir habitat. A small portion of these watersheds are comprised of non-forested areas, including meadows, riverbeds, commercial and residential developed land, and public parks (Big Pepperwood Creek).

According to GRT records, the Plan Submitter owns a large portion of these watersheds – approximately 5,700 acres of Big Pepperwood Creek, or 87%, and 2,371 acres of Lower Rockpile Creek, or 80% (roughly 85% of the total WAA). Besides the Plan Submitter, The Conservation Fund owns the remaining private land within Lower Rockpile Creek PWS. The remaining land ownership in Big Pepperwood Creek is comprised of both public and private parcels, some of the latter containing approved Non-Industrial Timber Management Plans (NTMPs). The tables below indicate the harvest activity over the past 10 years for each affected watershed. There have been no NTOs filed for NTMPs in the last 10 years within the WAA.

Past, Present, and Reasonably Foreseeable Probable Future Projects Tables:

Lower Rockpile Creek PWS (Cal Water # 1113.820003, 2,947 acres) Past Projects 2016 - 2026

Project #	PWS Acres	Landowner	THP/NTO Year	Silviculture	Yarding	Legal Description
1-20-00003-SON	141*	GRT	2020	CC, NH, ROW, SEL, TRAN	C, T	T11N, R14W, Sec. 28, 29, 32, 33
1-22-00042-SON	25	GRT	2022	CC, GSEL	T	T11N, R14W, Sec. 31, 32
1-22-00043-SON	97*	GRT	2022	NH, SEL	T	T11N, R14W, Sec. 28, 29, 31, 32
Subtotal	263					
This THP	24					
Grand Total	**287**					

*18 acres of No Harvest Area in the PWS

Big Pepperwood Creek PWS (Cal Water #1113.850201, 6,532 acres) Past Projects 2016 -2026

Project #	PWS Acres	Landowner	THP/NTO Year	Silviculture	Yarding	Legal Description
1-17-104-SON	199	GRT	2017	SEL, CC, STR, STA	T	T11N, R14W, Sec. 30, 31
1-19-00050-MEN	10	Rick Hautala, Dawn Aksamit	2019	SEL	T	T11N, R15W, Sec. 27
1-19-00197-MEN	2	GRT	2019	VR, TRAN	C, T	T11N, R14W, Sec. 18, 19; T11N, R15W, Sec. 24
1-20-00003-SON	1	GRT	2020	TRAN, CC	T	T11N, R14W, Sec. 29
1-22-00042-SON	41	GRT	2022	GSEL	T	T11N, R14W, Sec. 31
1-22-00043-SON	8	GRT	2022	SEL	T	T11N, R14W, Sec. 31
1-23-00073-MEN	283*	GRT	2023	VR, SEL, NH	C, T	T11N, R14W, Sec. 17, 18, 19, 20
1-23-00099-SON	175*	GRT	2023	SEL, NH	T	T11N, R15W, Sec. 25, 26, 35, 36
1-24-00103-MEN	169*	GRT	2024	SEL, NH, STA	T	T11N, R15W, Sec. 22, 23, 26, 27
1-25-00114-MEN	3	GRT	2025	TRAN	T	T11N, R14W, Sec. 18
Subtotal	891					
This THP	245					
Grand Total	**1,136**					

*16 acres of No Harvest Area in the PWS

Big Pepperwood Creek PWS (Cal Water #1113.850201, 6,532 acres) Reasonably Foreseeable Future Projects

THP Number	PWS Acres	Landowner	THP/NTO Year	Silviculture	Yarding	Legal Description
1-08NTMP-009-MEN	58	Bower Limited Partnership	2008*	GSEL	T	T11N, R15W, Sec. 22, 23, 27
Not assigned, "Cabin THP"	Unknown	GRT	2027	SEL, VR	C, T	T11N, R14W, Sec. 18, 19, 20, 30; T11N, R15W, Sec. 24, 25

STATE OF CALIFORNIA BOARD OF FORESTRY
CUMULATIVE IMPACTS ASSESSMENT

(a) Do the assessment area(s) of resources that may be affected by the proposed project contain any past, present, or reasonably foreseeable probable future projects?

Yes X No ____

If the answer is yes, identify the project(s) and affected resource subject(s).

The Watershed Assessment Area (WAA) and Biological Assessment Area (BAA) contain past, present and future projects which have been evaluated for potential continued adverse impacts to watershed and biological resources. Notably, past projects include logging, ranching, and rural residential development within the assessment areas. Reasonably foreseeable future projects within these large-scale assessment areas include ongoing THP and NTMP related timber harvesting, ranching and grazing activities, forest fire prevention work, maintenance of recreation areas, road improvement and maintenance, rural residential development and land improvement, and possible commercial development with the town of Gualala.

A portion of the THP footprint was harvested in the last 10 years. The THP area was most recently harvested under THP 1-17-104-SON which utilized Selection silviculture and tractor yarding operations. Prior to this entry the THP area was harvested in the early 1990s using evenaged regeneration methods and special prescriptions.

Current, ongoing projects within the WAA include the following THPs: 1-22-00042-SON, 1-22-00043-SON, 1-23-00073-MEN, 1-23-00099-SON, 1-24-00103-MEN, and 1-25-00114-MEN. Proposed future projects within the Plan Submitter's ownership include "Cabin THP" within Big Pepperwood Creek PWS. The exact size, location, and regeneration methods for Cabin THP are presently unknown, but it is expected to use a combination of unevenaged regeneration methods and special prescriptions as well as both tractor and cable yarding methods.

(b) Are there any continuing, significant adverse impacts from past land use activities that may add to the impacts of the proposed project?

Yes X No ____

If the answer is yes, identify the project(s) and affected resource subject(s).

Pre-harvest adverse cumulative watershed effects on the populations & habitat of anadromous salmonids have been considered. Presently, there are some continuing adverse effects from past timber operations. Some of the past damage is still contributing sediment to the stream systems. The significance of the ongoing impacts is difficult to quantify. The WAA has been impacted by historic logging activities which took place prior to the 1973 Forest Practice Act. Pre-regulation logging activities have included tractor skidding of logs down watercourse channels, landing construction on unstable areas and creek bottoms, past cut/fill road construction practices and tractor logging on slopes >65%. This resulted in sedimentation and accumulation of organic debris in the channels. Basic erosion control measures were not taken or minimally employed to prevent road and trail washouts and bank erosion.

Grazing also has had an impact on the watershed through soil compaction, road building, and the common burning practices of the past. These activities have affected the Watershed, Soil Productivity, and

Biological Resource Subjects. As modern logging techniques are utilized, roads are being moved out of the stream zones and placed on ridges/midslope locations and tractor skidding is being used much less on steep terrain. These practices and the application of the best available science are aiding in the recovery process of the WAA. Areas discovered during plan preparation, which are causing erosion and are the product of past logging related practices, will be addressed in Section II. If areas not addressed in Section II are discovered during operations, these will be corrected where possible, either with amendments to the THP, on the ground actions or the 1600 permit process, depending on the problem and what the Forest Practice Rules require. Much corrective work has been performed throughout the watershed where stands have been re-entered since the 1973 Forest Practice Act. This work includes the installation of erosion control structures, upgrading of roads, correction of stream diversions, stabilization of fill material and slide areas and use of all-aged timber management which leaves a significant stand post-harvest.

Additional erosion control measures will be implemented during the life of this project, including the installation and maintenance of erosion control structures and facilities on logging roads. These measures will further improve conditions and reduce the impacts from past timber harvesting projects. Some minor surface erosion from the most recently harvested areas is common but limited, as these areas are quick to re-vegetate and stabilize, following logging operations. Also, the protection measures incorporated into this THP will reduce to insignificance movement of soil and sediment into salmonid producing waters. These protection measures, along with ongoing improvements to the road system outside of the THP area, will reduce potential impacts from the proposed THP to insignificance, while positively reducing sediment in the watershed.

The Gualala River, which receives drainage from the WAA, is on the 303(d) list of the Clean Water Act. The Gualala River is listed as impaired from aluminum, sedimentation, and temperature. This plan will incorporate protection measures for sediment and temperature reduction. The Gualala River and its tributaries support populations of Coho salmon and steelhead trout, fisheries of concern in northern California. The 303(d) list describes water bodies that do not fully support all beneficial uses and are not meeting water quality objectives. It also describes the pollutants for each water body that impair beneficial uses and water quality. At the time of listing, sedimentation was judged to be associated, in part, with past management-related activities.

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(c) Will the proposed project as presented, in combination with past, present, and reasonable foreseeable probable future projects identified in items (1) and (2) above, have a reasonable potential to cause or add to significant cumulative impacts in any of the following resource subjects:

Resource Subjects	Yes, after mitigation (1)	No, after mitigation (2)	No reasonably potential significant adverse impacts (3)
A. Watershed			**X**
B. Soil Productivity			**X**
C. Biological			**X**
D. Recreation			**X**
E. Visual			**X**
F. Traffic			**X**
G. Greenhouse Gases (GHG)			**X**
H. Wildfire Risk and Hazard			**X**

(1) "Yes, after mitigation" means that potential significant adverse Cumulative Impacts are left after application of the Rules and mitigations or alternatives proposed by the Plan Submitter.

(2) "No after mitigation" means that any potential for the proposed timber operation to cause or add to significant adverse impacts by itself or in combination with other projects has been reduced to insignificance or avoided by mitigation measures or alternatives proposed in the Plan and application of the Rules.

(3) "No reasonable potential significant adverse impacts" means that the operations proposed under the THP do not have a reasonable potential to join with the impacts of any other project to cause, add to, or constitute significant adverse cumulative impacts.

(d) If column (1) is checked in (c) above describe why the expected Impacts cannot be feasibly mitigated or avoided and what mitigation measures or alternatives were considered to reach this determination. If column (2) is checked in (c) above describe what mitigation measures or alternatives have been selected which will substantially reduce or avoid reasonably potential significant adverse Cumulative Impacts.

Resource Subject Assessment Areas

A. Watershed

The watershed assessment area (WAA) includes the following planning watersheds:

Big Pepperwood Creek (CalWater V 2.2.1 #1113.850201, 6,532 acres); a tributary to the Gualala River**.** The plan area occupies 245 acres or 3.8% of the Watershed.

Lower Rockpile Creek (CalWater V 2.2.1 #1113.820003, 2,946 acres); a tributary to the Gualala River**.** The plan area occupies 24 acres or 0.8% of the Watershed**.**

The total WAA acreage is approximately 9,478 acres. The plan area and WAA are portrayed on the WAA maps in Section V of this THP.

Rationale: This assessment area is consistent with the January 7, 1992 CDF recommended guidelines to RPFs which states: “The watershed assessment area for assessing cumulative watershed effects should be selected to include an area of manageable size (usually an order 3 or 4 watershed) relative to the THP that maximizes the opportunity to detect an impact”.

B. Soil Productivity
The soil assessment areas are confined to the soils within the THP area.

Rationale: Soils outside of this area are unlikely to be significantly impacted by operations. As a result, this best represents the area in which potential adverse impacts may be detected. Soils outside these areas should be left undamaged and untouched by this timber harvest.

C. Biological
The Biological Assessment area (BAA) comprises all the area within 0.7 miles of the plan boundary. The 4,928-acre BAA is portrayed on the BAA Map located in Section V of the THP.

Rationale: Terrestrial plants and animals further away from the harvest area will be less affected by the disturbance than those within the project area. Aquatic species downstream from the THP area may be affected by water temperatures and sedimentation moving downstream. In addition, this assessment area was chosen because it coincides with the survey area for the Northern Spotted Owl set forth in the Forest Practice Rules.

D. Recreational
The recreational resource assessment area includes the harvest area plus 300 feet surrounding the harvest area.

Rationale: Technical Rule Addendum No. 2 Cumulative Impact Assessment.

E. Visual
Visual resource assessment area includes those areas within a three-mile radius of the harvest area from which significant numbers of the general public may view the proposed operation.

Rationale: Technical Rule Addendum No. 2 Cumulative Impact Assessment.

F. Traffic
The traffic assessment area includes the first roads not part of the logging area on which logging traffic must travel and those roads commonly used by logging traffic.

Rationale: The only roads that will be affected are those used by logging trucks and trucks hauling equipment to and from the project area. The roads outside the plan submitter’s ownership that may be impacted by this project include Gualala Road (County Road 501) and Old State Highway (County Road 501A).

G. Greenhouse Gases (GHG):
The Greenhouse Gases (GHG) Assessment Area is that area within the THP boundary and all roads located outside the boundary that will be used as part of harvest operations on this THP.

Rationale: While all carbon sequestration is limited to the plan area, this is true for most but not all emissions generated by the proposed project. Those emissions associated with the project but not created

within the plan boundary include log delivery and processing at the mill, which are accounted for in the GHG emission calculations.

H. Wildfire Risk Assessment:
The Wildfire Risk Assessment Area includes the THP and the surrounding area within 300 feet, including any dwellings or uninhabited structures.

Rationale: Modification to the vertical and horizontal distribution of forest fuels and the use of internal combustion tools or vehicles that can affect wildfire risk or hazard associated with the proposed timber operations is limited to the project area. The chosen assessment area allows for the consideration of possible ignition sources and forest fuel loading in the vicinity of the proposed project which could combine to produce a cumulative increase in wildfire risk and hazard.

A. Watershed Resources

Note to readers:

- The following cumulative effects analysis references information from and quotes sections of the Gualala River Watershed Council's (GRWC) Monitoring Program and the North Coast Watershed Assessment Program's (NCWAP) Gualala River Watershed Assessment (2003). The GRWC Monitoring Plan Report is the most comprehensive data available and summarizes the data that has been collected as part of the Gualala River Monitoring Program with a Quality Assurance Project Plan (QAPP). It is part of the ongoing development of a Watershed Management and Enhancement Plan (WMEP) for the Gualala River watershed. This program was funded by grants from the State Water Resource Control Board (SWRCB) 319(h) program and the California Department of Fish and Game (CDFG) SB271 program.
- The terms *watershed assessment area*, *assessment area*, and the abbreviation *WAA* are all used interchangeably.

General WAA Description
The WAA includes a variety of topographical aspects and slope inclinations. Ridges trend north northwest, typical of the Mendocino Range of the Coastal Range mountains. Soils within the assessment area are primarily derived from marine sandstone deposits associated with the Coastal Belt Franciscan Formation. Seismic activity along the San Andreas Fault and Tombs Creek Fault has been a dominant force in shaping the Gualala River Watershed. Watercourses within the assessment area range from Class I (fish-bearing) to Class III (seasonal tributary). Watercourses within and immediately adjacent to the THP area include Class I, Class II and Class III streams.

Conifers within the watershed assessment area generally range from 0-100 years (with some older second growth and scattered individual old growth redwood) and consist of a variety of different age classes. Canopy cover within the assessment area varies throughout but generally consists of heavy canopy cover ranging from 80-100% in areas previously managed under unevenaged silviculture. Evenaged silviculture within the WAA has resulted in small openings ranging from 20-70% canopy cover. These openings consistent of different stages of regeneration, therefore younger clearcuts, for example, contain a significant number of young trees but very little overstory canopy. Conifer species within and adjacent to the THP include (in order of % composition) Douglas-fir, redwood and sugar pine. The primary hardwood species present are tanoak, madrone, golden chinquapin, California bay-laurel and canyon live oak.

Annual precipitation within the WAA averages from 40 inches in the low elevation coastal regions to 50

inches in the higher inland elevations, which comes mainly in the form of rain. Much of the year the WAA experiences coastal fog that provides moisture to the redwood forests from leaf drip and foliar absorption and reduces evaporation by providing cover from solar radiation.

As mentioned above, the Gualala River is listed as an impaired waterbody under the Federal Clean Water Act Section 303(d) due to sediment, temperature and aluminum. A TMDL (Total Maximum Daily Load) addressing sedimentation was established by the U.S. Environmental Protection Agency (USEPA) in December 2001. The Regional Water Board prepared a Technical Support Document (TSD) addressing sources of sediment and temperature impairments in the watershed. The Gualala River Sediment TMDL was included in Resolution R1-2004-0087, Total Maximum Daily Load Implementation Policy for Sediment Impaired Receiving Waters in the North Coast Region, adopted by the North Coast Regional Water Quality Control Board in November 2004. Regional Water Board staff are currently developing an action plan to address continuing water quality impairments in the Gualala River watershed.

The North Coast Watershed Assessment Program (NCWAP) provides a description of the South Fork Gualala River.

> *"Downstream of the confluence with Wheatfield Fork, the South Fork Gualala consists of an aggraded channel leading to the estuary. Substrate in the flood plain is almost completely gravel, with some pockets of sand and silt. During low summer flow, the active channel up to 25 feet wide shifts to each side of the gravel basin over 200 feet wide in some areas. Pools greater than 2 ft. in depth between Wheatfield Fork and Big Pepperwood Creek comprise less than 10% total survey length. Photos from 1936 and 1942 show this same pattern with over 80% of the watershed in an old growth, undisturbed condition at this time. This further substantiates a basic finding of the study that geologic processes define habitat conditions (at least in the lower Gualala River). The basin is filled with probably more than 100 feet of alluvium deposited probably over many thousands of years, presumably in-step with sea level rises since the last Ice Age. The estimated thickness of the alluvium is collaborated in places with drillers logs that show alternating sequences of sand, silt, and clay sediment probably indicating repeated transitions between estuarine and fluvial conditions. Natural conditions favor aggradation in the lower reaches of the South Fork. Major disruptions along the San Andreas Fault and tributary faults bisecting the South Fork subbasin basically define sediment sources over geologic time. Sediment sizes in the lower basin reaches are largely controlled by declining stream gradient. This decline in gradient occurs as the Gualala River encounters deep alluvial valley fills that have been deposited over geologic time in response to rising sea levels".*

> *"Two land use eras characterize the Lower South Fork (1) steam donkey, redwood old growth harvesting between 1868 and 1911, and (2) tractor/cable harvesting 1991 to present. Most of the entire Lower South Fork basin (downstream of the Wheatfield confluence) was cleared of old growth timber by 1911. After this time, the Lower South Fork was inactive up to the late 1980s. Mid-century tractor operations mostly avoided the area. This minimized overall construction of in stream landings and streamside roads in this part of the watershed".*

The NCWAP report contains a significant amount of data collected and analyzed by qualified licensed professionals. NCWAP was published in March 2003 and contains the most comprehensive and scientifically valid information to date in regard to the existing conditions of the Gualala Watershed and how they relate to past land use practices. NCWAP was developed through cooperative efforts with Gualala Redwoods Inc., government agencies, and public cooperators. GRI and cooperators collected most of the data that relates to the watersheds affected by this plan. The NCWAP report and executive summary were reviewed as part of this analysis.

The following important points have been taken from the executive summary of the NCWAP report:

1) Most of the Gualala River Watershed has improved from 1984 to 1999/2000, based on aerial photo interpretation of accumulations of sediment that were interpreted as indicative of channel disturbance. Specifically, since 1984 total erosion from upslope areas has not resulted in a net increase of sedimentation within the majority of the tributaries to a degree discernable in 1999/2000 aerial photos.

2) Pool habitat, escape and ambush shelter/cover, and water depth are unsuitable for salmonids in some mainstem and tributary stream reaches in the Gualala River Watershed. Large woody debris function in the channel is low throughout the watershed. Increasing the instream habitat complexity is the top recommendation category for all of the sub-basins.

3) Water temperatures are suitable in the smaller tributaries for which we had data. In contrast mainstem temperatures were in the unsuitable range in most of the sub-basins.

4) Gravel and substrate suitable for salmonids is limited in some streams and abundant in others.

5) Harvest of coastal redwood and Douglas-fir actively occurs today, but with substantially improved practices. While some areas of the watershed experienced more improvement than others during this period, an overall trend towards improvement in the transport reaches was observed.

Based on the information available for the Gualala River Watershed, salmonid populations are currently being limited by:

- General watershed-wide lack of instream habitat complexity;
- Instream sediment conditions in some areas;
- High summer water temperatures in the mainstems; and
- Reduced watershed-wide coho salmon and steelhead trout populations over those observed in the 1960s.

The following habitat improvement activities would most likely lead to more desirable conditions:

- Reduce sediment delivery and deposition.
- Improve riparian canopy density and diversity
- Continue road assessments, storm proofing, improvements, and decommissioning.
- Evaluate and address non-road sediment sources.
- Add more large organic debris and shelter structures. (Pool depth and shelter consistently were limiting)
- Protect high quality habitat from degradation.
- Reduce livestock and feral pig entry.
- Evaluate fish rescue activities.
- Continue in-channel characteristics and stream flow monitoring.
- Expand aerial photo interpretation of channel characteristics.
- Expand temperature monitoring into eastern portions of watershed.

The loss of riparian shade canopy as a result of timber harvesting and instream/near-stream road and landing construction has resulted in long-term adverse effects to stream temperature. During the mid-century logging era the central and upper reaches of the mainstem North Fork and all its major tributaries were subject to bank-to-bank watercourse exposure (NCWAP 2003). In addition to the impacts of stream temperature increases, direct sidecast of road fill into watercourses and road-related fill failures and debris slides contributed to a severe increase in sediment delivery. The extensive network of near-stream roads and landings built during this period remains a major source of long-term sediment inputs within the

subbasin. This past activity combined with the high potential for landsliding within the geologic setting and periodic peak flow events contributed to an enormous increase in road-related mass wasting.

There are extensive alluvial terrace deposits along the Gualala River that are covered with second growth redwood forest. These alluvial flats act as a buffer between the steeper upslope areas, from which sediment is migrating, and the major watercourses. Sediment that is carried from transport reaches at the headwaters of the watershed units drop out of suspension as they cross the lower gradient storage reaches that occur adjacent to the river. Also, Class III watercourses that feed directly into the alluvial flats disappear into the sandy soil without contributing their sediment load directly to higher order watercourses. Numerous low spots within the flats along these watercourses also act as sediment catch basins when they periodically overflow their banks. The side slopes are vegetated with redwood, Douglas-fir, sugar pine, tanoak, madrone, and several other hardwood species in small amounts.

The South Fork of the Gualala follows the San Andreas Fault in a 100-200-foot-wide aggraded alluvial channel with less than 1% gradient. The summer low flow wetted channel is approximately 25 feet wide. The substrate is composed exclusively of small gravel and sand. The stream banks are 10–30 feet high and have a 50% slope prior to transitioning onto the terrace. The riparian zone is composed of densely spaced 2nd growth redwoods in the 12-to-40-inch dbh size classes. Due to channel width, the effective shade canopy is low even though the adjacent forest can be as high as 180 feet. Lack of bank erosion and evidence from historic aerial photography indicates little or no active channel migration. The narrow-wetted channel does meander within the wider channel zone but appears to be amazingly consistent in its location over the last forty years.

The floodplains at the lower reaches of the WAA subbasins and mainstem Gualala River are sediment deposition areas, not source areas. GRT has documented an increase in floodplain elevation between 1953 and 1986 of approximately 3.5 feet in some parts of the flood prone areas adjacent to the Gualala River.

The watershed resources that are affected by potential adverse impacts of this project are the beneficial uses of water in the Gualala River which are designated in the Water Quality Control Plan for the North Coast Region (Section 2, Table 2-1) as: municipal supply and domestic supply, agricultural supply, industrial service supply, industrial process supply, groundwater recharge, freshwater replenishment, navigation, hydropower generation, water contact recreation, non-water contact recreation, commercial and sport fishing, warm freshwater habitat, cold freshwater habitat, wildlife habitat, rare, threatened, or endangered species, migration of aquatic organisms, spawning, estuarine habitat, aquaculture, and subsistence fishing. The following table indicates estimated cubic feet per second (cfs) diversions during the year from the entire Gualala River Watershed as determined by the Gualala River Watershed Technical Support Document (GRWTSD) prepared by the Water Quality Control Board (2001).

Estimated Water Uses in the Gualala River Watershed

Water Use Estimated Maximum

User	**Withdrawal Rate (cfs)**
SWRCB appropriative rights	8
Vineyards—irrigation and frost control	27-100
Rural Residential	2.5
North Gualala Water Company	2
Sea Ranch	2.8

Potential total diversion amount	**42.3 – 115.3**

1. **Watershed Effects**

a. Sediment Effects:

Sediment-induced cumulative watershed effects occur when earth materials transported by surface or mass wasting erosion enter a watercourse system at separate locations and are then combined at a downstream location to produce a change in water quality or channel condition. The WAA lies within the greater Gualala River Watershed which is listed as 303(d) for Aluminum (mainstem only), Temperature and Sedimentation/Siltation Impairment. Within the Big Pepperwood Creek and Lower Rockpile Creek Planning Watersheds, primary historical and present activities include road and watercourse crossing construction, timber harvesting, milling and lumber production, agriculture and ranching, rural residential development, and recreation. Amongst these activities, the primary drivers of increased sedimentation to downstream resources include road building, deferred road maintenance, road failures, natural erosion processes, flooding of the Gualala River and agricultural operations upslope and directly adjacent to watercourses. Increased sediment is primarily responsible for pool filling and gravel embeddedness resulting in a decrease in available habitat for spawning and rearing salmonids. Increased sediment also can contribute to increased temperature due to pool filling.

Within the WAA, logging conducted between the 1850s through the 1970s placed an enormous amount of sediment and large woody debris (LWD) within the watercourses. Much of the LWD was buried in the deposited sediment. The morphology of the channels were also altered through widening and flattening. The Gualala River Watershed experienced intensive harvest activity beginning with oxen logging to the turn of the 20th Century. Use of steam donkeys and railroad logging followed this era and use of watercourse channels continued to be used as logging roads, skid trails, oxen trails, and railroad access. Watercourses are now showing evidence of downcutting through the sediment and buried LWD is emerging. Where the watercourses have cut through the sediment, steepened banks exist. The sediment in the over steepened banks is being slowly released into the streams during high flow events. The extensive near-stream road system built to facilitate the tractor logging era of the 1950s and 60s remains a long-term sediment source to this day.

The landowner is involved in an ongoing project to evaluate and rehabilitate their entire road system to offset any sediment impacts that result from their timber harvesting activities. GRI/GRT has improved 55% of their road system at their own cost of $4,000,000 not including grant money. This has prevented at least 300,000 cubic yards of sediment from being delivered into watercourses through work completed on company lands in the Gualala River Watershed from the period 2003 to 2023. The average cost of road upgrading has been $17,900 per mile. GRT has a goal of assessing their remaining road system over the next ten years and upgrading all roads to a storm-proofed condition over the next twenty years as money is available. In addition, roads are inspected annually and most road erosion sites that develop during the winter that are found and are accessible are repaired immediately so that small problems do not develop into big problems. Under miscellaneous addendums in Section V is a listing of "Completed Road Work" projects for each watershed. In these "Competed Road Work" addendums "Yards Stabilized" were only provided if a qualified person addressed the site, and many of the stabilization sites were repaired but actual quantitative sediment savings has not or is yet to be documented.

Sediment Effects – Baseline Conditions

The WAA and THP area contain the following baseline conditions regarding sediment effects:

- **Roads** – The existing, active road network within the project area contains primarily upper slope and ridgetop seasonal roads with water bars or rolling dips, and either culverted or rocked

watercourse crossings. Legacy road networks exist on the lower slopes and along lower-gradient stream channels. Besides permanent roads within the GRT ownership, these road systems have not been used since the legacy tractor logging era. While this system continues to contribute periodic sediment inputs during high flow and mass wasting events, it is almost entirely revegetated and stabilized. Direct corrective treatment of these sites is no longer feasible or advisable given access constraints, and the magnitude of excavation required to decommission these legacy road segments. In evaluating the THP area, the RPF identified potential sediment sources associated with the active road network and proposed corrective measures in Section II of the plan.

- **Yarding** – The entire THP area was previously logged using ground-based equipment in the 1950s and 1960s. Portions of the THP area were subsequently tractor/cable logged in the 1990s. There is an extensive network of existing skid trails, the majority of which are stable and in good condition. The RPF has evaluated the skid trail network and proposed ground-based yarding limitations to operate only on stable slopes. There are historic skid trails/tractor roads located within WLPZs of Class II watercourses and Class II and III watercourse channels, but none of these facilities are proposed for use. Most of these legacy tractor roads are revegetated and self-ameliorating. Similar to the prospect of legacy road decommissioning, an attempt to access these sites with heavy equipment and remove potential sediment sites would cause more harm than good. Although these trails have not been used in any recent past projects due to the enforcement of the FPRs, the effects within the watershed are still present as watercourses continue to find their way back to their original grade and alignment. This process has resulted in downcutting through deeply aggraded channels. It is not uncommon to see 8ft deep incised Class III channels cutting through legacy tractor road fill.

- **Unstable Features** – The RPF has identified several unstable features within the THP area. Most of these are located adjacent to watercourses and are a result of either natural erosional and tectonic (San Andreas Fault) processes, bedrock layers, or historical logging within and adjacent to watercourses. Landsliding within the assessment area has been a major force in the shaping of the geologic setting of the THP area. Historically, these features have likely contributed to active sedimentation, especially those that experienced heavy equipment and soil displacement. Section V includes GRI database information on unstable features per watershed, as well as published geologic maps of the THP area. While the active road system proposed for use under this THP is intact, evidence of historic road-related unstable areas have been identified by the RPF. Road improvements have been prescribed by the RPF to address these potential sediment sources.

Sediment Effects - Past Activities

The assessment area has a long history of human habitation. The main activities that may have contributed to past adverse impacts of the WAA, specifically to sediment effects, are road and watercourse crossing construction, timber harvesting, milling and lumber production, agricultural production, livestock grazing, wildland burning, residential building. Logging practices occurring prior to the Forest Practice Act likely impacted the entire Gualala River watershed, including the THP area; effects of these activities are present within the project area. Past adverse logging practices included oxen logging, steam donkey logging, and tractor logging. All practices contributed sediment into stream channels. Activities in the last 10 years have been limited to road maintenance and hardwood control within the project area.

Wildland Burning: Early landowners appear to have burned the slopes periodically following the initial logging in an attempt to enhance livestock carrying capacity. The wildland burning, which occurred from before the turn of the century until the early 1950s, had a definite negative impact on the

beneficial uses of water across the assessment area. Annual burning was conducted to increase the amount of grazing habitat and improve the quality of the grazing habitat. Burning during this period was also used in conjunction with clear cutting in the assessment area. This burning reduced protective ground cover exposing large areas of soil to increased erosion potential. Conifer shade canopy along the watercourses of the assessment area must have been reduced as a result of repeated burning, thus leading to higher summer water temperatures. Reduced canopy levels across the timbered portions of the assessment area would have resulted in reduced water use by vegetation and a potential for increased peak flows. The removal of canopy cover on a large scale followed by wildland burning and therefore the removal of organic material and root strength increases the amount of runoff, mass wasting and rain drop impact which led to excessive sedimentation.

The practice of broadcast control burning may still be practiced within the watershed to a certain degree to control fuel loads and vegetative cover and for site preparation activities. Fires are usually set in early winter when burning conditions are suitable for low intensity-controlled burns. Wildland burning, however, is not conducted on the same scale as it was in the past and is not used to increase grazing habitat.

Agriculture/Grazing: The watershed assessment area has a long history of agricultural use. Farming and livestock grazing were dominant uses in the past and continue to a much lesser degree today. Homesteads existed where permanent water, natural open areas and level ground allowed for subsistence farming. These impacts will likely be limited as the amount of grazing has been diminished.

Residential Development: The human population levels of the area have steadily increased over time. The development of the town of Gualala began in the 1860s as a mill town. During this time and decades after, the town supported the workers and families of the logging and mill industries. In the recent past, the town has supported residential citizens, landowners, travelers, and tourism. With the development of The Sea Ranch in the 1960s and the construction of California State Route 1, the WAA has seen an increase in visitors and residential building and development. It should be noted that most of the development in the Gualala area has occurred within the coastal zone, west of the assessment area.

Currently there are many residences located throughout the assessment area mainly located on semi-rural land (neighborhoods nestled into undeveloped areas), especially within the western corner of Robinson Creek PWS. The vast majority of the WAA is mountainous and forested, with significantly less development than the west side, owned by the plan submitter and other larger industrial landowners. Whenever there is human activity, there is potential for adverse effects on the environment. Human population growth affects all resources, either directly or indirectly, and increased pressure upon rural settings is a manifestation of those impacts. Accelerated erosion can occur from access roads and home sites through the diversion of natural watercourse patterns. Chemical and biological pollutants can enter waterways from septic systems, gardens, and roads. The increasing human population reduces the inventory of productive soils and disrupts wildlife. It reduces wildland recreational opportunities and disrupts the visual resources. The county/state controls almost all land use activities with regulations designed to prevent significant adverse impacts.

Road Building: Road building is associated with all the other past land uses discussed here. The sedimentation of watercourses from far past projects (before the Forest Practice Act of 1973) is perhaps the greatest past and continuing impact within the watershed and a major contributing factor to that would be the construction and use of forest and ranch roads. Several sources including the Handbook for Forest and Ranch Roads (Weaver, Weppner and Hagans, 2015) and the Klamath Resource Information System (KRIS) indicate that road failures can contribute both fine and course sediment to streams, and accumulated road failures in large storm events can have catastrophic effects, such as filling in pools and

reducing habitat complexity. Studies cited within KRIS show that roads can contribute 50 to 80% of the sediment that enters streams and the amount of sediment delivered from forests with roads can be more than 300 times greater than from undisturbed forest land. Roads on ranch lands and those leading to rural and suburban parcels also contribute to sediment problems in a watershed. Surface erosion from roads can produce chronic sources of fine sediment, which can diminish salmon and steelhead spawning success. Roads constructed next to streams are chronic contributors of fine sediment, particularly if they are used in winter months. Winter logging on seasonal road exacerbates this problem because the truck wheels pump fines from within the roadbed to the surface. Fine sediment from roads that enters streams fills interstitial spaces in gravel streambeds, reducing survival of salmon and steelhead eggs and aquatic insects.

Road construction in the past was not regulated as it is now, and resources such as the Handbook for Forest and Ranch Roads were not available to private landowners. State and county roads next to watercourses are there because of historic uses associated with livestock watering needs and gentle gradients. Roads for timber harvest were constructed within and next to streams and were commonly used during wet winter periods. There are historic logging roads within the WAA that are located within the floodplain of the Gualala River, under the ownership of the Plan submitter. These roads have been in good condition for decades and are actively maintained by the landowner. Mid-slope road construction from early logging altered drainage patterns of the watershed assessment area and proper watercourse crossings were not installed. This likely caused impacts and were addressed as necessary, but proper upgrades were not installed until more recent timber harvest plans (last 30 years). Much of the property has been addressed in the more recent past and has been monitored and maintained for multiple decades without major failure or sediment delivery. Recognition of road and erosion problems in the Gualala River watershed has led to several road improvement and erosion control projects in recent years. There are, however, many small landowners that continue to use road systems during wet periods and who conduct little or no upgrades to their road systems.

Timber Harvesting: Before the implementation of the Forest Practice Act of 1973, early and historic logging activities did not take into consideration hydrology, erosion, mass wasting or the watercourse protection issues that forest harvesting focuses on today. Although there is evidence of this within watercourse channels and WLPZs through filled in channels, widened valleys and skid trails, these effects are older and weathered due to the fact that many of these facilities have not been used in multiple past projects. The facilities that have been recently used are upslope, mostly on gentle flat ground with little construction, and have intact waterbreaks at appropriate spacing. The last harvest entry on the THP area was in 2017 utilizing unevenaged management and tractor yarding systems. Prior to this, evenaged management and special prescriptions used a combination of tractor and cable yarding methods in the early 1990s.

In the historic past, roads and skid trails were constructed either directly in or adjacent to watercourses resulting in sedimentation of the watercourses and reduction of shade canopy. Large increases in large woody debris and increased sediment inputs resulted in the storage of large amounts of sediment. As the woody debris begins to decay, stored sediment is moving through the watershed. Furthermore, lack of adequate erosion control on skid trails, roads and watercourse crossings resulted in the deposition of sediment and organic debris into the watercourse channels. Overall impacts from past timber management, however, appear to have been beneficial. The lands remain forested with various levels of regeneration dependent upon location. Incidental adverse impacts to watershed resources are more likely associated with past skidding patterns, road maintenance or primary log transport using watercourses rather than harvesting per se. After the FPRs, all past projects in the WAA did not use the skid trails that are directly located inside of major watercourse drainages, therefore these streams are still recovering from the initial and pre-FPR harvests.

Sediment Effects – Quantitative Analysis of Past Projects (last 10 years)
A list of approved and/or active past projects within the WAA is included in the Past Projects Tables. In brief, these include 10 THPs in the Big Pepperwood Creek PWS totaling approximately 891 acres cumulatively, or 13.6% of the watershed area, and 3 THPs in the Lower Rockpile Creek PWS totaling approximately 263 acres cumulatively, or 8.9% of the watershed area. The total cumulative acreage subject to some form of timber harvesting in the last 10 years as of this analysis is 1,154 acres, or 12% of the WAA. It should be noted that of the 1,154 acres reported 34 acres were No-Harvest zones. This analysis does not account for the additional no-harvest acreages associated with WLPZ core zones, no-cut VR aggregates, or unstable areas (unless mapped as No-Harvest silviculture).

**The acreages reported above represent approximate plan acreages within the WAA planning watersheds and not total THP acreages. Several of the THPs filed in the last 10 years overlap more than one planning watershed. This data is supplied by CDF through their online GIS portal. GIS data is sourced from approved THPs. The RPF makes no guarantees as to the accuracy of this data.*

Sediment Effects - Reasonably Foreseeable Probable Future Projects
Timber production is the principal land use within the WAA, and this is not expected to change in the foreseeable future. GRT's portion of the assessment area will continue to be managed for sustained timber production and the enrichment of all forest resource attributes. Reasonably foreseeable future projects in the WAA include "Cabin" THP, which is in the early stages of planning and does not yet have an exact location, size, or regeneration methods, and one NTMP: 1-08NTMP-009-MEN, which has not had an NTO filed in the last 10 years. It is reasonable to expect that an NTMP property may conduct timber operations in the foreseeable future, though it is impossible to predict the acreage of harvest.

The GRT property is managed under the California Forest Practice Rules Option C. Additional plans are currently being prepared under Option C, located throughout the property. Those THPs will be submitted in the future and it should be assumed that additional plans will be filed over the next 10 years within the assessment area. Until THP field work and layout begins, GRT is not able to predict with any degree of certainty that an actual THP for a specific area will be written, submitted and approved. Future harvesting projects are often contemplated or appear to be feasible based on assumed ground conditions, stand age and composition, and other information, including information from the landowners Geographic Information System (GIS). Until actual field work begins, the location of the THP on the ground, its area layout (including its size and shape), its foreseeable impacts or associated protection measures are unknown. At this time, the RPF knows of no additional THP's where fieldwork has begun on Gualala Redwood ownership within the planning watershed.

While most of this acreage will be in the form of THPs, other projects will likely include road construction, reconstruction and maintenance. Appurtenant roadwork, such as road upgrades, installing rolling dips and out sloping, will be done concurrent with THP work. Also, given the history of land use in the assessment area, it is safe to assume that agricultural uses and timber harvesting will continue to occur in other parts of the assessment area that are not under Gualala Redwood ownership. The timing and nature of any additional future projects is difficult to predict, due to constantly changing economic conditions.

Other non-harvest forest management activities can be expected to occur on GRT's ownership as future projects will or may include:

Road Rehabilitation: Watershed restoration work and road storm proofing is an ongoing activity. In the last 25 years nearly 60% of the ownership's road system has been improved to reduce potential sediment

delivery to the streams within the Gualala River Watershed. This has been accomplished through stream crossing replacements and improvements, removal of legacy earth fill crossings and undersized culverts, storm proofing roads by reconstruction to an outsloped running surface and hydrologically disconnecting the road surface from nearby watercourses. In all, approximately 295,000 cubic yards of sediment have been prevented from being delivered to the tributaries and the main watercourses of the Gualala River and has been retained on the hillslopes through stabilization work.

Fish Habitat Improvement: GRT plans to continue its grant funded work with the Gualala River Watershed Council (GRWC), the California Department of Fish and Wildlife, and NOAA Fisheries to improve the on-property fish habitat with additional instream large woody debris placement. To date it is estimated that 199 logs have been placed in the North Fork Gualala River and its fish bearing tributaries within Robinson Creek PWS and 72 logs have been placed in the North Fork Gualala River within the Stewart Creek PWS on GRT property. This work was primarily accomplished through State grant funding and company cost share, and to a limited extent as off-site fish habitat improvements related to the gravel extraction and mining permit. In 2018 eleven (11) large trees (nearly 14 MBF) were placed in the North Fork of the Gualala River by use of the Option 'v' process in the ASP Rules that allows for site-specific restoration work within the watercourse channel. GRT expects it will continue this work into the future in association with GRWC, California Department of Fish and Wildlife, the North Coast Regional Water Quality Control Board, and NOAA Fisheries.

All this past and expected future restoration and stabilization work as addressed above has been evaluated through monitoring efforts by the GRWC and found to be contributing significant improvements to the Gualala River Watershed. The regulatory agencies support continuing this work into the future as the work is resulting in measurable water quality and salmonid habitat improvements.

Timber Harvest Scheduling: Harvesting, for practical reasons due to historical past harvest entries, access availability, equipment and manpower mobilization and staging, is often concentrated in one watershed for a period of time and reduced in another watershed. This varying harvest intensity must be addressed in a cumulative effects analysis. In the assessment of potential cumulative effects that may result from harvesting the percent watershed acres harvested is a poor indicator by itself because if all silviculture were even-aged then one would expect on a sixty-year rotation to only harvest 16.7% of a watershed area in a ten-year period due to adjacent harvest unit constraints imposed by the Forest Practice Rules. However, if the landowner were to fully engage in uneven-aged silviculture over the entire watershed one could expect to selectively harvest 50 to 100% of the acres over a ten to fifteen-year period. Since there is a mixed employment of silvicultural prescriptions within a watershed the areas harvested in a ten to fifteen-year period become more complicated to decipher. This also does not take into account the fact that these are not fully regulated stands but have been harvested in bursts of activity in the past which has resulted in the majority of these stands becoming harvestable at approximately the same time in many cases. This pattern results in decades with higher harvest rates over an area followed by decades in which little to no harvesting occurs, so potential impacts can be periodic in nature.

At the present rate of harvest and because of harvest unit adjacency rules it is likely that many of the stands on the landowner's property will not be harvested until they are many decades older than the rules require for minimum stand age using even-aged management. Much of the ownership will continue to be managed using unevenaged silviculture, and older stands of mature timber will continue to exist because of a number of restrictions and considerations including watercourse protection rules, geological hazard set-asides, northern spotted owl habitat protection, as well as other plant and animal retention areas being left across the ownership.

Other activities in the WAA, outside of GRT ownership, will likely continue including development,

agriculture, grazing, recreation and tourism. These all have the ability to contribute to sedimentation, but with regulations are not expected to be at a significant level in the future.

Sediment Effects - Proposed THP

- Silviculture (14 CCR 913): THP Item #14 describes the silvicultural methods proposed in this THP, which are Single-Tree Selection, Group Selection, Commercial Thinning, and Variable Retention (VR). Portions of the WLPZ, unstable areas, and VR aggregates will not be harvested at all. Aggregate retention areas have been located to protect unstable areas, Class III watercourses, and potential headwall swales. Portions of the VR units not protected by aggregates will have most, if not all, of the merchantable conifers removed (besides retained wildlife trees). After the harvest of this unit, tanoak and brush species may be controlled to assist in redwood regeneration, but not all vegetation will be removed or treated. Slash and brush or tree species not creating competition for young redwoods will remain in the stand post-harvest. Runoff and sedimentation from this unit after harvest is expected to be minimal since there will still be canopy cover from uncut trees, canopy cover from the aggregate patches and streamside vegetation. Expected high levels of post-harvest vegetative cover throughout the plan area will help to reduce the potential for deleterious amounts of sediment entering into watercourses in the form of excessive surface runoff and rain drop impact.

- Road Improvements (14 CCR 923; 14 CCR 916.9): THP Section II describes road treatments that will be implemented to reduce the potential for generation of sediment near watercourses. Required road rules have been applied to this plan and include specific requirements for Anadromous Species Protection. Road upgrades proposed in this THP include redesigning crossings to meet a 100-year flood event, which controls and limits the amount of potential sediment that could discharge if the crossing fails. Maintenance, like adding rock armoring or cleaning the existing infrastructure secures bare mineral soil to the site and allows for proper functioning of facilities. Road drainage has also been assessed and includes upgrades to limit the amount of water that collects, drains on, and erodes the road prism. There is no new road construction proposed. This THP proposes the following activities aimed at road improvement:
    -Existing watercourse crossing upgrades
    -Road drainage facility improvements
    -Hydrologic disconnection of logging roads

- Yarding Methods (14 CCR 914.2 & 914.6): THP Item #16 describes the yarding methods to be employed during harvest operations. The THP proposes ground-based and cable yarding systems. Existing skid trails exist throughout the THP, however new trails may be required in some of the flatter portions of the THP where old trails may be indistinguishable. After operations, skid trails will meet FPR waterbarring requirements to prevent and reduce the concentration, flow, and erosion of surface runoff down trails. A waterbar is required to be placed prior to a watercourse where they are crossed to hydrologically disconnect the trail or road from the watercourse. The reuse of these skid trails and reinstallation/addition of drainage facilities is expected to keep sedimentation to a level less than significant. Cable yarding is proposed on steeper slopes and within WLPZs. Cable roads will be laid out by the LTO to maximize deflection thereby minimizing log dragging. Cable road widths shall be kept to a minimum (typically 8-12') to maintain canopy and ground cover. Ground-based equipment use is proposed in an area where average slopes exceed 65%. This is considered an exception to the standard rule pursuant to 14 CCR 914.2(f). Section III of the THP explains why this exception practice has been proposed and why it will provide equal or greater protection to the environment than the standard rule. The proposed exception practice will allow the landowner to harvest a portion of the Group Selection Silviculture stand with ground-based equipment on preexisting, stable skid

trails which have been evaluated and flagged by the RPF. Harvesting this area with ground-based equipment utilizes existing forest infrastructure, thereby minimizing potential adverse impacts to sediment effects by avoiding new road and landing construction which would otherwise be required to facilitate cable yarding or helicopter yarding.

- Unstable Features: Potentially active unstable areas identified by the RPF have been designated equipment exclusion zones (EEZ). Heavy equipment shall be limited to existing stable road surfaces within these features. Depending on the risk of reactivation, some unstable areas have been designated either no-harvest zones or special treatment zones (STZ). Ground-based equipment use is proposed on a geologic feature mapped by CGS as a probable dormant mature rock slide in a portion of the plan that was previously tractor logged. This practice is considered an exception to the standard rule pursuant to 14 CCR 914.2(d). Section III of the THP explains why this exception practice has been proposed and why it will provide equal or greater protection to the environment than the standard rule. The proposed exception practice will allow the landowner to harvest portions of the unit using only existing, stable skid trails which have been evaluated by the RPF. Harvesting this area with ground-based equipment utilizes existing forest infrastructure, thereby minimizing potential adverse impacts to sediment effects by avoiding new road and landing construction which might otherwise be required to facilitate cable yarding. Furthermore, the road and skid trail networks were designed for ground-based yarding systems due to the gently sloped topography. Yarding this ground with cable systems would result in excessive damage to residual timber and conifer regeneration and soil disturbance due to dragging logs across an area with poor deflection.

- Soil Stabilization Measures (14 CCR 923.5 & 916.7): THP Item #18 includes soil stabilization measures for logging roads, tractor roads, and WLPZs/ELZs/EEZs, with specific requirements for Anadromous Species Protection special road use and maintenance provisions will be applied to wet weather conditions during the non-winter period; self-maintaining drainage features, such as rolling dips, will be used in appropriate places. Covering bare mineral soil disturbed by operations prior to winter storms prevents fine sediment from washing off-site and reaching a higher order stream.

- Winter Period Operating Plan (14 CCR 914.7): THP Item #23 includes numerous provisions that are proposed to minimize the mobilization of sediment during the winter period. This THP includes the following measures:
  -No ground-based equipment operations during saturated soil conditions.
  -No log hauling during saturated soil conditions.
  -No watercourse crossing installation or proposed road construction during the Winter Period.
  -No site preparation activities during the Winter Period.

Sediment Effects Conclusion

The existing conditions within the WAA regarding sediment effects have been impacted by pre-forest practice rules timber harvesting activity, and there may be a continuing impact. Future projects are not expected to have an adverse impact on sediment effects in the WAA. The proposed THP area is generally in good condition regarding sediment effects. An evaluation of interactions of the proposed project and incorporated impact avoidance measures with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on sediment effects reveals that there are no significant cumulative adverse impacts, and that current conditions will be maintained or improved through implementation of the project.

b. Water Temperature Effects

The Gualala River is listed as impaired under CWA Section 303(d) for Temperature (Feb. 4, 2003). The range of the calculated maximum weekly average temperatures (MWAT) recorded in most of the major tributary streams within WAA watersheds are included in the Stream Reports Tables (Section V).

Temperature data collected within the Mainstem Subbasin indicate an average MWAT ranging from 64-72 degrees F across 7 stations (NCWAP). Tributaries generally exhibited lower MWATs between the "fully supportive" range and just below the upper level of the "suitable" range for salmonids. Water temperature data for the lower mainstem Rockpile Creek indicated MWATs ranging from 71-75 degrees F, just below the lethal maximum, while temperature data from a sampled tributary was within the suitable range (50-60 F).

Water temperature can be the single most critical feature of habitat for salmonids and other aquatic organisms and is relatively easy to monitor. California chinook salmon, coho salmon and steelhead trout are all Pacific salmon species (genus Oncorhynchus), and all require cold water. Water temperature tolerance varies somewhat between species and also between life stages. Warm temperatures can reduce fecundity, decrease egg survival, retard growth of fry and smolts, reduce rearing densities, increase susceptibility to disease, decrease the ability of young salmon and trout to compete with other species for food and to avoid predation. Sedimentation of streams may also contribute to elevated water temperatures. Sediment can fill pools and cause the width-to-depth ratio of a stream to increase, which can facilitate heat exchange.

Within the WAA and the project area, two main watercourse conditions affect water temperature: canopy cover and pool depth. A cursory review of aerial imagery indicates canopy cover is very high within the WAA. This is corroborated by the harvest history within the assessment area – see harvest history discussion under Sediment Effects above. Adoption of the ASP rules in 2009 significantly contributed to the retention of near-stream canopy cover. Pool depth has gradually decreased over the last 200 years, due to anthropogenic activities increasing sedimentation to streams. However, adoption of the FPRs has resulted in restoration of these pools through the increased recruitment of Large Woody Debris (LWD) in watercourses and a gradual decrease in sedimentation resulting from timber operations. The intentional placement of large wood in fish bearing streams within the assessment area has also created additional pool structure.

Water Temperature – Baseline Conditions

The THP area contains the following baseline conditions regarding water temperature:

- **Canopy Cover** – There are two Class I watercourses adjacent to the Plan area. The THP area contains multiple Class II watercourses, Class III watercourses, and several wet areas. Shade canopy along Class I & II watercourses within the THP ranges from 85% to 100%. Shade canopy along Class III watercourses within the THP ranges from 70% to 100%. Canopy cover is comprised primarily of mature redwood, Douglas-fir, sugar pine and tanoak. While historic logging activities may have removed canopy cover adjacent to watercourses, current conditions reveal adequate regeneration, high stocking, and recovered shade canopy.
- **Pool Depth** – The Class I & II watercourses within/adjacent to the Plan area have channels with a moderately developed pool structure. Most pools within the THP dry up during late summer months, with only the deepest pools remaining wet through fall. Watercourses within the THP are in the process of scouring and degrading rather than aggrading. Sediment continues to flush through the system within the THP area, gradually increasing pool depth as this occurs during high flow events, and as more large wood is introduced to the channels. The factors contributing to sedimentation described above will be addressed in this THP and should have a positive effect on increased pool depths.

Water Temperature - Past Activities

The main activities that may have contributed to past adverse impacts of the Watershed Assessment Area, specifically to water temperature, are similar to and connected to the sediment effects section above. They include road and watercourse crossing construction, timber harvesting, milling and lumber production, agricultural production, livestock grazing, wildland burning and residential building.

- Wildland Burning: The removal of canopy cover on a large scale followed by wildland burning and therefore the removal of organic material and root strength increases the amount of runoff, mass wasting and rain drop impact which led to excessive sedimentation, turbidity, and increased water temperatures. The lack of streamside canopy due to burning, as well as input of organic matter and loss of LWD also contributed to an increase in temperatures. Past LWD projects from the recent past on GRT lands have been abundant and help to create pools within the Gualala River and tributaries, and therefore decrease water temperature.
- Agriculture/Grazing: Past grazing activity often converted forestlands to grassland which
- decreased the amount of canopy in the WAA at times. Additionally, roads and access for grazing and agricultural activities in the WAA through grasslands with flashy watercourses and poor drainage caused mass wasting events and sediment delivery.
- Rural Development: Whenever there is human activity, there is potential for adverse effects on the environment. Human population growth affects all resources, either directly or indirectly, and increased pressure upon rural settings is a manifestation of those impacts. Accelerated erosion can occur from access roads and home sites. Today, the county/state controls almost all land use activities with regulations designed to prevent significant adverse impacts.
- Road Building: Road building is associated with all the other past land uses discussed here. The sedimentation of watercourses and therefore an increase in water temperature is perhaps the greatest past and continuing impact within the watersheds and a major contributing factor to that would be the construction and use of forest and ranch roads. The building of logging roads through riparian areas and alongside Class I watercourses within the WAA, reducing canopy cover and therefore increasing temperatures, and the pushing of fill material into creeks during their construction most likely contributed to an increase in water temperatures during these historic practices and prior to the implementation of the FPRs.
- Timber Harvesting: Before the implementation of the Forest Practice Act of 1973, historic logging activities occurred within the plan area, and much of the surrounding timberland at one point. These activities did not take into consideration erosion, mass wasting or the watercourse protection issues that forest harvesting focuses on today. The last harvest entry on the THP area was in 1995. In the distant past, roads and skid trails were constructed either directly in or adjacent to watercourses resulting in sedimentation of the watercourses and reduction of shade canopy. Large increases in large woody debris and increased sediment inputs resulted in the storage of large amounts of sediment. As the woody debris begins to decay, stored sediment is moving through the watershed. Furthermore, lack of adequate erosion control on skid trails, roads and watercourse crossings resulted in the deposition of large amounts of sediment and organic debris into the watercourse channels. Overall impacts from past timber management, however, appear to have been beneficial. The lands remain forested with various levels of regeneration dependent upon location. Incidental adverse impacts to watershed resources from historic past activity are more likely associated with road maintenance or primary log transport using watercourses rather than harvesting per se. The timber operations conducted in the recent past, within the last 10 years did not result in any significant adverse impacts, including an increase in water temperature.

Water Temperature - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area affecting water temperature are development, road building, timber harvesting, and to a lesser extent wildland burning, agriculture, and recreation. It is anticipated that these activities will continue into the future, as discussed above.

Road building is not expected to result in adverse impacts to the assessment area in the future as a majority of the assessment area is currently roaded and any new roads constructed will utilize proper planning, design and construction techniques. Road maintenance and repair will increase in the future as awareness of the impacts of roads are evaluated and landowners work to improve their roads, using the Handbook for Forest and Ranch Roads.

Wildland burning is expected to be conducted in the future, to a certain degree, to control fuel loads and vegetative cover and for site preparation activities. The amount of burning conducted is expected to be minimal and should not result in any adverse impacts to sediment, canopy or water temperature, and in fact should maintain the amount of overall canopy.

Livestock grazing and other agricultural uses are expected to continue at limited levels which is not expected to have significant impact.

Large, forested land holdings have been and will likely continue to be harvested and maintained as timberland, but some of this land could be sold and subdivided. Rural residential development will continue to have impacts upon the management of large tracts of industrial and small private timberland within the WAA.

Water Temperature - Proposed THP

- Silviculture (14 CCR 913): THP Item #14 describes the silvicultural methods proposed in this THP. The THP states that there shall be no salvage logging in WLPZ areas. Additionally, LWD shall be retained within riparian corridors. The unevenaged management proposed will retain a high level of overstory and understory cover throughout the Plan area, particularly within WLPZ corridors, Class III ELZs, and unstable areas. The high levels of post-harvest vegetative cover will shade the riparian areas which regulate water temperature, and maintain canopy and root strength within unstable areas which have a high risk of sediment delivery.
- All other previously mentioned proposed activities that could impact sedimentation: Sedimentation of streams contributes to elevated water temperatures. Sediment can fill pools and cause the width-to-depth ratio of a stream to increase, which can facilitate heat exchange. See above for a description of sediment effects with regards to potential impacts on water temperature.

Water Temperature Conclusion

The existing conditions within the WAA regarding water temperature effects indicate that there may have been an impact in the past, but since the adoption of Forest Practice Rules, especially WLPZ and ASP rules, the effects of timber harvesting on water temperature regulation have become less than significant. WLPZ stands in the assessment area have regrown since the historic logging activities of the 19th and 20th centuries and continue to achieve canopy closure along Class I and Class II channels. Future timber harvesting projects conducted in conformance with modern forest practice rules are not expected to have an adverse impact on water temperature effects. The proposed THP alone is not expected to have an adverse impact on water temperature due to the chosen silviculture, yarding, and other operational restrictions in accordance with the FPRs. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on water temperature effects reveals that there are no

significant cumulative impacts, and that current conditions will be maintained or improved through the implementation of this project.

c. Organic Debris Effects

Organic debris in a watercourse can have either positive or negative effects depending on the size and stability of the material. Large woody debris is an important component of a healthy functioning watershed, while an excessive amount of small fine organic debris will have a negative impact including increased acidity and decreased dissolved oxygen. A sudden large input of unstable organic debris, including logs, can have a detrimental effect on the watershed. Debris torrents, stream diversions, and barriers to fish migration can cause major impacts to the health and resilience of watershed ecosystems. LWD provides instream habitat for salmonid species as well as storage and metering of sediment within the stream itself. A lack of LWD in Class I watercourses has been identified as a limit on salmonid habitat function.

Large trees that fall into coastal streams play a dominant role in forming pools, metering sediment, trapping spawning gravels and creating a more complex stream environment. Redwoods are particularly valuable because a large tree may not decay for several hundred years (Kelly et al., 1995). Fir and spruce trees last for several decades while alder and hardwood species rot within a few years of being recruited into the stream (Cedarholm et al., 1997). In general, the larger the size of the woody debris the greater its stability in the stream channel. Heavier pieces require higher flows for mobilization and longer pieces are more likely to be caught by the stream bank and its vegetation. Reeves et al. (1993) found that "wood is a primary element influencing habitat diversity and complexity in streams. Consequences of decreased amounts of wood include loss of cover and structural complexity, decreased availability and abundance of habitat units, and reduced varieties of current velocities and other hydraulic features."

Within the WAA, GRT is involved in the facilitation of ongoing stream reach, stream cross sectional, and LWD placement monitoring being conducted annually by the Gualala River Watershed Council (GRWC) on GRT's property. To date, GRT has placed 72 redwood logs in fish bearing streams within the Big Pepperwood Creek PWS, and 21 redwood logs in fish bearing streams within the Lower Rockpile Creek PWS with the goal of improving salmonid habitat through the creation of pool structure and refugia.

Organic Debris - Baseline Conditions

The THP area contains the following baseline conditions regarding organic debris:

- **Small Organic Debris** – The watercourses within the THP area have high levels of canopy cover which therefore introduces a natural amount of small organic debris into the watercourses. The RPF has observed a healthy degree of leaf litter and needle cast in the watercourses present in the Plan area. Currently, there is no evidence of the small organic debris that was input into watercourses during historic logging activities, and no adverse effects regarding small organic debris inputs from the 1990s harvests were observed. The WAA in general does not appear to have significantly adverse levels of small organic debris within its watercourses.
- **Large Woody Debris –** The watercourses within the Plan area contain a moderate to high amount of LWD that appears stable. Existing LWD is not causing diversions or damming. Existing LWD is mostly in the form of tree boles, redwood buckskins, root wads, and large branches that are contributing to bank stabilization and pool development. The WAA overall could use more of these structures to reach peak watershed health but there is no lack within the THP area. As mentioned before, buried LWD is becoming exposed over time as watercourses cut through and scour out the sediment that was deposited a result of logging activities of the mid-20th century. The high levels of stocking within WLPZs will contribute to the ongoing recruitment of instream LWD.

Organic Debris - Past Activities

The main activities that may have contributed to past adverse impacts of the Watershed Assessment Area, specifically to organic debris, are wildland burning, agriculture/grazing, rural development, road building, and timber harvesting, similar to the discussion for sediment effects above.

- Wildland Burning: Past burning activities could have reduced the amount of small debris in watercourses, however it also contributed to a lack of LWD available for watercourses. Burning that has caused bank mass wasting may have also delivered sudden inputs of sediment and organic debris into watercourses.
- Agriculture/Grazing: Past grazing and agriculture limited forestlands and therefore LWD production, and mass wasting events caused by these activities and their roads may have suddenly
- input organic debris into watercourses.
- Rural Development: Building and converting reduced the amount of LWD available, and also diverted watercourses to ditches and underground systems, eliminating their natural drainage area.
- Road Building: Road building and mass wasting events of the past, prior to modern day regulations, undoubtedly input sudden amounts of organic debris into watercourses.
- Timber Harvesting: Historic past timber harvesting did not take into account erosion or mass wasting, and skid trail and road construction to assist in harvesting practices pushed sediment and debris into watercourses, and in many cases even converted watercourses to skid trails. Recent past projects did not use any of these facilities and followed the FPR regulations, therefore there is not an observable impact from these past activities.

Organic Debris - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, residential development and to a lesser extent wildland burning and agriculture. It is anticipated that these activities will continue into the future.

Road building is not expected to result in adverse impacts to the assessment area in the future as a majority of the assessment area is currently roaded and any new roads constructed will utilize proper planning, design and construction techniques. Road maintenance and repair will increase in the future as awareness of the impacts of roads are evaluated and landowners work to improve their roads.

Wildland burning is expected to be conducted in the future, to a certain degree, to control fuel loads and vegetative cover and for site preparation activities. The amount of burning conducted is expected to be minimal and should not result in any adverse impacts.

Livestock grazing and other agricultural uses are expected to continue at minimal levels.

Large, forested land holdings have been and will likely continue to be harvested unless sold and subdivided. Rural residential development will continue to have impacts upon the management of large tracts of industrial and small private timberland, and development can reduce the amount of LWD available for watersheds.

Organic Debris - Proposed THP

- Silviculture (14 CCR 913): THP Item #14 describes the silvicultural methods proposed in this THP. The THP states that there shall be no salvage logging in WLPZ areas. Additionally, LWD shall be recruited and retained within riparian corridors. The unevenaged management proposed will retain a high degree of overstory and understory cover throughout the Plan area, along WLPZ

corridors, upland areas adjacent to tributaries, and on steep slopes and landslide features. Expected high levels of post-harvest vegetative cover throughout the plan area will help maintain and regulate the deposition of organic debris into aquatic ecosystems. The VR units will retain aggregated forest patches, which are located around Class III watercourses and unstable areas. This will maintain the current input of small debris and allow for some snag development.

- Yarding Methods and Watercourse Protections (14 CCR 916.3 (b); 916.4(c)(3); 923.9(p); 916.3(d)): Accidental depositions of soil or other debris in lakes or below the watercourse or lake transition line in Class II waters, shall be removed immediately after the deposition or as approved by the Director. This FPR ensures that an excess amount of organic debris does not enter watercourses. Soil deposited during timber operations in a Class III watercourse other than at a temporary crossing shall be removed and debris deposited during timber operations shall be removed or stabilized before the conclusion of timber operations, or before October 15. Any organic debris deposited in these watercourses will be removed or stabilized to prevent an increase in the organic debris content of these watercourses.

Organic Debris Conclusion

The existing conditions within the WAA regarding organic debris effects indicate that there may have been an impact in the past, but since the adoption of modern regulations, the effects have become less than significant. Currently, there is a natural input (not excessive) of small organic debris in watercourses, and the reintroduction of LWD is slowly increasing in the larger watercourses. Future projects are not expected to have an adverse impact on organic debris effects. The proposed THP is not expected to have significant adverse impacts on organic debris effects through conformance with the FPRs regarding LWD, snags, and wildlife tree recruitment in the WLPZ, shade canopy retention in the WLPZ, and other operational WLPZ restrictions. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on organic debris effects reveals that there are no significant cumulative adverse impacts, and that current conditions will be maintained or improved through the implementation of this project.

d. Chemical Contamination Effects

The WAA could have been impacted by chemical contamination from past historic projects with regards to the following activities: grazing and ranching, agriculture, cannabis cultivation, recreation, roadside herbicide treatments, slash pile burning, broadcast burning, heavy equipment maintenance and rural/residential runoff. Chemical contamination to downstream resources can have negative impacts on aquatic organisms, as well as the beneficial uses of water.

Chemical Contamination - Baseline Conditions

The THP area contains the following baseline conditions regarding chemical contamination:

- **Management activities using heavy equipment** – within the project area, there are no known significant adverse effects of chemical contamination from activities using heavy equipment in the past. In the recent past and present, there has been heavy equipment use under the 1990s logging operations, and since then there has been minimal to no heavy equipment use. In the WAA overall, there have been many timber harvest projects in the recent past within the plan submitter's ownership in which no chemical contamination events have occurred, and there are no existing impacts from past activities.
- **Herbicide Usage –** There are no known existing impacts to water quality relating to herbicide usage, therefore it has not been listed as a past adverse impact.

Chemical Contamination - Past Activities

The main activities that may have contributed to past adverse impacts of the Watershed Assessment Area,

specifically to chemical contamination effects, are wildland burning, agriculture/grazing, rural development and tourism, road building and timber harvesting. Activities related to illegal cannabis cultivation and other trespass activities may have contributed to past adverse effects, though these are difficult to evaluate.

- Wildland Burning: Burning throughout the watershed occurred within or near watercourses and riparian areas in historic burning, which likely input chemicals into the watershed ecosystem. Equipment for these activities may have also been worked on in these areas.
- Agriculture/Grazing: This past activity may have contributed to this effect through heavy equipment servicing near watercourses and the use of pesticides and fertilizers.
- Rural Development and Tourism: People living within the WAA in the past and present have likely disposed of or stored chemicals that may have impacted watercourses. The large number of people who visit the area may also have dumped trash or chemicals into watercourses.
- Road Building: Road building uses heavy equipment, therefore there was likely chemical contamination of watercourses within the WAA prior to the FPRs. Projects after the FPRs and the most recent harvests in the WAA do not service equipment inside of the WLPZ and there are no known issues related to this from the past.
- Timber Harvesting: Similar to road building, heavy equipment used within what are now WLPZs likely contributed to chemical contamination.

Chemical Contamination - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, rural development, and to a lesser extent wildland burning, agriculture, recreation, trespass, and illegal cannabis cultivation. It is anticipated that these activities (with the possible exception of cannabis cultivation) will continue into the future.

Use of heavy equipment within the WLPZ and riparian areas is restricted and limited within the State, and it is unlikely that any future activities will contribute to significant chemical contamination effects within the watershed.

The assessment area consists of both large private landowners, and small rural parcels. Typically, large private landowners manage timberlands or other agriculture. Some larger landowners may not conduct any activities on their property and therefore do not have impacts to chemical contamination. These activities on the larger ownerships are expected to continue. The future activities will be conducted with the knowledge gained from past practices and will result in fewer adverse impacts and improved forest health and diversity. In regard to timber harvesting and forestry practices, herbicides may be used for unwanted brush and tree species that inhibit the growth and success of fire-resilient conifer tree species. This is a management tool that many landowners use to control vegetation in the most economical way and is expected to continue for small and large timberland owners in the WAA. Other agricultural management may also use herbicide and pesticides for their crops, and this activity is also expected to continue.

Wildland burning is expected to be conducted in the future, to a certain degree, to control fuel loads and vegetative cover and for site preparation activities. The amount of burning conducted is expected to be minimal and should not result in any adverse impacts, especially since the FPRs restrict fueling and heavy equipment in the WLPZ.

Livestock grazing and other agricultural uses are expected to continue at limited levels, and chemicals associated with these activities may contribute a small and insignificant amount to contamination in the future.

Large, forested land holdings have been and will likely continue to be harvested but could be sold and sub-divided in the future. Residential development in rural environments will continue to have impacts upon the management of large tracts of industrial and small private timberland. The presence of people always increases the risk for chemical contamination. Activities and presence of the public in the WAA (tourists, recreators, and short time residents) are likely not associated with a project, especially one under state and public review, and has a much higher chance of directly contributing chemicals to the WAA without any consideration for environment or the cumulative effect.

Trespass (and possibly illegal cannabis cultivation) will undoubtedly continue into the future without substantial changes to the current laws. This can lead to chemical contamination, but at a level that is not significant. There are instances of trespass and illegal crop cultivation within the project area, but it is likely to be reduced in the future. There are no current adverse impacts from these instances, and therefore no probable future impacts.

Chemical Contamination - Proposed THP

- Herbicide Usage: The THP proposes hardwood control to reduce tanoak stocking and encourage conifer seedling establishment and ingrowth of natural regeneration. To meet these ends, use of herbicide to control brush and hardwood species may be necessary. Herbicide usage is considered an optional tool at the disposal of the landowner. The risk of chemical contamination is low, since the probable herbicide to be used are applied via local injections to the target stem (frilling, aka hack-and-squirt) of the minimal amount of chemical needed to kill the tree (likely Imazapyr). For brush species, a foliar spray of Imazapyr or Glyphosate is used in a diluted solution directly onto the leaves of the undesired individual. If herbicides are to be used during the life of the THP, a PCA will be used to obtain a prescription for treatment. Herbicide is not used within WLPZs or within ELZs of Class III watercourses. Please see the more detailed discussion on herbicide usage below.
- Pile Burning and Equipment Maintenance (14 CCR 916): Potential sources of chemical contamination include the accidental release of equipment fuels and oils and introduction of excess nutrients released during the burning of slash piles. Maintenance and fueling of equipment shall be done in locations away from watercourses. Slash piles will be created at landing sites. These will be located along roads. The distance of slash piles from watercourses and the establishment of WLPZ filter strips will significantly minimize the movement of excess nutrients into watercourses. Slash piles created as a result of this THP will follow the requirements of the FPRs including the placement of piles away from watercourses. Furthermore, equipment shall be re-fueled and worked on away from any watercourse and outside WLPZ buffers.
- Dust Palliatives (14 CCR 916): This THP may use dust palliatives such as magnesium chloride or other natural material to assist with dust abatement during the implementation of this Timber Harvest Plan. Dust palliatives are substances applied to roads or ground surfaces to reduce airborne dust and help reduce its environmental impact by tightening and compacting the particles of the road prism surface. The landowner and the applicator should take necessary precautions to keep dust palliative material out of watercourses and roadway ditches leading directly to watercourses or bodies of water to reduce the amount of salt, lignin, or other dust abatement material that is input into the system. If dust palliatives are used in conjunction with this THP, the dust palliative shall be applied following all local, state, and federal regulations.

Additional Discussion on Herbicide Use within the proposed THP

CEQA Analysis of the Landowner's Potential Use of Herbicides Associated with THP Reforestation Activities:

Herbicides are used to temporarily control the growth of brush and weeds that compete with conifers for nutrients and sunlight while the conifers are young. The landowners use a subclass of pesticides referred to as "herbicides". This is an important distinction, for the methods by which herbicides control vegetation are related to plants and their unique growth mechanisms. Unlike insecticides, herbicides are generally not toxic to animals, because they do not try to disrupt energy pathways or essential vertebrate life processes. It is important to note that the herbicides used, are virtually non-toxic to humans. Forest application of herbicides may occur, on average, once or twice on any given forest acre during the course of stand development. The use of herbicides mimics and accelerates the natural progression of growth in a timber stand. Sometime before and/or after artificial regeneration, often in terms of years, planted trees may be aided by herbicide application designed to suppress competing vegetation until the young conifers can overtop the competition. This creates the association between harvesting and the ultimate application of an herbicide. Potentially significant, adverse, cumulative impacts are not expected from herbicide application with such long intervals between applications on any acre.

Herbicides that might possibly be used in reforestation have been the subjects of extensive testing and research within a certified regulatory program under CEQA administered by the Department of Pesticide Regulation (DPR). The DPR regulatory program is a functional equivalent of an Environmental Impact Report (EIR) certified by the California Secretary of Resources pursuant to PRC Section 21080.5. The DPR regulatory program is designed to study and test pesticides, and to avoid potential environmental effects by the totality of the registration, label, and commercial application control processes. These processes include the US EPA label (which is a binding legal document) that prescribes limitations on use and guidelines for proper use. California may add additional restrictions beyond the EPA label and does so through the classification of an EPA labeled pesticide as a California "Restricted Use" pesticide. California's DPR process also requires additional site-specific analysis, before any commercial application of pesticides (including herbicides). The analysis takes the form of a written recommendation for herbicide use prepared by a licensed Pest Control Advisor (PCA). Finally, this program requires that the application of any pesticides be supervised by licensed Qualified Applicators. The landowners work with all contractors to ensure applications are conducted in a professional manner that strictly follows all regulatory and licensing requirements. Licensed Qualified Applicators (QAL/QAC) are required to attend 20 hours of continuing education every 2 years to maintain their licenses. Pest Control Advisors are required to attend 40 hours of continuing education every 2 years.

When a pesticide is registered in California it has been determined through detailed testing and analysis (building upon the US EPA testing) that if applied according to the label restrictions there will not be significant adverse impacts upon the environment. The term label is misleading since labels are booklets of 30 to 50 pages in length. The testing and research includes evaluation of conditions under which the herbicides may be applied for various uses including forestry, yard & garden, agricultural field crops, orchards, vineyards, pastures and right-of-ways. The active ingredient of a given herbicide can be registered and labeled for use under one or more of these categories. Herbicide use on the landowner's forested property requires a written recommendation by a licensed Pest Control Advisor and application by a licensed Pest Control Operator (PCO).

Pesticides tested for both EPA label and DPR registration undergo a number of tests and evaluations of risk. These analyses and measures were designed to provide protection for human health and the environment and were developed under assumed use in urban and semi-urban/agricultural environments. Each pesticide has a label that describes possible environmental hazards associated with the use of the product. The label prohibits any use that is dangerous to the environment and describes

measures to minimize any adverse environmental effects. All pesticide handlers must, by law, undergo annual training in the safe and effective use of all pesticides they utilize. They are required to read those pesticide labels before use. This training also includes the use of personal protective equipment (PPE), and procedures for emergency medical treatment and spill cleanup. A Pest Control Advisor must certify, in a written recommendation, the alternatives and measures that would substantially lessen any significant adverse impact on the environment, have been considered and if feasible, adopted. Licensed Pest Control Operators must also read and follow any additional restrictions and/or measures listed on the PCA recommendation. Both PCAs and PCOs must maintain copies of all recommendations for one year following the date of the recommendation. Contractors must report the agricultural use (which includes timber production) of any restricted use pesticide to the agricultural commissioner within seven days of completion of the application. The PCO must report any pesticide use by the 1Oth of the month following an application to the county program coordinator.

The DPR registration process establishes how materials may be applied and used (through EPA label restrictions), and whether the label is adequate for human and environmental protection. If DPR finds the label lacking or finds some other issue of concern, it can change the status of the pesticide to a restricted class and add additional measures through that status. Representatives from several state agencies participate in this review to assist DPR. These agencies include Air Quality, Water Quality, Agriculture, Fish and Wildlife, and the Office of Environmental Health Hazard Assessment. Notices of the "Decision to Register" for each pesticide are posted for at least 30 days for public comment before such pesticide is finally licensed for use in the state. 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 new problems come to light, DPR is required to reopen and reexamine the registration.

The County's agricultural commissioner oversees portions of the DPR's functional equivalent program and is designated as a state agency for the purposes of certification (3 CCR 6100(a)(7)). Detailed records are kept on any pesticide application. This information is tracked by DPR and is available to the public. The labels usually require that non-protected contact with herbicides be avoided until the applied herbicides are dry. Most permitted or adjacent landowner access is by vehicle on company-controlled roads, and thus human contact with herbicides during the 12-24 hour drying period after application is unlikely. Employees and contractors working on the property spend little or no time in areas that are treated during the drying period. Thus, even in the most heavily traveled or accessible areas on the property, the likelihood of such contact is low enough to be considered insignificant in regard to adverse impacts.

Application of herbicides is not intended to eliminate entire populations of the targeted species. Both landowners encourage a healthy understory as a beneficial environment for the varied species of plant and animals that utilize our forests. There are fundamental differences in how herbicides are used in reforestation applications that provide added measures of protection and lower risk assessment for its use. Herbicide applications to specific areas within a forested watershed also do not create a substantial or potentially substantial adverse change in the environment. Impacts to target plants are short lived. Site occupancy/re-occupancy by invading vegetation or vegetation on site is rapid.

The properly timed application(s) of site-appropriate herbicide(s) can reduce the competition for light and nutrients from non-desirable or noxious plants, improve forest productivity, increase biodiversity and species richness, and lengthen the interval between fires through reduction in undesirable fuel loading. Additionally, once activated, the persistence of the herbicides in the soil is very short lived. In most cases, such persistence lasts only a few weeks and a few last up to one season. Herbicides used by the landowner break down in sunlight or by soil microbe activity. Thus in 5 years, and

especially after 10 years, there is a very low likelihood that any past herbicide use contributes to on-going effects.

Imazapyr is registered for forestry and right-of-way uses. Imazapyr is a non-selective, systemic plant growth inhibitor. This chemical is biologically active in plants at low concentrations. The plant rapidly takes up Imazapyr, where it inhibits an enzyme essential to plant growth. This enzyme is not present in other organisms. In forestry dissipation studies, reported values for the half-life of Imazapyr range from 14 to 44 days in forest litter, 19 to 34 days in forest soils, and 12 to 40 days on plants. Imazapyr is water soluble and does not readily bind to organic material in soils. Therefore, it is classified as highly mobile and can travel through soil with water and enter groundwater. It can also move with runoff and enter surface water. Its low application rates minimize potential impacts on surface or groundwater. Based on lab and field studies Imazapyr is practically non-toxic to fish, birds and bees on a short term (acute) basis. Imazapyr does not appear to bioaccumulate in animals and is classified as practically non-toxic to mammals on a short-term basis. We have reviewed DPR and EPA's research and testing for impacts pertaining to Imazapyr. Given the scientific and toxicological information in conjunction with the DPR and EPA testing and label restrictions, Imazapyr use would not pose a significant human health hazard nor produce any significant adverse environmental impacts when used in accordance to label or other regulatory restrictions and when used in the typical manner during reforestation.

Triclopyr controls woody plants and broadleaf weeds in forestland, rangeland and permanent grass pastures. It acts by disrupting plant growth and it is absorbed by green bark, leaves and roots and moves throughout the plant. It accumulates in the meristem region of the plant. Triclopyr is active in the soil and is adsorbed by clay particles and organic matter in the soil. Microorganisms degrade Triclopyr rapidly with the average half-life being 46 days. The potential for leaching depends on the soil type, acidity and rainfall. It should not present a leaching problem under normal conditions since it binds to clay and organic matter in the soil. It may leach from light soils if rainfall is very heavy. Sunlight breaks down Triclopyr rapidly in water in less than 24 hours. It is slightly toxic to practically non-toxic to soil microorganisms and it is low in toxicity to fish. Triclopyr does not accumulate in fish and is slightly toxic to practically non-toxic to invertebrates. Triclopyr is slightly toxic to mammals, but most Triclopyr is excreted, unchanged, in the urine. There are no reported long-term or short-term human health effects. It is not to be applied directly to water according to EPA label restrictions (EPA 352-378). Given the scientific and toxicological information in conjunction with the DPR and EPA testing and label restrictions, Triclopyr use would not pose a significant human health hazard nor produce any significant adverse environmental impacts when used in accordance to label or other regulatory restrictions and when used in the typical manner during reforestation.

Glyphosate, the active ingredient in the over the counter herbicide Roundup©, is used to control grasses, herbaceous plants including deep rooted perennial weeds, brush, and some broadleaf trees and shrubs. It is applied to foliage, is absorbed by leaves, and rapidly moves through the plant. It acts by preventing the plant from producing an essential amino acid. Aminomethylphosphonic acid is the main break-down product. It is generally not active in soil and is not usually absorbed from the soil by plants. It remains unchanged in the soil for varying lengths of time, depending on soil texture and organic- matter content. The half-life of Glyphosate can range from 3 to 130 days. The surfactant in roundup has a soil half-life of less than one week. The main breakdown product of the surfactant is carbon dioxide. Glyphosate dissolves easily in water. The potential for leaching into groundwater is low as it is strongly adsorbed by soil particles. It does not evaporate easily. Glyphosate has no known effect on soil microorganisms. It is practically non-toxic to birds and mammals and bees. It is no more than slightly toxic to fish and practically non-toxic to aquatic invertebrate animals. It does not build up in fish. There are no reported cases of long-term health effects in humans due to Glyphosate.

According to label restrictions, Glyphosate is not to be applied directly to water or wetlands. Typically, in forestland uses, Glyphosate is applied to individual weed species that are in competition with growing conifers. We have reviewed DPR and EPA's research and testing for impacts pertaining to Glyphosate. Given the scientific and toxicological information in conjunction with the DPR and EPA testing and label restrictions, Glyphosate use would not pose a significant human health hazard nor produce any significant adverse environmental impacts when used in accordance to label or other regulatory restrictions and when used in the typical manner during reforestation.

Use of herbicides could occur anywhere from pre-harvest to ten years post-harvest. The same can be said for the other methods of vegetation control as well. Prior to application, the following will be obtained:

1. A written recommendation will be made by a state licensed pest control advisor (PCA).

2. Application will be made by a state licensed Pest Control Operator (PCO) contracted and supervised by the RPF of record or PCA if available.

3. Herbicide(s) used will provide both contact and residual control of grasses and woody plants.

4. Site preparation application is normally made in the fall following the completion of logging and mechanical site preparation but may be utilized during the following spring and summer. Herbicide application for release from competing vegetation is normally in the fall or spring. Pre-harvest herbicide applications are normally made in the spring, summer, or fall, depending on the vegetative state of the target species. Hand applied, directed sprays can be applied during the spring, summer and fall. Weather patterns including temperature, wind speed, and rainfall will affect application decisions and PCA prescriptions.

5. If we use herbicides, those herbicides will only be applied from ground-based equipment or by ground crews using backpack sprayers. The factors affecting choice of application method include; the size and continuity of the target vegetation, cost, worker safety, the kind of herbicides to be applied, and regulatory constraints thereof.

6. If present or found by subsequent survey, special interest plants (including listed plant species) are protected from herbicides, by site-specific application of plant protection measures detailed under the biological resources section of this THP.

7. All required buffers near watercourses and wetlands will be carefully avoided.

In addition, "carefully avoided" means no herbicide will be directly applied in these buffers. Therefore, when we say required buffers, we mean those required by either the FPR or pesticide label, and we utilize whichever gives the most protection. In summary, based on the extensive testing by herbicide manufacturers for the US EPA, review and analysis of those tests by the EPA and DPR, the ongoing review of new information by DPR, and the application by a state licensed Pest Control Operator following the recommendations of a state licensed Pest Control Advisor, no significant cumulative impacts are anticipated to occur.

The potential for herbicides to move off-site via leaching or surface movement is a complex function of several variables including; rate and method of application, timing of the application relative to precipitation, soil characteristics, degree of moisture content, slope, surface and subsurface channeling, amount of vegetative or organic materials left on site, and the existence of

vegetative buffers around watercourses. Factors that minimized the risk of off-site movement include; targeted application, large woody debris, organic carbon resulting from prescribed burning, and substantial vegetative buffers retained in watercourse protection zones. In the unlikely event that forest management activities interface with water, in most cases, such water is normally free flowing, and thus any herbicide that does reach such waters would dilute rather than concentrate. While highly improbable, this possibility is only raised to place into context that even in a worst-case scenario, the potential for significant adverse effects, is extremely remote.

Biological effects of herbicide use can vary depending on the number of applications and the timing of the applications, but generally, field observations indicate that none of these above-mentioned herbicides are 100% effective in eliminating brush, forbs or weeds. Site control is usually reached within the first 4 to 5 years after planting, depending on the spacing and survival rate of planted conifers. All the products have labeled target vegetation species against which the material is effective, but even a total elimination of these labeled species is not typically gained, although there may be stunting of the growth of some of these species for a time.

From what is known about the toxicity of the chemicals as discussed above and the proper application methods; the label restrictions as specified above in regard to use around water and wetlands; the fact that these products are not repeatedly used in forest conditions on the same acreage as they might be used in other agricultural or urban settings; the relatively low toxicity as shown in the laboratory testing conducted thus far; and all the other factors discussed herein, it does not appear there is a substantial risk of a significant adverse environmental or other impacts.

Public concerns in the past have raised the issue of additives to herbicides used by other industrial landowners. We have attempted to identify each additive (commonly called adjuvants) added to a spray solution to enhance or modify its performance. A subset of adjuvants is surfactants, which are added by the applicator and mixed with the herbicide at the time of application. Surfactants are specialized additives, formulated to improve the emulsifying, spreading, sticking and absorbing properties of liquids. There are five surfactant classes: nonionic surfactants, crop oil concentrates, nitrogen-surfactant blends, esterified seed oils and organo-silicone surfactants. The use of a surfactant tends to reduce the amount of herbicide needed per square meter of application area, because they allow the herbicide to spread more evenly, with a thinner coat and they also cause the active ingredient to stick to leaf surfaces. We also add dye to mixes when hand applying herbicides to allow applicators to observe areas of application and avoid repeat spraying. Those additives commonly used by in reforestation efforts include: Hasten, Syl-Tac, Rainier EA, MOC/MSO (both methylated, non-ionic, esterified vegetable oils), crop oil concentrate, and Colorfast Purple or Hi-Light Blue (dye). Surfactants and additives are usually inert, detergents, vegetable oils, crop oils or petroleum distillates. The actual quantity of additives that are dispersed into the environment is very low in reforestation herbicide application. These additives break down quickly in the forest environment and repeat applications are minimal. The PCA is required to include any adjuvants used in each prescription and the PCO is required to report to the county agriculture commissioner herbicide application including adjuvants. Since the potential use of herbicides is speculative and removed from the THP in time, both the herbicides used as well as the adjuvants may be different in the future from those commonly used today.

Alternatives Considered

The landowner considers alternatives to the use of herbicides before any such use. In our evaluation of potential use of herbicides, a licensed agricultural Pest Control Adviser is utilized at the actual time of that potential use to determine if and when to use an herbicide. The advisor also must consider, if feasible, any reasonable, effective and practical protection measure, or use any feasible alternative

which would substantially lessen any significant adverse impact on the environment. These typical protection measures include specific restrictions on weather conditions and wind speed that prohibit using herbicides in conditions which might increase risks. They also include specific protections as to mixing, loading herbicides and washing equipment to prevent any accidental releases near watercourses. Each licensed agricultural Pest Control Operator shall have available a copy of a written recommendation covering each agricultural use application of an herbicide and shall operate in accordance with the product label or any pesticide permit issued by the county agriculture commissioner.

GRT, to the extent feasible, may utilize prescribed fire and mechanical methods to prepare a site for planting. Prescribed fire removes the physical barriers created by dead slash and living vegetation but has no effect on controlling re-sprouting of burned plants. The extent to which mechanical methods are effective will be one of the determining factors in whether, how, and when herbicides are used. Mechanical methods include ripping or sub-soiling, brush raking and piling to prepare a planting site.

Manually clearing brush does not have the same effect as herbicide application. Manual treatments temporarily control growth, but do not kill the plant. Pulling the plant out by the roots kills the plant altogether. Cutting most plants temporarily reduces above ground stems, but rapid re-sprouting usually does not result in effective conifer release. Therefore, the effects of manual brush control are less predictable and not as consistent as herbicide application. Manual clearing is not feasible because there is a lack of a large, local work force that would be willing to do very strenuous and logistically challenging work. The rate of injuries is also very high, for the work is tedious, difficult, and it often must be performed during adverse weather conditions. Once mechanical methods have been employed or have become impractical because young trees have been planted or have seeded in, there is no feasible alternative to herbicide application that might achieve a similar result.

It is also important to note that harvesting under the California Forest Practice Act (FPA) requires successful restocking of cleared sites and the maintenance of relative site occupancy by group A species in order to continue to meet the combined objectives of the landowner and the California legislature. These objectives are located in the intent section of the FPA, and Section 4551 as shown below (Emphasis added):

4513. Intent of Legislature. It is the intent of the Legislature to create and maintain an effective and comprehensive system of regulation and use of all timberlands so as to assure that:
(a) Where feasible, the productivity of timberlands is restored, enhanced, and maintained.
(b) The goal of maximum sustained production of high-quality timber products is achieved while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment.
4551. Adoption of district forest practice rules and regulations. The board shall adopt district forest practice rules and regulations for each district in accordance with the policies set forth in Article 1 (commencing with Section 4511) of this chapter and pursuant to Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code to assure the continuous growing and harvesting of commercial forest tree species and to protect the soil, air, fish and wildlife, and water resources, including, but not limited to, streams lakes and estuaries.

Chemical Contamination Effects Conclusion

Past activities involving chemical contamination of watercourses may have had an impact on the watershed in the distant past, but there is not a significant effect of those activities or from recent past projects within the WAA today. Future projects are not expected to cause significant adverse effects on chemical contamination as long as they are conducted in conformance with existing regulations. The proposed project is not expected to have a significant adverse impact on chemical contamination through compliance with existing regulations. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future

Projects on chemical contamination effects reveals that there are no significant cumulative impacts.

e. Peak Flow Effects

The assessment area experiences a Mediterranean climate with wet winters that typically bring long duration, low intensity storms commonly occurring from October to April. Occasional "bomb cyclone" or "atmospheric river" events can deliver high intensity rainfall, as was seen in November of 2024. Increases in peak flow arising from land management projects generally are associated with rapid runoff resulting from decreased evapotranspiration due to vegetation removal. Furthermore, peak flow has been shown to be directly associated with storm events rather than harvest levels. Studies on the Caspar Creek Watershed in Jackson Demonstration State Forest failed to correlate higher peak flows with harvest levels. However, the duration of peak flows was correlated with harvest, as the percentage harvest of a watershed increased the timing and duration of peak flows also increased. Peak flow can further increase if not only the vegetation is removed, but the soil and permeable ground is capped through development (e.g. pavement).

Approximately 12% of the assessment area has experienced some form of timber harvesting within the last ten years, all but 3.8% of which has been partial-cutting or even no-harvest silviculture. According to the literature, this past activity is not expected to have a significant adverse impact on the intensity or duration of peak flows. More substantial impacts within the WAA have likely resulted from residential development, grazing and agriculture, and timberland conversions.

Peak Flow Effects - Baseline Conditions

The THP area contains the following baseline conditions regarding peak flows:

- **Storm Events –** Storm events have been typical of the THP area's Mediterranean Climate. Several short duration, high intensity storms have been recorded in the area associated with atmospheric river events, leading to multiple peak flow events in small tributary streams. The mainstem Gualala River routinely floods within the WAA.
- **Harvest Intensity –** Portions of the plan area were last harvested approximately 35 years ago at a relatively intensive level (only 4 acres harvested under 2017 Selection). Today, conifer stocking and canopy cover is high throughout the THP area, which intercepts rainfall and has a net decrease on peak flows. Currently there are no conditions within the THP which are negatively impacting peak flows.

Peak Flow Effects - Past Projects

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment Area in regard to peak flow are those that remove timber or other vegetation on a large scale like historic era wildland burning (post-harvest), agriculture/grazing, and timber harvesting. Additional activities include LWD removal, paving and other development.

- Wildland Burning: A large-scale reduction in canopy and vegetation from past burning activities leads to excessive runoff and a lack of interception and delay of water reaching watercourses. This could have had an impact on peak flow in combination with storm events in the past.
- Agriculture/Grazing: Similar to burning, forested areas converted to grassland may have increased runoff to watercourses which in combination with storm events could have had impacts to peak flow in the past.
- Timber Harvesting: With intensive and expansive timber harvest, there may have been a lack of canopy on a large scale at various times that could have contributed to increased runoff and in combination with storm events, could have increased peak flow or the duration of peak flow in the past.

- Development: The pouring of concrete and asphalt in the developed portions of the WAA undoubtedly decreased canopy and ground vegetation and increased the amount of runoff as impermeable surface area increased. Undeveloped land and roadways that maintain a natural substrate have the ability to absorb and slow water and runoff in ways that concrete and asphalt cannot. Development increases runoff through the capping and covering of the natural landscape with smooth, basically impermeable surfaces. This allows water to concentrate and quickly flow as it drains across these surfaces towards drainage structures. Detention of water in developed areas can slow down the rate of runoff but not the total volume of runoff.

Peak Flow Effects – Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are timber harvesting, development, wildland burning, agriculture and grazing. It is anticipated that these activities will continue into the future. Harvesting and development are the main factors in the future that could affect peak flow, in combination with storm events, however with the FPRs, there is not expected to be a significant adverse impact on peak flow from harvesting because large scale clear-cutting followed by burning or conversion to grassland is not a permitted activity today.

Peak Flow Effects - Proposed THP

Silviculture (14 CCR 913): Adherence to FPRs and provisions in the THP are designed to maximize tree retention near streams and subsequently the filtering capability of the forest near watercourses, while minimizing sediment deposition. The silvicultural methods outside of the WLPZ require stocking levels to be adequate immediately after operations or within 5 years after operations (for Variable Retention). If the VR unit is not stocked through natural regeneration after the first few years, the unit will be planted with seedlings (artificial regeneration). Vegetation retention across the landscape, utilizing the silviculture proposed in this THP, shall reduce the possibility of extended peak flows as noted in the Jackson State study. Due to the level of selective harvesting in this watershed and the proposed THP there is not expected to be any measurable effect on peak flows associated with this harvest.

Yarding Methods (14 CCR 916; 923): This plan proposes to reduce potential peak flows as a result of operations through the following proposed management practices:

- Tractor operations are limited to existing skid trails when feasible or required. When skid trails have been blocked by the RPF, the LTO shall abide by these and avoid further encroachment on the trail.
- Exposure of significant areas of soil or reduction of large amounts of vegetation will not occur on large areas outside of the WLPZ.
- Slash remaining from operations will remain on-site to lessen raindrop impact for most of the project area. Slash can also be used to cover skid trails or landings that may need extra coverage.
- Large areas of exposed ground will not occur due to low amounts of repetitive skid trail use and no prescribed burning. There are few, if any, new facilities that will be needed during operations, and the majority of operations will utilize existing infrastructure. Waterbarring again after operations will improve drainage by refreshing the drainage facilities.
- Existing, well established mainline roads used for repetitive hauling are concentrated on the ridges and upper to midslopes away from watercourses.
- The application of soil stabilization measures for road and tractor watercourse crossings.

Peak Flow Effects Conclusion

The past activities in the WAA including historic era timber harvesting and burning, grazing and agriculture, and development of natural land may have had an impact in combination with and during storm events regarding higher peak flow rates or longer duration of peak flow. Because no

future activities are expected in the WAA that would convert forestland on a large-scale, and the proposed THP also does not propose large scale reduction in canopy or intensive broadcast burning, there is not expected to be a significant adverse impact from the proposed project or other timber harvest related projects. There may be, however, a continuing increase in total peak flow volumes from the development of land through paving and capping of permeable soils in developed portions of the WAA. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on peak flow effects reveals that there are no significant cumulative adverse impacts.

2. **Watercourse Condition**

a. Gravel Embeddedness

Excess fine sediment can cause gravels in the water body to become embedded (i.e., the fine sediment surrounds and packs-in against the gravels), which effectively cements them into the channel bottom. Embeddedness can prevent the spawning salmon from building their beds. The intrusion of fine sediment into gravel reduces intra-gravel flow of water by reducing permeability, which results in reduced rates of oxygen delivery to incubating embryos and removal of metabolic waste from the egg pocket. The volume of fine sediment in spawning substrates is thus an indirect measure of gravel conditions that affect survival to emergence, whereas permeability directly measures conditions affecting embryonic survival.

Halligan states that embeddedness is a problem on the Gualala River. The GRWTSD states that the Regional Board Staff was able to observe 6 miles of stream during their random sample field work and they observed a thin to non-existent armor layer underlain and embedded with fine sediment. The absence of an armor layer is indicative of an oversupply of sediment (Dietrich et al. 1989). The available statistics show a wide variability across the range and are sometimes worse and sometimes better than similar sized old growth watersheds. Although the D50 data set falls below the 38mm level as determined by Knopp 1993 for healthy watercourses the Gualala is a depositional reach that falls at a 1% gradient or less. Data collected from the Knopp study is mostly taken from watercourses with a 2% or greater grade. You would expect to find more fine sediment falling out of suspension as the watercourse gradient decreases.

Gravel Embeddedness - Baseline Conditions

The WAA contains the following baseline conditions regarding gravel embeddedness:

- **Fine Sediment –** NCWAP set target conditions for embeddedness as >50% or more of the stream length is <50% embedded. Embeddedness within the THP watercourses is estimated as low to moderate where most of the pool tail-outs had cobbles embedded less than 50%. As was previously stated roads, yarding, and unstable features all have the potential to contribute to fine sediment delivery within the plan area. Please refer to the description of Sediment Effects above.

Gravel Embeddedness - Past Activities

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment Area in regard to gravel embeddedness and excessive fine sediment are the same as those discussed above in the sediment effects section. It includes wildland burning, agriculture/grazing, development, road building, and timber harvesting. Sedimentation of watercourses led to the embedding of gravels and therefore a reduction in the quality of habitat for spawning anadromous salmonids. Effects of past activities can be seen today within the WAA, where sediment was once delivered to the watercourse in mass wasting, skid trails, and watercourse crossings.

Gravel Embeddedness – Reasonably Foreseeable Probable Future Projects

It is anticipated that the past activities in the WAA will continue to occur, but under modern day regulations. As discussed above in the sediment effects section above, the FPRs and other county and state regulations for roads and timber harvesting ensure that there is not a significant impact in the future.

Gravel Embeddedness - Proposed THP

Excessive sediment delivery to streams can increase gravel embeddedness. The following THP activities have been designed to avoid adverse impacts to water quality and maintain the existing watercourse condition described in the baseline conditions above:

- Silviculture – the methods chosen will regulate erosion upslope of and adjacent to watercourses, maintain streamside vegetation, and prevent sedimentation and pool filling. The Variable Retention unit maintains canopy and streamside vegetation around the Class III watercourses through aggregated patches of no-harvest, and much of the area outside of patches will still have ground cover in the form of brush, slash, and wildlife trees, or large oaks that will not be removed from the stand.
- Road Improvements – Watercourse crossing upgrades and drainage facility maintenance decreases sedimentation and large-scale bank mass wasting events. This THP proposed upgraded crossings to meet 100-year flood standards.
- Yarding Methods (14 CCR 923; 916) – use of existing skid trails that are stable and in good condition and appropriate waterbarring of these skid trails reduces the risk of erosion and sediment delivery to downstream watercourses.
- Soil Stabilization Measures – soil stabilization reduces rates of erosion and sediment delivery to downstream watercourses.
- Winter Period Operating Plan – prevents the use of heavy equipment on saturated soils which prevents erosion and sediment delivery to downstream watercourses.

Gravel Embeddedness - Conclusion

Historic past activities within the WAA may have had an adverse impact regarding sediment effects as discussed above, which can increase gravel embeddedness; however, past projects occurring after adoption of the FPRs and ASP rules have not contributed to a significant adverse impact. Future projects are not expected to have an adverse impact on gravel embeddedness. The proposed THP is not expected to have adverse impacts on gravel embeddedness. An evaluation of interactions of proposed project with impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on gravel embeddedness reveals that there are no significant cumulative adverse impacts.

b. Pools Filled

Salmonids need a variety of habitat types such as pools, riffles and flatwaters to accommodate different life stage functions during their lifecycle. Pool habitats are required by most salmonids at one or more life stages. Provided that water quality is adequate, primary pools provide critical summer habitat for steelhead and coho salmon.

Pools Filled - Baseline Conditions

The THP area contains the following baseline conditions regarding pool filling:

- **Sedimentation –** Most of the Class II watercourses within the Plan area have channels with a moderately developed pool structure and the RPF has observed minimal amounts of sedimentation filling these pools. Some of the larger watercourses have flatter gradients and therefore lack the ability to develop deep pools where there is a lack of LWD.

Pools Filled - Past Activities

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment

Area in regard to pools filled and excessive fine sediment are the same as those discussed above in the sediment effects section. It includes historic era wildland burning, agriculture/grazing, development, road building, and timber harvesting. Sedimentation of watercourses led to pools being filled and therefore a lack of protective and productive pool habitats. Effects of past activities can be seen today within the WAA, where sediment was once delivered to the watercourse in mass wasting, skid trails, and watercourse crossings, but is overall not significant in these watersheds.

Pools Filled – Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, development, wildland burning, and agriculture. It is anticipated that these activities will continue. There may be some sedimentation that can be attributed to these activities, but the effects are not significant in the WAA. As discussed above in the sediment effects section above, the FPRs and other county and state regulations for roads and timber harvesting ensure that there is not a significant impact in the future.

Pools Filled - Proposed THP

Excessive sediment delivery to streams can increase the rates of pool filling. The following THP activities have been designed to avoid adverse impacts to water quality and maintain the existing watercourse condition described in the baseline conditions above:

- Silviculture – the methods chosen regulate erosion upslope of watercourses, maintain streamside vegetation, and prevent sedimentation and pool filling. VR aggregates are focused around Class III watercourses and unstable areas to retain canopy and vegetation in these areas.
- Road Improvements – Watercourse crossing upgrades and drainage facility maintenance decreases sedimentation and large-scale bank mass wasting events.
- Yarding Methods– use of existing skid trails that are stable and in good condition and appropriate waterbarring of these skid trails reduces the risk of erosion and sediment delivery to downstream watercourses.
- Soil Stabilization Measures – soil stabilization like mulching and slash packing reduces rates of erosion and sediment delivery to downstream watercourses.
- Winter Period Operating Plan – prevents the use of heavy equipment on saturated soils which prevents erosion and sediment delivery to downstream watercourses.

Pools Filled - Conclusion

Historic past activities within the WAA may have had an adverse impact regarding sediment effects as discussed above, which can increase pool filling conditions; however, past projects occurring after adoption of the FPRs and ASP rules have not contributed to a significant adverse impact. Future projects are not expected to have an adverse impact on pool filling conditions, nor is the proposed THP expected to have adverse impacts on pool filling. An evaluation of interactions of the proposed project with impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on pool filling reveals that there are no significant cumulative adverse impacts.

c. Aggrading

Stream aggradation describes the raise in channel bottom elevation of a watercourse channel due to the deposition of sediment. As a result of this elevated sedimentation, or as an example of it, stream aggradation is evident throughout the watershed. A low to moderate level of aggradation has occurred within the streams adjacent to and within the project area, with McGann Gulch having moderate levels due to its gentler gradient. The streams within the plan that have higher gradients show less aggradation, as these streams are more capable of flushing the sediment downstream. Spawning gravels are impacted by the delivery of fine and coarse sediment to the stream which causes

aggradation, the burial of large woody debris and other structural elements, a loss of the stream's ability to effectively sort gravel, and a potential reduction in the dominant particle sizes.

Aggrading - Baseline Conditions

The THP area contains the following baseline conditions regarding stream aggradation:

- **Gentle Stream Gradients –** Big Pepperwood Creek and Little Pepperwood Creek (not formally named) have moderately gentle channel gradients adjacent to the THP area. Gentle stream gradients inhibit the rapid flushing of sediment downstream and has led to some stream aggradation. Stream aggradation is a natural phenomenon in the low-gradient depositional reaches of the Gualala River system, and this is not expected to change.

Aggrading - Past Activities

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment Area in regard to aggrading and excessive fine sediment deposition are the same as those discussed above in the sediment effects section. It includes wildland burning, agriculture/grazing, development, road building, and timber harvesting. Sedimentation of watercourses led to a rise in the elevation of the channel bottoms at times, and historic era skidding of logs down large watercourse channels may have changed the morphology of the channels and their gradients. Effects of past activities can be seen today within the WAA, where high volumes of sediment were delivered to the watercourse via mass wasting events, and the construction and long-term, metered inputs associated with skid trails, roads and watercourse crossings, but aggradation is not known to have effects at a significant level today.

Aggrading – Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, development, and to a lesser extent wildland burning and agriculture. It is anticipated that these activities will continue. As discussed above in the sediment effects section above, the FPRs and other county and state regulations for roads and timber harvesting ensure that there is not a significant impact in the future.

Aggrading - Proposed THP

Excessive sediment delivery to streams can increase the rates of aggradation, especially in lower gradient watercourses. The following THP activities have been designed to avoid adverse impacts to water quality and maintain the existing watercourse condition described in the baseline conditions above:

- Silviculture – the chosen methods will maintain an evenly distributed canopy, maintain streamside vegetation, and therefore prevent sedimentation and pool filling.
- Road Improvements – Watercourse crossing upgrades and drainage facility maintenance decreases sedimentation and large-scale bank mass wasting events that may lead to aggradation.
- Yarding Methods (14 CCR 923; 916) – use of existing skid trails that are stable and in good condition and appropriate waterbarring of these skid trails reduces the risk of erosion and sediment delivery to downstream watercourses.
- Soil Stabilization Measures – soil stabilization reduces rates of erosion and sediment delivery to downstream watercourses on timber harvest activities that expose bare mineral soil near watercourses.
- Winter Period Operating Plan – prevents the use of heavy equipment on saturated soils which prevents erosion and sediment delivery to downstream watercourses.

Aggrading - Conclusion

Historic past activities within the WAA may have had an adverse impact regarding sediment effects as discussed above, which can increase stream aggradation; however, past projects occurring after adoption of the FPRs and ASP rules have not contributed to a significant adverse impact. Future

projects are not expected to have an adverse impact on stream aggrading, nor is the proposed THP expected to have adverse impacts on stream aggrading. An evaluation of interactions of the proposed project with impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on stream aggrading reveals that there are no significant cumulative adverse impacts.

d. Bank Cutting and Downcutting

Bank cutting is indicated by areas of fresh, un-vegetated soil or alluvium exposed along the stream banks, usually above the low-flow channel and often with a vertical or undercut face. Severe bank cutting is often associated with channels that are down cutting, which can lead to over-steepened banks. As described above, high levels of sedimentation within the watershed has led to or is evidenced by stream aggradation. Also described above is the fact that more recently, sedimentation levels have been decreasing and the watercourses are now flushing the sediment downstream and are downcutting through this historic stored sediment, particularly in upper drainage areas where gradients are steeper.

Bank Cutting and Downcutting – Baseline Conditions

The THP area contains the following baseline conditions regarding bank cutting and downcutting:

- **Stream Aggradation –** As stated above, the THP area contains some gentle gradient watercourses that have experienced historic stream aggradation. The historic filling of these channel bottoms has led to a slight rise in elevation in the watercourse channel and therefore has resulted in varying levels of bank cutting and downcutting. This process is expected to continue as sediment is flushed from the upper reaches down to the mainstems, and eventually the South Fork and estuary.

Bank Cutting and Downcutting - Past Activities

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment Area in regard to bank cutting, downcutting and excessive fine sediment deposition are the same as those discussed above in the sediment effects section. It includes wildland burning, agriculture/grazing, rural development, road building, and timber harvesting. Sedimentation of watercourses led to a rise in the elevation of the channel bottoms at times, which causes watercourse channels to cut down through the deposited fine sediment. Evidence of bank and/or downcutting observed within the THP is primarily associated with outdated/undersized road watercourse crossings. The RPF has proposed corrective measures to address these sites in Section II. Effects of past activities can be seen today within the WAA, where high volumes of sediment were delivered to the watercourse via mass wasting events, and the construction and long-term, metered inputs associated with skid trails, roads and watercourse crossings, but severe bank cutting and downcutting is not known to be occurring at a significant level today.

Bank Cutting and Downcutting - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, rural development, and to a lesser extent wildland burning and agriculture. It is anticipated that these activities will continue. As discussed in the sediment effects section above, the FPRs and other county and state regulations for roads and timber harvesting ensure that there is not a significant impact in the future.

Bank Cutting and Downcutting - Proposed THP

Excessive sediment delivery to streams can increase stream aggradation rates, especially in lower gradient watercourses, which can, in turn, increase the rates of bank cutting and downcutting through deposited sediment before reaching the natural watercourse grade and native substrate. Excessive runoff, increased peak flows and undersized crossing facilities can also increase the rate and magnitude of downcutting through amplified velocity and force of flow. The following THP activities have been designed to avoid

adverse impacts to water quality and maintain the existing watercourse condition described in the baseline conditions above:

- Silviculture – the chosen methods will regulate erosion upslope of watercourses, maintain streamside vegetation, and prevent sedimentation and pool filling, while also regulating the amount of runoff reaching streams at rapid rates.
- Road Improvements – Watercourse crossing upgrades and drainage facility maintenance proposed under this THP decreases sedimentation and large-scale bank mass wasting events by sizing the crossing to withstand a 100-year flood event and effectively draining road prisms to reduce the potential for road failure. Inadequately sized crossings can increase the velocity of water as it passes through the constricted facility and cause major downcutting events at the outlet of the crossing. Outsloping of roads and installation of appropriately spaced waterbreaks will also reduce the potential for high velocity concentrated runoff by disrupting flow patterns on the road surface.
- Yarding Methods (14 CCR 923; 916; Mitigation) – use of existing skid trails that are stable and in good condition and appropriate waterbarring of these skid trails reduces the risk of erosion and sediment delivery to downstream watercourses. The reuse of existing facilities reduces the amount of new ground disturbance.
- Soil Stabilization Measures – soil stabilization reduces rates of erosion and sediment delivery to downstream watercourses.
- Winter Period Operating Plan – prevents the use of heavy equipment on saturated soils which prevents erosion and sediment delivery to downstream watercourses.

Bank Cutting and Downcutting – Conclusion

Historic past activities within the WAA may have had an adverse impact regarding sediment effects as discussed above, which can increase bank cutting and downcutting; however, past projects occurring after adoption of the FPRs and ASP rules have not contributed to a significant adverse impact. Future projects are not expected to have an adverse impact on bank cutting and downcutting, nor is the proposed THP expected to have adverse impacts on bank cutting and downcutting. An evaluation of interactions of the proposed project with impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on bank cutting and downcutting reveals that there are no significant cumulative adverse impacts.

e. Bank Mass Wasting:

The Gualala River system and surrounding topography evolved in response to rapid geologic changes along the west coast of North America over the past 30 million years, and especially in the last five million years. The landmass west of the South Fork of the Gualala is an uplifted portion of the Pacific Plate, a result in the change of plate boundary with the North American Plate to the east. The new transform fault system, knowns as the San Andreas Fault is a right-lateral strike-slip fault that brought the Pacific plate up from the southwest over the last 30 million years. The main fault is located in the South Fork Gualala River. The drainage networks evolved along with the changing landscape. The drainage network of the Gualala River is fault controlled and records the major tectonic and flood events that took place.

The landscape continues to change, most notably by flood-caused mass wasting. Mass wasting and erosion affect fluvial geomorphic conditions, which in turn affect aquatic habitat conditions. The causes of mass wasting are varied. A large percentage of mass wasting is a result of natural geologic processes. Grazing cattle and sheep on unstable grasslands and timber harvesting or road building on unstable soils can also result in mass wasting. Roads produced the highest sediment delivery to watercourse channels when compared to other erosion processes (MSG 1999). The majority of the

road related mass failures were associated with fill slope problems, indicating that proper road construction techniques are critical for protecting instream resources.

Bank Mass Wasting - Baseline Conditions

The THP area contains the following baseline conditions regarding bank mass wasting:

- **Roads** – The existing road network within the project area contains primarily upper slope and ridgetop seasonal roads. Besides spur roads constructed in the modern era, these roads were likely built to facilitate historic logging operations in the 1960s. The roads proposed for use under this THP are serviced by adequate drainage facilities. A few of these drainage structures are outdated, which could contribute to bank mass wasting in the event of a failure. These sites are proposed to be upgraded.
- **Yarding** – The THP area was likely logged in the 1950s and 1960s using ground-based equipment. Therefore, there is an existing network of skid trails, and the trails proposed to be used under this THP appear stable and in good condition. Waterbarring of legacy skid trails was not consistent with modern day FPRs, therefore trails which were not reused and waterbarred in the 1990s harvest (because of slope limitations of the FPRs) caused some unrestricted runoff and small-scale bank mass wasting events, as noted in sediment effects above. These instances have not had any observable significant adverse effects on water quality in the recent past, and in most cases they are self-ameliorating.
- **Unstable Areas** –Published geologic maps for the Gualala River watershed indicate extensive debris sliding and debris flow features within the WAA as well as probable rock slides and earth flows. The RPF has identified several unstable areas within the THP area. Many of these are located upslope of watercourses and are a result of either natural erosional processes or historical logging activities within and adjacent to watercourses. Some of these features appear to have been caused by inadequate skid trail drainage, improper road-building techniques, and inadequate road drainage design. Historically, these features have likely contributed to active sedimentation and bank mass wasting.

Bank Mass Wasting - Past Activities

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment Area in regard to bank mass wasting, landsliding and excessive amounts of sediment and organic debris in watercourses are the same as those discussed above. It includes wildland burning, agriculture/grazing, rural development, road building, and timber harvesting. Effects of past activities can be seen today within the WAA, where landsliding and erosion once delivered sediment and organic debris to a watercourse, but severe or significant mass wasting is not known to be at a significant level. These events may have occurred because of past management practices in the WAA in combination with natural geologic processes, and contribute to the overall sediment effects of the WAA. This condition alone does not have a significant impact on the WAA.

Bank Mass Wasting - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, wildland burning, agriculture and rural development. It is anticipated that these activities will continue. As discussed above in the sediment effects section above, the FPRs and other county and state regulations for roads and timber harvesting ensure that there is not a significant impact in the future on bank mass wasting.

Bank Mass Wasting - Proposed THP

Landsliding within watercourses, and all mass wasting events within the WAA, may continue to occur as a result of natural erosional processes, and may continue to occur as a result of past management activity. The following THP activities have been designed to avoid adverse impacts to water quality and maintain

or improve the existing watercourse conditions described in the baseline conditions above:

- Silviculture – the chosen methods will regulate erosion upslope of watercourses, maintain streamside vegetation, retain aggregate patches around unstable areas, Class III watercourses, and headwall swales, and retain vegetative cover and root strength across the majority of the plan area, especially in high risk areas.
- Unstable areas – Areas exhibiting evidence of slope instability within the THP have been designated special treatment equipment exclusion zones (EEZs) with canopy retention requirements. High risk and/or active unstable areas have been designated no-harvest zones.
- Road Improvements – Watercourse crossing upgrades and drainage facility maintenance decreases sedimentation and large-scale bank mass wasting events. This THP proposes several road and crossing upgrades.
- Yarding Methods (14 CCR 923; 916) – Use of existing skid trails that are stable and in good condition and appropriate waterbarring of these trails reduces the risk of erosion and sediment delivery to downstream watercourses. Cable yarding of steep, erosive slopes reduces ground disturbance and loss of root strength.
- Soil Stabilization Measures – soil stabilization reduces rates of erosion and sediment delivery to downstream watercourses.
- Winter Period Operating Plan – prevents the use of heavy equipment on saturated soils which prevents erosion and sediment delivery to downstream watercourses.

Bank Mass Wasting – Conclusion

Historic past activities within the WAA may have had an adverse impact regarding sediment effects as discussed above, in which bank mass wasting likely played a significant role; however, the effects of those activities are not significant today. Further sedimentation from bank mass wasting is expected to continue as a natural process within the WAA, but this is not expected to occur at significant levels. Future projects are not expected to have an adverse impact on bank mass wasting, nor is the proposed THP expected to have adverse impact on bank mass wasting. Indeed, improvements to, or active decommissioning of, historic logging roads is expected to occur under future projects just as they have on recent past project. An evaluation of interactions of the proposed project with impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on bank mass wasting reveals that there are no significant cumulative adverse impacts.

f. Scouring:

Scouring is described in the Forest Practice Rules as "Stream channels that have been stripped of gravel and finer bed materials by large flow events or debris torrents. Streamside vegetation has often been swept away, and the channel has a raw, eroded appearance." Large flow events are described below under the discussion of flooding. Flood events in the Gualala tend to deposit massive amounts of sediment from upstream gravels and cobbles, as well as finer sand and silt. Scouring may occur in some of the tributaries within the WAA outside of the flood prone areas. NCWAP aerial photo interpretation and gravel mining records states that downcutting may have occurred in the South Fork Gualala River. However, no recent areas of scouring have been noted in the North Fork. There is one instance of scouring within the THP induced by a debris torrent which is described in the geologic writeup. Watercourse channels within the THP area generally have intact substrate and bank vegetation.

Scouring - Baseline Conditions

The THP area contains the following baseline conditions regarding scouring:

- **Large Flow Events –** After the drought of 2020-2022 ended the WAA has seen three good water years. In the 2024/2025 water year, the Gualala flooded in the months of November, December and February with another notable flow event on February 23, 2026. However, with the heavy

alluvium load within the Gualala River, the effect of scour exposing and striping the channel bottoms to bedrock is not evident. As noted above, only one channel in the THP area exhibits a raw, eroded appearance, therefore the level of scouring within the WAA and THP area is considered low.

Scouring - Past Activities

The primary activities that could have contributed to past adverse impacts of the Watershed Assessment Area in regard to scouring are those that remove vegetation on a large scale like historic era wildland burning (post-harvest), agriculture/grazing, and watershed-wide clearcut logging (timber harvesting). Additional activities that may induce or encourage scouring include instream LWD removal/dredging and timberland conversion.

- Wildland Burning: A large-scale reduction in canopy and vegetation from past burning activities leads to excessive runoff and a lack of interception and delay of water reaching watercourses. This could have had an impact on peak flow and scour in combination with storm events in the past.
- Agriculture/Grazing: Similar to burning, the conversion of forested areas to grasslands may have increased runoff and delivery potential which in combination with peak storm events could have had impacts to peak flow and scour in the past.
- Timber Harvesting: With intensive and expansive timber harvest in the past, there may have been a lack of canopy on a large scale at various times followed by wildland burning that could have contributed to increased runoff and in combination with storm events, could have increased peak flow, the duration of peak flow, and scour in the past.

Scouring - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are timber harvesting, wildland burning and agriculture and ranching. It is anticipated that these activities will continue in the future. Harvesting is the main factor in the future that could affect scouring due to peak flow or large flow events. However, with the FPRs, there is not expected to be a significant adverse impact on peak flow in combination with storm events because large scale clear-cutting followed by burning or conversion to grassland is not a permitted activity today.

Scouring - Proposed THP

- Silviculture (14 CCR 913): Adherence to FPRs and provisions in the THP are designed to maximize tree retention near streams and subsequently the filtering capability of the forest near watercourses, while minimizing sediment deposition. Vegetation retention across the landscape, utilizing the silviculture proposed in this THP shall reduce the possibility of extended peak flows as noted in the JDSF study. Due to the level of selective harvesting in this THP there is not expected to be any measurable effect on peak flows and scouring of watercourse channels associated with this harvest.
- Yarding Methods (14 CCR 916; 923): This plan proposes to reduce the effects of peak flows and scouring as a result of operations through conformance with the FPRs using the following proposed management practices:

  -Tractor operations limited to existing skid trails when feasible.

  -Exposure of significant areas of soil or reduction of large amounts of vegetation will not occur on large areas.

  -Slash remaining from operations and or standing vegetation will remain on-site to reduce raindrop impact.

  -Large areas of exposed ground will not occur due to low amounts of repetitive skid trail use and no prescribed burning.

-Existing, well established mainline roads used for repetitive hauling are concentrated on upper slopes and ridges away from watercourses when feasible.
-Upgrading of watercourse crossings.

Scouring - Conclusion

Because past activities were conducted on a larger scale that led to the reduction of forested land and canopy in the WAA, there may have been an impact during storm events regarding higher peak flow rates, longer duration of peak flow, and the resulting scouring of channels. Because no future activities are expected in the WAA that would convert forestland on a large-scale, and the proposed THP does not propose large scale reductions in canopy or intensive broadcast burning, there is not expected to be a significant impact on scouring. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on scouring potential reveals that there are no significant cumulative adverse impacts.

g. Organic Debris:

See Organic Debris Effects discussion under Cumulative Watershed Effects above.

h. Streamside Vegetation:

Streamside vegetation and near-stream vegetation provide shade or cover to the stream, which may have an impact on water temperature, and provide stability to stream banks and floodplains and filter sediment from flood flows. Root systems of terrestrial vegetation provide a natural stabilizing factor of streamside banks and canopy provide terrestrial insect drop (i.e. fish food) and nutrients in the form of leaf litter and organic material. Leaf litter, organic material and their associated nutrients are known to be utilized as a food source by benthic macro-invertebrates, which in turn are a major food source of fish. Terrestrial vegetative bank protection is substantial within the assessment area in the form of large conifers, hardwoods, sedges, grasses, ferns, and various forbs.

Streamside Vegetation - Baseline Conditions

The THP area contains the following baseline conditions regarding streamside vegetation:

- **Canopy Cover** –The THP area contains several Class II and Class III watercourses, and wet areas. Streamside vegetation and shade canopy along watercourses across the Plan area varies from as high as 100% to as low as 70% (Class III only). There are no areas that are severely lacking in canopy or vegetation within the project area. Canopy cover is comprised mainly of mature redwood, Douglas-fir, and tanoak. Understory stream vegetation includes ferns, sedges, grasses and forbs. While historic logging activities may have removed canopy cover adjacent to watercourses, current conditions reveal adequate regeneration, high stocking, and recovered shade canopy. There are WLPZ roads within the WAA. WLPZ roads inherently decrease canopy cover adjacent to watercourses, as road construction and maintenance requires the removal and/or pruning of overstory trees, however this does not make up a significant portion of the assessment area.

Streamside Vegetation - Past Activities

The main activities that could have contributed to past adverse impacts of the Watershed Assessment Area, specifically to streamside vegetation, are wildland burning, agriculture/grazing, rural development, road building, and timber harvesting, similar to the discussion for sediment effects above.

- Wildland Burning: Past burning activities could have reduced or removed canopy and streamside vegetation. Burning of streamside vegetation including forbs and lower canopy species could have greatly impacted slope stability and water temperatures.
- Agriculture/Grazing: Past grazing and agriculture limited forestlands and possibly streamside vegetation, and over-grazing near riparian areas may have greatly impacted slope stability,

water quality, and water temperatures.

- Rural Development: Building and converting within riparian areas reduced the amount of streamside vegetation available.
- Road Building: Road building and mass wasting events of the past, prior to modern day regulations, undoubtedly removed streamside vegetation.
- Timber Harvesting: Historic timber harvesting did not take into account riparian zones or WLPZs, and harvesting and removing of streamside vegetation was common.

Streamside Vegetation - Reasonably Foreseeable Probable Future Projects

As described above, the main activities that have been conducted within the Watershed Assessment Area are timber harvesting, wildland burning and agriculture and ranching. It is anticipated that these activities will continue in the future. Road building, agriculture, and rural development are the main factors in the future that could affect streamside vegetation. With the limitations imposed by the FPRs, there is not expected to be a significant adverse impact on streamside vegetation because clear-cutting and burning of the WLPZ is not a permitted activity.

Streamside Vegetation - Proposed THP

Excessive removal of streamside vegetation can cause slope instability, increases in water temperature, increases in sedimentation and loss of refugia for aquatic species. The following THP activities have been designed to avoid adverse impacts to water quality and maintain or improve the existing watercourse conditions described in the baseline conditions above:

- Silviculture – The chosen methods will regulate erosion upslope of watercourses, maintain streamside vegetation, and prevent excessive erosion leading to sedimentation and pool filling.
- Road Improvements – Watercourse crossing upgrades and drainage facility maintenance decreases the risk of failures near watercourses, thereby protecting streamside vegetation.
- Yarding Methods (14 CCR 923; 916) – use of existing skid trails that are stable and in good condition and appropriate waterbarring and removal of temporary crossings of these skid trails reduces the risk of erosion and sediment delivery to downstream watercourses, and also the loss of streamside vegetation due to erosion. Equipment limitation zones and exclusion zones impose restrictions on heavy equipment use within WLPZs, Class IIIs and wet areas.
- Soil Stabilization Measures – stabilizing bare mineral soil that was exposed during watercourse crossing activities, pulling of temporary crossings, and road crossing upgrades prevents or reduces erosion and potential sediment delivery to downstream watercourses, and aids in the effect of streamside vegetation and cover.

Streamside Vegetation – Conclusion

Intensive, pre-FPR timber harvesting likely removed much of the streamside vegetation at once, which undoubtedly had significant effects on watershed health. More recent past harvesting conformed to the FPRs and did not include the large-scale removal of streamside vegetation. The current baseline condition of the WAA includes an abundance of streamside vegetation. Future projects within the WAA are expected to promote and protect streamside vegetation through conformance with modern regulations. The THP as proposed is designed to protect streamside vegetation. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on streamside vegetation reveals that there are no significant cumulative adverse impacts.

i. Recent Floods:

Flooding of the Gualala River is a common event and occurs nearly every winter. The mainstem has extensive floodplains within the WAA which regularly flood. The likelihood of flood events within the project area itself is extremely low given the topography and channel morphology, therefore, no impacts on the current watercourse conditions relating to flooding are anticipated. In WAA, however, flooding is a common occurrence and is expected to continue with regularity.

Recent Floods - Baseline Conditions

The Gualala River regularly floods its banks. A rise in elevation of the alluvial flood plain adjacent to the river (a sediment trap) has been documented. It has been estimated that the alluvial flats have risen up to 3.5 feet in the last thirty years due to sediment depositions. These flats therefore act as sediment traps during flooding. Recent flooding events have not significantly changed the watercourse conditions in the WAA, as the floodplains of the Gualala River watershed are accustomed to regular flooding and resulting sediment trapping effects.

Recent Floods Conclusion

Recently flooding in the WAA has occurred. This is to be expected, is in line with historic observations, and is not expected to significantly change the watercourse conditions of the WAA. There are no floodplains or proposed operations within floodplains associated with this THP.

Additional Watershed Considerations: Fog Drip Discussion

Timber stands close to the coast receive significant amounts of moisture from fog drip. Dawson (1996) determined that 8-34% of water used by coastal redwood trees and 6-100% of water used by understory vegetation originated as fog drip. The closer to the coast the more pronounced the effect since more days have significant fog. The removal of canopy by harvesting in the past reduced the amount of fog interception and therefore reduced fog drip (at least temporally until the canopies grow back and close in). The effect on ground water and stream flow is less clear since although fog drip is reduced by removal of canopy through logging, evapotranspiration is also reduced by the removal of the tree. Loss of evapotranspiration from forest harvest may be a more significant variable to changes in watershed hydrology than fog drip (Keppeler 1998). Timber harvest has been found to increase streamflow by diminishing transpiration and canopy interception, which offsets any reduction in fog drip. This was concluded by Keppeler in 2007 in her post-harvest analysis of a 65% selective harvest by volume stand and a 50% clearcut by area stand in the Caspar Creek watershed.

Fog Drip - Baseline Conditions

The proposed THP is located within the zone of coastal fog influence (fog belt). The assessment area frequently experiences heavy fog during the morning hours of the summer and fall months. Redwoods growing in this belt contribute to fog drip within the WAA. The forested area within the WAA has a high volume of large redwood trees. The project area has a moderate volume of small to medium seized redwood trees.

Fog Drip – Past Projects

Historic projects in the assessment area that removed vast areas of old growth and large second growth redwood at once undoubtedly impacted fog capture, absorption, and delivery to the ground. The amount of fog absorption and drip produced prior to the initial harvest was probably very high. Between intensive harvests, fog drip probably increased as trees and crowns regenerated. Selective harvests within the WAA under more recent past projects would have maintained or improved fog drip by opening stands through selection and small clear-cuts while allowing residual dominant and codominant trees to increase their crown growth and therefore fog capturing capacity. These more recent harvests in the WAA have allowed the stands to gain more resources for growth from the removal of other competing trees, which allows the

residual trees to grow their crown larger than it would have if no thinning took place; stagnation would eventually occur. The more space redwood crowns have, the more capable they are of capturing large amounts of fog for their own absorption as well as fog drip.

Fog Drip - Reasonably Foreseeable Probable Future Projects

Future projects within the WAA and project area would maintain or improve fog drip from all regeneration methods in the FPRs. The use of unevenaged methods on GRT lands in the future would especially maintain or improve fog drip. There may be a slight temporary reduction post-harvest for certain areas, and then a return to the baseline and likely an increase over time.

Fog Drip - Proposed THP

Fog is common in the plan area and fog drip may be slightly reduced initially as a result of the proposed operation, but it is not expected to be significant and will actually increase over time. Given the proposed silvicultural prescriptions, it is anticipated that the THP will not have an impact on fog drip since there will still be a high amount of well-distributed large-crowned redwood trees capable of fog capture. The largest trees in the THP area are in the WLPZ, especially the core zone, which is a no-cut area. An abundance of large conifers shall be retained post-harvest that will continue to input fog precipitation into the watershed.

Fog Drip Conclusion

Fog drip is common in the WAA and project area, and both contain a large tree component, especially in the WLPZs. Past projects of greater scale and harvest intensity, such as the initial old growth harvest, probably reduced fog drip input in a dramatic way within the WAA. More recent entries were more selective, and less intensive and therefore did not have a significant impact. The project area has been experiencing healthy fog drip input, relative to the climate conditions. Future projects and the proposed THP may have a slight temporary reduction post-harvest, but over time will return to baseline or increase in the amount of fog drip produced. An evaluation of interactions of the proposed project with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on fog drip reveals that there are no significant cumulative adverse impacts.

Watershed Resource Overall Conclusion

In conclusion, there is not a significant cumulative adverse impact to Watershed Resources with the implementation of this THP. There may still be an impact to the watershed regarding sediment effects within the WAA from historic past projects; this can impact water temperature, aggradation, pool filling, down cutting and bank cutting conditions. The impact of excessive sedimentation is a result of historic logging practices, land development, road construction, and heavy equipment operations within unstable areas, all of which occurred prior to the implementation of the California Forest Practice Rules (FPRs). The baseline conditions indicate there is still some evidence of sediment delivery in watercourses within the project area and WAA from these past practices, but not at a level that is significant. There are no significant effects expected from future projects, and with conformance with the FPRs, no significant impacts are expected from the proposed THP. All other watershed conditions not related to sediment effects do not indicate a significant impact from the past, present, reasonably foreseeable probable future projects or the proposed THP. Altogether, the RPF has concluded that there will be no significant cumulative impacts to the watershed resources of the assessment area as a result of this project. All of the watershed effects and watercourse conditions are expected to be maintained or positively impacted through the implementation of this project.

Identification of Information Sources: A. <u>Watershed Resources</u>

Brown, L.R., P.B. Moyle, and R.M. Yoshiyama. 1994. Historical Decline and Current Status of Coho Salmon in California. North American Journal of Fisheries Management. 14(2):237-261.

CAL FIRE GIS Data 2024 & 2025.

California Regional Water Quality Control Board (CRWQCB), Technical Support Document for the Total Maximum Daily Load for Sediment and Temperature for the Gualala River Watershed. 2001. Adopted by the Board in 2004.

California Salmonid Stream Habitat Restoration Manual; State of California Resources Agency Department of Fish and Game; Second Edition; October 1994.

Past THPs on record with the California Department of Forestry and Fire Protection (CAL FIRE) Santa Rosa office and CalTREES.

Porter-Cologne Water Quality Control Act; State Water Resources Control Board, June 1992.

State Water Resources Control Board Resolution No. 98-055. "APPROVAL OF THE 1998 CALIFORNIA SECTION 303(D) LIST AND TOTAL MAXIMUM DAILY LOAD PRIORITY SCHEDULE".

Water Quality Control Plan for the North Coast Region; North Coast Regional Water Quality Control Board; September 21, 1989.

Thalweg profile analysis, Gualala River Watershed Assessment & Cooperative Monitoring Program (O'Connor and Rosser 2006).

Gualala River Watershed Assessment Report. North Coast Watershed Assessment Program, Klimt, Robert R.C. LeDoux-Bloom, J. Clements, M. Fuller, D. Morse, and M. Scruggs (multidisciplinary team leads). 2002. Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

GRWC Monitoring Plan Report 2000-2005, Kathleen Morgan , 2006.

Weaver, W.E., and D.K. Hagans. 2015. Handbook for Forest and Ranch Roads - A Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining and Closing Wildland Roads. Prepared for the Mendocino County Resource Conservation District, Ukiah, California. 420 pp.

CDFW, 2003. South Fork Gualala River Stream Inventory Report.

Dawson, T. E. 1996. The use of fog precipitation by plants in coastal redwood forests. Pages 90-93 in J. LeBlanc, editor. Proceedings of the conference on coast redwood forest ecology and management. University of California, Cooperative Extension, Forestry.

Keppeler, E. T. 1998. The summer flow and water yield response to timber harvest. In: Proceedings of the Conference on Coastal Watersheds: The Caspar Creek Story. USDA, United States Forest Service Pacific

Southwest Research Station Gen. Tech. Rep. PSW-GTR-168. pp 35-44.

Ziemer, R. R. 1998. Flooding and stormflows. Pages 15-24 in R. R. Ziemer, editor. Proceedings of the conference on coastal watersheds: the Caspar Creek story. General Technical Report PSW-GTR-168. USDA Forest Service, Pacific Southwest Research Station, Albany, California.

Richardson, P.W., Seehafer, J. E., Keppeler, E.T., Sutherland, D. G., Wagenbrenner, J. W., Bladon, K.D., Dymond, S.F., Cole, R.P. 2021. Fifty-eight years and counting of watershed science at the Caspar Creek Experimental Watersheds in northern California. California Department of Forestry and Fire Protection; National Science Foundation, Grant/Award Number: NSF-EAR-1807165; USDA Forest Service.

Fongers, D. and Fulcher,J. 2002. Hydrologic Impacts Due to Development: The Need for Adequate Runoff Detention and Stream Protection. Water Management Division Michigan Department of Environmental Quality. Revised May 2002.

A Study Evaluating the Effectiveness of Riparian Buffers in Minimizing Impacts of Clearcut Timber Harvest Operations on Shade-Producing Canopy Cover, Microclimate, and Water Temperature along a Headwater Stream in Northern California, Cajun Elaine James 2003.

Regional Assessment of Stream Temperatures Across Northern California and their Relationship to Various Landscape-Level and Site Specific Attributes, Lewis et al. 2000, Forest Science Project, HSUF Arcata, CA.

Lewis, J., S. Mori, E. Keppeler, and R. Ziemer. 2001. Impacts of logging on storm peak flows, flow volumes and suspended sediment loads in Caspar Creek, California. Pages 85-125 in: M. S. Wigmosta and Steven J. Burges editors. Land Use and Watersheds: Human Influence on Hydrology and Geomorphology in Urban and Forest Areas. Water Science and Application Volume 2, American Geophysical Union, Washington, D.C.

Dietrich, W. E., Kirchner, J. W., Ikeda, H., & Iseya, F. (1989). Sediment supply and the development of the coarse surface layer in gravel-bedded rivers. Nature, 340(6230), 215-217.

Knopp, C. (1993). Testing indices of cold water fish habitat. Unpublished Final Report submitted to the North Coast Regional Water Quality Control Board and the California Department of Forestry under Interagency Agreement No. 8CA16983. Sacramento, CA. 56 p.

Dennis Halligan. GRI Westside THP Fisheries Report. 2000. NRM 1434 Third St. Eureka, CA 95501.

Gualala River Watershed Literature Search and Assimilation by Patrick Higgins 791 Eighth Street, Suite N, Arcata, CA 95521 707-822-9428.

Gualala Redwoods Inc. Stream Reports for The Years 1994 to 2025.

Geo Hazard Maps Created by Tim Best, C.E.G.

USGS 7.5' Quad Map: McGuire Ridge.

Geologic maps and reports, https://www.conservation.ca.gov/cgs.

California Department of Conservation, Division of Mines and Geology, Note 50.

Fuller et al. California Geological Survey. Geologic and Geomorphic Features Relating to Landsliding, Gualala River Watershed, Plate 1, Sheet 1 of 3 (Northern Area). 2002.

Lidar imagery of the Gualala River Watershed.

Flood Prone Area Considerations in the Coast Redwood Zone. California Department of Forestry and Fire Protection. 2005.

Personal Communications

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Scott Kelly, RPF and Forest Manager, Conservation Fund.

B. Soil Productivity Resources

1. Organic Matter Loss

Significant losses of organic matter can result in long-term loss of soil productivity. Loss of organic matter will expose topsoil to erosion, which along with duff, litter layer and woody debris provides the source of nutrients for future forest growth. Organic matter loss can occur by displacement of surface organic materials during skidding, mechanical site preparation, and other land disturbing activities 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.

The THP area contains the following baseline conditions regarding organic matter:

- **Existing Infrastructure** – The THP currently contains an existing network of roads and skid trails in which organic matter was displaced and possibly removed during past project activities. Evidence of past fires is apparent in some areas; however, the intensity of the fire is unknown. Burning results in organic matter loss.
- **Unstable Features** – The RPF has identified several unstable features within the THP area. Most of these are located upslope of watercourses and are a result of either natural erosional processes or historical logging within and adjacent to watercourses. These features have likely contributed to organic matter loss through bank mass wasting.

Organic Matter Loss - Past Projects

The main activities that may have contributed to past adverse impacts of the Soil Productivity Assessment Area (THP area), specifically to organic matter loss, are wildland burning, road building, and timber

harvesting.

- Wildland Burning: Past burning activities could have reduced the amount of vegetation and slash after harvest on a large scale, reducing the amount of organic matter available for soil production. There have been no cases of broadcast burning within the project area in the recent past. Pile burning has occurred along roads and landings and is expected to continue.
- Road Building: Road building within the project area removed topsoil and displaced organic matter within road alignments. Many legacy roads have revegetated, and there is a low density of roads proposed for use within the THP.
- Timber Harvesting: Past timber harvesting in general did not take into account the value of organic matter in the production of soil, a vital component of a healthy forest. The historic logging of the 1950s and 1960s in the project area resulted in the most organic matter loss. More recent past harvests do not appear to have resulted in any significant organic matter loss.

Organic Matter Loss - Reasonably Foreseeable Probable Future Projects

Future projects within the project area will follow the FPRs and therefore are not expected to have a significant adverse impact on soil productivity. The existing road system should be sufficient to facilitate future harvests, and with the exception of potential short spur roads, loss of organic matter as a result of new road building activities is not anticipated or expected to be significant. Much of the project area will likely be managed again in the same manner in roughly 10-20 years. Slash generated from future harvests is expected to remain on site to contribute to organic matter and topsoil production.

Organic Matter Loss - Proposed THP

- Silviculture: THP Item #14 describes the silvicultural methods proposed in this THP. The unevenaged silviculture methods proposed will retain a high degree of overstory and understory cover throughout the Plan area and particularly along WLPZ corridors, upland areas adjacent to tributaries, and on steep slopes and unstable areas. The VR units will still maintain high canopy levels around watercourses within no-harvest aggregate patches and will still have vegetative cover outside of patches in the form of brush, slash, small trees, larger oaks, and any wildlife trees. Expected high levels of post-harvest vegetative cover throughout the plan area will help maintain and regulate the deposition of organic matter.
- Yarding Methods: The use of existing skid trails will reduce the amount of organic matter loss in the project area since they were already converted in the past. The use of exception skid trails in a portion of the Group Selection unit will allow for the reuse of existing skid trails and avoid the need for new road and landing construction. Slash or straw mulch will be used to cover large areas of exposed soil. Slash generated in the woods from operations will remain to decompose and produce topsoil.
- Road Construction: New road construction is limited to 150’ of spur road.
- Site Preparation: Organic matter may be locally displaced if site preparation activities occur in VR units but will not necessarily be lost from the unit. Aggregate patches will continually deposit material outside of their boundaries into areas where organic matter may be displaced through site preparation. Planting following site preparation activities will also ensure that there will be both short and long-term accumulation of organic matter loss that may be displaced from the VR units of this THP. This will not add to or cause any adverse impacts regarding organic matter loss.

Organic Matter Loss Conclusion

The existing conditions within the Soil Productivity Assessment Area regarding organic matter indicate that there may have been an impact in the past, but since the last harvest entry in the 1990s

the effects have become less than significant. There has been a natural input of organic matter after the last harvest to the present day. The proposed THP activities will not have a significant impact on organic matter loss. An evaluation of interactions of the proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on organic matter loss reveals that there are no significant cumulative adverse impacts, and that current conditions will be maintained through the project implementation.

2. Surface Soil Loss

Topsoil is the major storehouse of nutrients that provide current and future site fertility. Displacement or loss of topsoil can have an immediate and long-term negative effect on an area to grow trees and plants, which may not be readily measurable. Soil loss occurs from mechanical displacement (scalping) during road construction, harvesting, or site preparation and by surface erosion or mass wasting on harvest units. Removing the surface soil has a disproportionate effect 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. Loss of soil by surface erosion from harvesting units is generally small for timber operations conducted under current Forest Practice Rules, and mass wasting (above background rates) from timber operations is prevented by identifying and placing limits on operations in unstable areas.

The THP area contains the following baseline conditions regarding surface soil loss:

- **Existing Infrastructure** – The THP currently contains an existing network of roads and skid trails in which surface soil was displaced during past project activities. Much of this network is located on steep slopes and near watercourses which will not be utilized again. These alignments have revegetated, have well developed topsoil, and have integrated into the forest matrix.
- **Unstable Features** – The RPF has identified several unstable features within the THP area. Most of these are located upslope of watercourses and are a result of either natural erosional processes or historical logging within and adjacent to watercourses. These features have likely contributed to surface soil loss through bank mass wasting.

Surface Soil Loss - Past Projects

The main activities that may have contributed to past adverse impacts of the Soil Productivity Assessment Area (THP area), specifically to surface soil loss, are road building and timber harvesting.

- Road Building: Historic road building within the project area removed topsoil and displaced organic matter on a limited amount of area. Recent past projects included very limited road building with the primary goal of facilitating cable yarding of ground previously tractor logged.
- Timber Harvesting: Past timber harvesting in general did not take into account the surface soil in the production of soil, a vital component of a healthy forest. The historic logging of the 1950s and 1960s in the project area resulted in the most surface soil loss. More recent past harvests do not appear to have resulted in any significant surface soil loss.

Surface Soil Loss - Reasonably Foreseeable Probable Future Projects

Future projects within the project area will follow the FPRs and therefore are not expected to have a significant adverse impact on soil productivity. The existing road system should be sufficient to facilitate future harvests, and with the exception of potential short spur roads, loss of organic matter as a result of new road building activities is not anticipated or expected to be significant. Much of the project area will likely be managed again in the same manner in roughly 10-20 years. Slash generated from future harvests is expected to remain on site to contribute to organic matter and topsoil production.

Surface Soil Loss - Proposed THP

- Yarding Methods: The use of existing skid trails will reduce the amount of surface soil loss in the project area since they were already converted in the past. Ground-based operations will result in some displacement of topsoil through skidding of logs; however, the disturbance will be minimal due to the reuse of existing trails, and the topsoil generally stays on site. The proposed exception practice discussed in Section III of the THP and described above under Sediment Effects has the potential to increase surface soil loss through surface soil erosion and slope instability. To minimize these potential impacts the RPF has proposed to limit heavy equipment use to only preexisting, stable skid trails and installing waterbreaks at extreme EHR intervals. Additionally, potential impacts relating to surface soil loss are further minimized by avoiding the need for construction of new roads and landings and soil displacement as a result of log dragging by utilizing existing infrastructure designed for ground-based yarding.
- Road Construction: Road Construction: New road construction is limited to 150' of spur road.

Surface Soil Loss Conclusion

The existing conditions within the Soil Productivity Assessment Area regarding surface soil loss indicate that there may have been an impact in the past, but since the last harvest entry in the 1990s the effects have become less than significant. There has been a natural input of organic matter and topsoil has remained relatively undisturbed after the last harvest to the present day. The proposed THP activities will not have a significant impact on surface soil loss. An evaluation of interactions of the proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on surface soil loss reveals that there are no significant cumulative adverse impacts, and that current conditions will be maintained through the project implementation.

3. Soil Compaction

Highly compacted soils inhibit plant growth for a variety of reasons and can cause increased surface water runoff resulting in erosion. Soil compaction in timberlands is typically caused by heavy equipment running repeatedly over soils that are partially saturated. The THP area contains the following baseline conditions regarding soil compaction:

- **Depth of Surface Litter** – The depth of the surface litter is variable within the THP area, however on average the depth ranges from 2-18 inches. The surface litter is comprised of leaf litter (tanoak and madrone), needle cast (redwood, pine and Douglas-fir), branches, twigs and duff. The surface litter is well distributed and is neither lacking nor excessive within the THP area. The surface litter in the THP area is sufficient to prevent excessive soil compaction due to ground-based operations.
- **Soil Structure** – The soil structure within the Plan area is moderate to highly permeable and well-drained indicating pore space between soil particles. Soil structure is susceptible to soil compaction when the space between pores is large. However, much of the project area is located in areas with predominantly sandy soils that have large grain sizes which are less likely to compact.
- **Soil Organic Matter Content** – The soil organic matter content within the THP area is primarily composed of decaying leaf litter, needle cast, branches, bark, and logs. Forb species (bracken fern, sword fern, and redwood sorrel) also contribute to the soil organic matter content. Because the soils within the THP area have a healthy amount of soil organic matter, the risk of excessive soil compaction is reduced.

- **Presence and Amount of Course Fragments in the Soil** – Soil within the THP area has a moderate depth to bedrock. The soil is derived from marine sandstone parent material. The amount of course fragments in the soil is moderate to high. An abundance of coarse fragments in the soil makes it less susceptible to compaction.
- **Soil Texture** – The soil within the Plan area has high detachability and is primarily composed of sand with smaller amounts of loam and clay.
- **Soil Moisture Status –** The soil moisture within the THP area varies throughout the year. On average the available water capacity of the specific soil types is low. Soil moisture depends greatly on microsite within the Plan area. Riparian corridors with higher amounts of LWD, canopy cover, and organic soil material tend to retain soil moisture throughout the year.

Soil Compaction - Past Projects

The main activities that may have contributed to past adverse impacts of the Soil Productivity Assessment Area (THP area), specifically to soil compaction, are road building and timber harvesting.

- Road Building: Road building within the project area removed topsoil and compacted soil within the running surface of the prism.
- Timber Harvesting: Historic and more recent harvest activities likely resulted in some level of soil compaction along skid trails. As noted above, the physical attributes of the soil in the THP area resist compaction, so this impact is not significant.

Soil Compaction - Reasonably Foreseeable Probable Future Projects

Future projects within the project area will follow the FPRs and therefore are not expected to have a significant adverse impact on soil productivity. The existing road system should be sufficient to facilitate future harvests, and with the exception of potential short spur roads, soil compaction as a result of new road building activities is not anticipated or expected to be significant. Much of the project area will likely be managed again in the same manner in roughly 10-20 years. Slash generated from future harvests is expected to remain on site to contribute to organic matter and topsoil production.

Soil Compaction - Proposed THP

- Yarding Methods: The use of existing skid trails will reduce the amount of new areas being compacted in the project area since those were already converted in the past. Ground-based operations will result in some further compaction of existing trails, but the surface of the skid trails will still be able to provide growing space (to some grass, shrub and tree species) and will contain waterbars and dips for drainage.
- Road Construction: Road Construction: New road construction is limited to 150’ of spur road.

Soil Compaction Conclusion

The existing conditions within the Soil Productivity Assessment Area regarding soil compaction indicate that there may have been an impact in the past, but since that time the effects have become less than significant as sites recover. Future projects are not anticipated to require extensive new road construction. The proposed THP activities will utilize the existing seasonal road system and will not result in further soil compaction. An evaluation of interactions of the proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on soil compaction reveals that there are no significant cumulative adverse impacts, and that current conditions will be maintained through the project implementation.

4. Growing Space Loss

Potential losses to growing space would primarily result from new road, landing, skid trial construction,

and/or mass wasting events. The roads to be construction include maximum width specifications which will reduce the amount of road construction and ensure that no unnecessary land be taken out of production. There are no present significant effects to soil productivity due to growing space loss in the project area.

The Caspar Creek watershed study (Keppeler, Reid, and Lisle, 2009) provides an example of how practices related to growing space have improved over the past two to three decades. When the South Fork was logged selectively with crawler tractors from 1971 to 1973, approximately 15% of the watershed was compacted through the creation of roads, skid trails, and landings. When the North Fork was logged from 1985 through 1991, only about 3% of the basin was found to be compacted by creating new roads. Since practices have continued to improve, this level of impact to growing space can be anticipated to continue at the 1985 through 1991 level or decline even further.

The THP area contains the following baseline conditions regarding growing space loss:

- **Road Building** – there is an extensive, in-tact and functional road system within the property that once removed growing space but now allows access to forested areas to continue to promote the growth of the forestland. Many legacy roads constructed during the mid-century logging era have either been decommissioned or left to revegetate on their own. It is in the timberland owners best interest to maintain growing space and not over build roads to the point of excessively reducing growing space.

Growing Space Loss - Past Projects

The main activity that may have contributed to past adverse impacts of the Soil Productivity Assessment Area (THP area), specifically to growing space loss, is road building.

- Road Building: Road building within the project area removed topsoil and compacted soil in its prism. All current roads are maintained, and therefore have permanently converted the growing space. There are no significant impacts from this past activity removing growing space to soil productivity of the project area.

Growing Space - Reasonably Foreseeable Probable Future Projects

Future projects within the project area will follow the FPRs and therefore are not expected to have a significant adverse impact on soil productivity. The existing road system should be sufficient to facilitate future harvests, and, with the exception of potential short spur roads, growing space loss as a result of new road building activities is not expected to be significant. Much of the project area will likely be managed again in the same manner in roughly 10-20 years. During this break of activity, road that are not part of the permanent road system will continue to grow vegetation, and previously used skid trails will temporarily return to available growing space.

Growing Space Loss - Proposed THP

- Yarding: Although some existing skid trails will be reused, many of the older skid trails that once caused growing space loss will not be reused for various reasons. These trails are and have been regrowing vegetation, therefore there will be a net positive for growing space in this regard.
- Road Construction: Road Construction: New road construction is limited to 150’ of spur road.

Growing Space Loss Conclusion

The existing conditions within the Soil Productivity Assessment Area regarding growing space loss indicate that there was not a significant impact in the past, and there is not a present significant adverse impact to soil productivity in the assessment area. Future projects are not anticipated to

require extensive new road construction. This THP should not result in additional growing space loss. An evaluation of interactions of the proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on growing space loss reveals that there are no significant cumulative adverse impacts, and that current conditions will be maintained through the implementation of this project.

Soil Productivity Resource Overall Conclusion

In conclusion, there is not a significant cumulative adverse impact to Soil Productivity Resources with the implementation of this THP. The baseline conditions indicate high soil productivity within the THP area, and no observable significant adverse impacts to soil productivity from past projects. This project will result in some organic matter displacement and surface soil displacement, but this is not expected to occur at a significant level due to conformance with FPRs. This project is not expected to have an impact on soil compaction or growing space loss because road construction is not proposed, and existing skid trails will be reused to the extent feasible within tractor ground. The proposed silviculture will maintain organic matter inputs across the project area, and slash generated from logging will protect and eventually contribute to surface soils. The RPF has concluded that there will be no significant cumulative impacts to the soil productivity resources of the assessment area as a result of this project.

Identification of Information Sources: B. Soil Productivity Resources

Keppeler, Elizabeth & Reid, Leslie & Lisle, Tom. (2009). Long-term Patterns of Hydrologic Response after Logging in a Coastal Redwood Forest.

Past THPs on record with the California Department of Forestry and Fire Protection (CAL FIRE) Santa Rosa office and CalTREES.

USDA Natural Resources Conservation Service Web Soil Survey web site:
https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

GRT's geographic information system maps.

Soil Veg Maps - http://sonomavegmap.org/blog/category/soils/

Personal Communications
Mark Pugsley, Forest Manager, Gualala Redwood Timber, LLC.

John Bennett, Retired Forest Manager, Gualala Redwood Timber, LLC.

C. Biological Resources

The Biological Assessment area (BAA) comprises all areas within 0.7 miles of the THP boundaries. The 4,928-acre BAA is portrayed on the WAA and BAA map in Section V. The habitat within the BAA is generally densely forested and includes a stretch of riparian habitat along the mainstem Gualala River. There are no known large rock outcrops, ponds or wetland areas, or large bodies of water. This assessment area as described is large enough to account for any effects that may be caused by this THP.

There are two Class I watercourses adjacent to the THP and four Class I watercourses within the BAA (Big Pepperwood Creek, "Little Pepperwood Creek", Rockpile Creek and the Gualala River). There are four NSO activity centers located within the BAA.

The biological resources are the plants, vertebrate, and invertebrate species that inhabit the Biological Assessment Area during all or part of the year. Species of concern are those identified as known Rare, Threatened or Endangered listed (US & CA) species, CDFW species of special concern (SSC) and Sensitive Species listed by the Board of Forestry. The Natural Diversity Data Base (NDDB) of the California Department of Fish and Wildlife (DFW), California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California, the California Wildlife Habitat Relationships System (WHR) and various wildlife biologists were consulted for occurrences of special plants, animals and natural communities on the biological assessment area. While the BAA is comprised of the area within 0.7 miles of the THP, eight (8)* USGS quadrangles (the one the project is in its adjacent quads) were assessed for plant and animal occurrences. The eight quadrangles include: McGuire Ridge, Gualala, Eureka Hill, Zeni Ridge, Ornbaun Valley, Gube Mountain, Annapolis and Stewarts Point 7.5-minute quadrangles.

*Stewarts Point OE W 7.5' Quad was not included in the query as 90+% is offshore and is not representative of the habitat found near the THP.

Biological Resources - Baseline Conditions

The THP contains the following baseline conditions regarding biological resources, in which each are expanded on below this list:

(1) **Known Listed Species** – Please see the extensive list below for all species that could be directly or indirectly affected by proposed project activities. Although there are many species known to exist within the BAA and have habitat within the project area, there are no species that are expected to be adversely affected by proposed operations.
(2) **Significant Known Wildlife or Fisheries Resource Concerns** - The Gualala River is 303(d) listed as sedimentation/siltation, aluminum, and temperature impaired (with a TMDL). Some forest habitats are limited or impacted within the project area and BAA due to a lack of burning over the last century (large scale fire suppression) and lack of maintenance of forests which allows for an overabundance of dense brush species like manzanita and huckleberry to persist and take over.
(3) **Aquatic and Near Aquatic Habitat Conditions -** Please see the species list below for the current conditions of pools and riffles, large woody material, and near-water vegetation as it applies to aquatic species. Overall, this resource is generally in good condition in the BAA. The Gualala River system has a high amount of deep sediment, and these gravel bars move substantially during flood events, but the increasing amount of LWD being reintroduced to the river allows for the development of pool structures in certain portions of the river. Aquatic habitat is in good condition within the plan area and immediate surrounding area, but some effects like sedimentation are evident today at a less than significant level to aquatic species.
(4) **Biological Habitat Conditions** - Please see the section below for the current conditions of snags/den trees/nest trees, downed large woody material, multistory canopy, road density, hardwood cover, late seral (mature) forest characteristics, late seral habitat continuity, and special habitat elements. There is a moderate presence of snags (primarily Douglas-fir and sugar pine from drought and overcrowding) and special characteristic trees near riparian areas, a healthy multistory canopy, downed large woody material, low road density with few drainage issues, moderate hardwood cover, no late seral forests or habitats.

(1) Known Listed Species and (2) Known Wildlife or Fisheries Resource Concerns

Birds

Northern Spotted Owl (*Strix occidentalis caurina*): (Status: Federal Threatened, State Threatened CDF Sensitive Species)
There are 4 NSO Activity Centers within 0.07 miles of the THP. The northern spotted owl primarily inhabits old growth forests in the northern part of its range (Canada to southern Oregon) and landscapes with a mix of old and younger forest types in the southern part of its range (Klamath region and California) . The species' range is the Pacific coast from extreme southern British Columbia to Marin County in northern California. It nests in cavities or on platforms in large trees and will use abandoned nests of other species. The Northern Spotted Owl is primarily nocturnal. Its diet consists mainly of wood rats (Neotoma sp.) and flying squirrels, although it will also eat other small mammals, reptiles, birds and insects.

One threat to spotted owl populations, at least in the northern part of its range, has been the loss of old-growth and mature late-seral forest, which contains large dead trees for nesting and prey habitat, as well as cool, dark roosts under the dense overstory canopy. Fragmentation of remaining habitat results from logging and roads and may have increased predation by Great Horned Owls and other species. More recently (since 1960s), a related eastern species, the Barred Owl (Strix varia), has invaded the Pacific Northwest. Barred owls are larger, more aggressive, and compete for both nest-sites and food. It is believed that Barred Owls occasionally attack spotted owls but the evidence for this is sparse. More likely the slightly larger barred owl displaces Spotted Owls from their territory. Barred Owls will also mate and hybridize with spotted owls. Barred Owls in the west occur in both young and old forest and are thought to displace spotted owls from their territories in old growth and mature forests. Additional threats to Spotted Owls include loss of habitat to wildfire and forest diseases as well as the West Nile Virus.

The habitat typing used in this assessment is consistent with the USF&WS Coastal Northern Spotted Owl Habitat Description.

> Nesting-roosting habitat includes: 60% (or greater) canopy cover of trees 11 inches (or larger) diameter at breast height.
>
> Foraging habitat includes: 40% (or greater) canopy cover of trees 11 inches (or larger) diameter at breast height. Basal area of 75 (or greater) sq. ft. of trees 11 inches (or larger) diameter at breast height.

The timberland owner is working with Forest Ecosystem Management (FEM) to develop and refine the Northern Spotted Owl habitat classification in GIS, which will allow for more accurate habitat mapping and analysis. FEM biologists ground truth habitat typing during NSO surveys and Activity Center walk-in visits. FEM's preliminary overview finds that company has correctly mapped the NSO habitat, and in some cases is more conservative than the FEM surveyor's typing.

Priority Ranking of Habitat Retention Areas
Tree Species Composition.
Mixed conifer stands should be selected over pine-dominated stands.

A. Abiotic Considerations include the following:
i. Distance to Nest.

> I. Nesting-roosting and foraging habitat should be located closest to identified nest tree(s), or closest to roosting tree(s), if no nesting trees are identified.

ii. Contiguity.

I. Nesting-roosting habitat within the 0.5-radius circle around an activity center must be as contiguous as possible.

II. Fragmentation of foraging habitat must be minimized as much as possible.

iii. Slope Position.

I. Habitats located on the lower one-third of slopes provide optimal microclimatological conditions and an increased potential for the presence of intermittent or year-round water resources.

iv. Aspect.

I. Habitats located on northern aspects provide optimal vegetation composition and cooler site conditions.

v. Elevation.

I. Habitat should be located at elevations of less than 6000 feet, although the elevation of some activity centers (primarily east of Interstate 5) may necessitate inclusion of habitat at elevations greater than 6000 feet.

Size and Shape of Habitat Patch

a. Narrow strips of habitat (WLPZs, retention areas between clearcuts, etc.) may contain the characteristics of nesting-roosting habitat. However, when these narrow strips of habitat are surrounded by unsuitable or low-quality habitats, they function as foraging habitat at best.

b. Narrow strips of habitat (100 meters or less) provide for a lot of edge habitat and little or no interior habitat. Franklin et al (2000) describe interior habitats as the amount of spotted owl habitat ≥100 meters from an edge. They describe edge habitat as edge between spotted owl habitat and all other vegetation types.

c. Because WLPZs, for example, are 100 meters or less in total width, they are generally considered edge habitats surrounded by unsuitable habitat. Edge habitats do not provide for protection from predators, nor do they provide the microclimates of interior habitats.

No take discussion

The THP as proposed will not 'take' NSOs nor will NSO habitat within the assessment area be reduced below threshold levels established by the Forest Practice Rules or guidelines recommended by USFWS. Approval of this THP will require the Director to determine there will not be a take of Northern Spotted Owl (NSO) as a result of timber operations. This determination will be based on the fact that the plan is in conformance with 14 CCR 919.9 (d) and current guidelines developed by USF&WS specifically to avoid take of NSO. The USF&WS guidelines are intentionally ultraconservative to ensure that, if followed, the Director can confidently determine no take will occur. THP Section II, Item 32 contains operational actions to avoid take of NSO. THP Section V contains non-operational information such as CNDDB reports, activity center walk-in survey results, evening survey results, pre and post-harvest habitat maps, a map of survey routes and tables of activity center habitat acreage summaries. This non-operational information provides the Director supporting evidence that the THP conforms to the USF&WS guidelines and 14 CCR 919.9 (d). Methods to avoid take of NSO include locating the birds, seasonal restrictions, restrictions based on proximity to NSO activity centers and prohibitions on reducing acres of habitat below thresholds determined by USF&W and the Rules of the Board of Forestry. Because this THP will not result in take and conforms to USF&WS guidelines, cumulative negative impacts are avoided. The effects of the proposed operations cannot accumulate with effects of past or foreseeable future projects to negatively impact NSO. Additional information on the Spotted Owl has been attached in Section II and Section V of the plan.

Marbled Murrelet (*Brachyramphus marmoratus)* Status: Federal Threatened, State Endangered, Board of Forestry Sensitive Species.

In California the species ranges from the Oregon border south to Santa Cruz County. Specific nesting

habitat of this species is large, older, sometimes decadent trees (Carter and Erickson 1988, and others). Although marbled murrelets have been found nesting in some cases in younger trees, and also on the ground, they have primarily been found nesting in over mature coniferous forest throughout most of their range (Carter and Erickson 1988, Paton and Ralph 1988, Hamer and Cummins 1990, 1991). Throughout most of the year this species is found in small groupings in near shore coastal waters where they feed on small baitfish. Habitat loss, gillnetting, and catastrophic events such as oil spills and wildfire are potential threats to this species.

Department of Fish and Game biologists have utilized radar technology near where the Annapolis Road crosses the South Fork and Wheatfield Fork. They suspect that murrelets fly up the Gualala River, although at this time murrelets have not been visually confirmed. Private biologists working for landowners have conducted extensive surveys along the South Fork Gualala River and at the confluence of the North Fork and South Fork. No murrelets were detected during these surveys. The nearest known occurrence of marbled murrelet is over 9 miles south of the plan area, where in 1999 CDF&W staff documented vocalizations and below canopy flight over the Clipper Mill Bridge. Habitat within the THP and BAA is not conducive to murrelet nesting.

Northern Goshawk (*Accipiter gentilis*): (Status: Board of Forestry Sensitive Species and CDF&W Species of Special Concern)
In California the northern goshawk is an uncommon resident. Goshawks typically breed on north slopes, near water in the densest parts of mature conifer forests but close to openings. The nest is usually located in fork of large horizontal limbs in large live trees at the bottom of the live canopy. In the north coast redwood belt goshawks are extremely rare nesters and irregular transients. They are not known to breed this far south in the coast range. It is unlikely that goshawks are present within the THP area. The habitat present is not suitable for the species, and there are no recorded occurrences within the assessment area.

Osprey (*Pandion haliaetus*): (Status: BOF Sensitive Species, CDF&W Species of Special Concern)
The range of this species in California is the northern portion of the state where their nest sites are associated with large fish-bearing bodies of water. In the north coast region this species is a common summer resident and breeder; but rare in winter (Harris 1991). Typical habitat consists of large, elevated trees or artificial structures for nesting within a few kilometers of a fish source (Johnsgard 1990). Although ospreys are most often very tolerant of human activity and often nest adjacent to roads and other conspicuous locations, disturbance of nest sites during the nest season (April-early October) can cause nest abandonment.

Osprey nests have been continually monitored on landowner's property since at least 1975. There are several known osprey nests clustered around the mouth of the Gualala River. There are no known active nests within the BAA, and no raptor nests were observed during THP layout. There have historically been nests along the South Fork Gualala River.

Bald eagle (*Haliaeetus leucocephalus*): (Status: Federal Delisted, California Endangered, BOF Sensitive Species)
In California, bald eagles breed in the northern quarter of the state. The species winters throughout most of their breeding range, with half of the state's population wintering in the Klamath Basin (Zeiner et al. 1990b). Specific winter habitat of this species is generally large trees with open crowns near large creeks, rivers, or lakes that have a fish supply. In Mendocino and Sonoma County bald eagles are a rare winter migrant; only a few individuals are observed annually. These wintering eagles are opportunistic hunters and scavengers, normally passing through the area during their winter migration. The Gualala River drainage provides foraging habitat. Bald eagles prefer large trees to hunt from, and many large trees will be left standing after operations are complete. The proposed project will have no effect on bald eagles

foraging opportunities.

There are no known nests of bald eagles in the assessment area. Bald eagles are a premier species and are quite visible. If nesting was occurring in the area, it is doubtful that it would be missed by local residents or by foresters or biologists working for the company. Bald eagles are routinely seen along the coastline and near the Gualala estuary, but there have been no sightings within the assessment area.

Golden Eagle (*Aquila chrysaetos*): (Status: BOF Sensitive Species, CDF&W Species of Special Concern)
The range of golden eagles in California is throughout the state, scarce in the southeastern desert region, and they are found in rolling country with lightly wooded areas, savannas, grasslands, desert edges, farms, or ranches. The species is a rare to uncommon resident and breeder (Harris 1991). The overall breeding densities of this species are relatively low, due to territorial spacing of nesting and foraging habitats. Overall population densities of this species currently appear stable, but excessive disturbance at nest sites can cause nest failure.

In Mendocino County and Sonoma County the golden eagle is an uncommon permanent resident and local breeder. Locally, golden eagles use a variety of habitats, including conifer and hardwood forests, mixed conifer-hardwood woodlands, coastal oak woodlands, and grasslands. Golden eagle forage and roosting habitat with some nesting habitat can be found in the assessment area. Usually, golden eagles prefer cliff ledges or large wolfy trees in more upslope and remote areas. No large nest structures were observed, and no golden eagle nests are known to exist in the assessment area.

Peregrine Falcon (*Falco peregrinus*): (Status: Federal – Delisted in 1999, California – Candidate for Delisting (Fully Protected), BOF Sensitive Species)
In California, the species breeds and winters throughout the state, with the exception of desert areas (CDF&G 1990). In the north coast region, they are an uncommon migrant and winter visitor; a rare, local breeder, and summer resident (Harris 1991). The specific habitat of this species is tall cliffs for nest and perch sites with protection from mammalian predators and the weather, most often close to water and adequate prey populations. Peregrines are not known to be present in the vicinity of the project and there are no large vertical cliffs within the assessment area. It is known that peregrines forage up and down the coast, up some of the major river valleys and over the clearcut blocks, which may occur within the assessment area. This foraging area will not be affected by operations. Logging activities should not negatively impact the birds' ability to capture prey. The proposed project will have no effect on Peregrine falcons.

Great Blue Heron (*Ardea herodias*): (Status: BOF Sensitive Species)
In California this species ranges throughout most of the state up to approximately 4,900' above sea level, with heronries scattered throughout northern California (Zeiner et al. 1990b). Great blue herons inhabit a wide variety of freshwater and saltwater habitats. Foraging areas include coastal bays, lagoons, tidal flats, mud flats, and rocks along rivers, creeks, ponds, and lakes (Yocom and Harris 1975) and agricultural lands and along watercourses in mountainous areas. Their heronries are often found in brush, on rocks and ledges, or on the ground, but they prefer groves of trees near feeding areas (Zeiner et al. 1990). Individual large trees are sometimes used by single pairs of herons as well. Threats to this species include alteration of habitat through development and harvesting or inadvertent destruction of nest trees.

The birds are often seen foraging along the larger forks of the Gualala River. The main concern with this species would be protection of a nesting colony from disturbance although these species are known to nest singly as well. A heronry or individual heron nest should have been visible during the THP layout, and none were observed.

Great egret (*Casmerodius albus*): (Status: BOF Sensitive Species)
In California, the range of great egrets is widespread throughout the state except at high elevations, and in desert areas (Brown et al. 1986). The specific habitat of this species is nearly synonymous with that of the great blue heron, with the two species often foraging and breeding in proximity. After severe population declines around the turn of the century due to the harvest of their feathers, populations have rebounded. Alteration or draining of wetlands habitat, as well as industrial or residential development are considered threats to the continued wellbeing of this species. As with great blue herons, no great egret rookeries are known in the BAA. No egrets or nests were observed.

Mammals

Pacific Fisher (*Martes pennanti*): (Status: Federally Endangered, State Threatened for Southern Sierra Nevada ESU/DPS)
The THP is located within the Historic Fisher Range and where Fishers are rare or absent (Ouick Reference: Range of Martes *pennant,* The Pacific fisher in California, Coastal California Map, CDF&FP, August 2009). The range of the Pacific fisher in California is the Pacific coastal range, Siskiyou range and Sierra Nevada Mountains. Primarily nocturnal, the pacific fisher is a good climber and swimmer. Its home range on the California coast can be up to 3,700 acres for females and 14,000 acres for males. The fisher prefers stands with large trees and high canopy closure. Douglas fir and true fir were the preferred forest types in the Coast Range. Oaks, especially black oaks appear to be important for denning in some areas. Its main quarry is hares, porcupines, squirrels, mice, chipmunks, carrion, fruit and other plants. It dens in hollow trees, logs or rocky crevices. It has natal denning areas and once kits are old enough, they are moved to maternal denning areas. The natal period occurs as early as March 1 and extends to May 15th. Maternal denning occurs from May 16th and is usually completed by July 31st.

Resting areas include large limbs, raptor or squirrel nests, and mistletoe brooms. The fur is especially prized, which has caused its extirpation in some areas. It requires extensive wilderness, so loss of habitat has also depleted populations. One threat to fishers may be the loss of large decadent trees that contain cavities that are used for natal and maternal denning. No fishers have ever been detected within the GRT ownership. Within the watershed, loss of large decadent features that would be used by fishers occurred mostly at the turn of the century and again in the 1950s and 1960s.

Pacific Fisher Analysis
Regulatory mechanisms that exist to protect habitat and structural elements for existing fisher populations within the planning watershed and the need to provide additional protection measures.

Class II watercourses have zones adjacent to them that are no-harvest zones and these often have the largest trees in the watershed which are protected from harvest. Also, snags are generally left across the entire landscape unless they create a safety concern. GRT will continue a policy of leaving at least three wildlife trees per acre across the property. These trees are evaluated by foresters and chosen based on qualities such as cavities, large size, platforms, broken tops and large branches, which are many of the same qualities that fishers prefer for denning and for resting. GRT will continue to leave hardwoods 24 inches DBH or larger up to four trees per acre and all downed large woody debris within WLPZs are left. Most large woody debris outside of WLPZs is also left unless it is being used for creek restoration work.

Measures that have been incorporated in this THP to avoid take include:

A. leaving of all snags that aren't a safety risk;
B. retention of trees that have the characteristics that fishers prefer such as forks, cavities, busted tops, nests, mistletoe brooms or decadent trees with large flat branches; and

C. retaining large hardwoods (24" or greater).

The specific requirements for fisher regarding structural elements for denning and resting sites within the Plan area. As mentioned above the fishers need large trees and snags with cavities, large limbs, downed logs, witches' brooms, for both denning and resting. Since this THP is in the redwood belt there exist many hollow old growth redwood stumps in addition to decadent Douglas fir trees and large woody debris scattered across the plan area.

Existence of large-scale habitat plans on or near the proposed Plan area.

- Across the landscape the existence of numerous alluvial flats adjacent to the Class I watercourses on this property provide linearly connected habitat corridors where all of the best elements needed by fishers are provided for. These elements are contiguous with class II large and standard protection zones which also provide habitat and with areas of no-cut or selectively cut zones that provide additional habitat. Even the even-aged management units on the property provide habitat in the form of down logs and foraging opportunities by supporting a greater number of small mammal prey species.

Anticipated change in fisher habitat quantity and quality within the planning watershed and biological assessment area as it relates to possible future projects.

- It is projected that fisher habitat on GRT property will improve over time since structural elements that fishers prefer are mostly not harvested. There will be some loss of large snags as these deteriorate over time however the large redwood snags and goose pens are likely to be present and relatively stable for long periods of time into the future. Some snags of existing live trees will develop over time. In addition, the stands that exist on alluvial flats, which are quite extensive on this property, will have only light harvesting of the smaller trees in the future and the largest and oldest trees will continue to age slowly, developing old growth qualities eventually.

Grey Wolf (*Canis lupus*): (Status: Federally Delisted due to recovery, State Endangered)
Range in California-Although gray wolves formerly inhabited California, their historic abundance and distribution is unclear (Schmidt 1991, Shelton and Weckerly 2007). While there are many anecdotal reports of wolves in California, specimens were rarely preserved. The historic range of the wolf in California has been reported to include the Sierra Nevada, southern Cascades, Modoc Plateau, Klamath Mountains, and perhaps the North Coast Ranges (Stephens 1906; Grinnell et al 1937; Hall 1981; Paquet and Carbyn 2003). However, Schmidt (1991) concluded that wolves also "probably occurred in the Central Valley, the western slope of the Sierra Nevada foothills and mountains, and the Coast Ranges of California until the early 1800s, although their population size is unknown and may have been small."

Habitat- The gray wolf is a habitat generalist, and can occur in deserts, grasslands, forests and arctic tundra. Habitat use by gray wolves is strongly correlated with the abundance of prey, snow conditions, absence or low livestock densities, road densities, human presence and topography. Actual dens are usually constructed for pups during the summer period. When building dens, females make use of natural shelters such as fissures in rocks, cliffs overhanging riverbanks and holes thickly covered by vegetation. Sometimes, the den is the appropriated burrow of smaller animals such as foxes, badgers or marmots. An appropriated den is often widened and partly remade. On rare occasions, female wolves dig burrows themselves, which are usually small and short with 1–3 openings. The den is usually constructed not more than 500 meters away from a water source, and typically faces southwards, thus ensuring enough sunlight exposure, keeping the denning area relatively snow free. According to CDFW information titled California's Known Wolves Past and Present (February 2020) the gray wolf is moving back into northeastern California in small but increasing numbers. Two wolf packs identified as the Lassen and Shasta packs are known. The Shasta pack is thought to be no longer operating as a pack. Other wolves fitted with tracking collars that are known to be or known to have been in California include (OR7 now

deceased), (OR25), (OR54, now deceased), (OR44) and (OR59, now deceased). Other contemporary wolf sightings have been reported in Siskiyou, Modoc, Lassen, and Plumas counties. There are no known wolves near the THP. Habitat is poor in the vicinity of the THP because of the lack of prey species, particularly deer, which would be the main prey species available in California. See Section II for protection measures.

Sonoma Tree Vole (*Arborimus pomo*): (Status: CDFW Species of Special Concern)
The range of this species in California includes coastal forests in the humid fog belt (Jameson and Peters 1988) south to Sonoma County on the coast and to Mendocino County in the coastal mountains, and east to Trinity County (Maser 1966). They have been located at elevations of from 150'-3,100' above sea level (Maser 1966). The habitat of this species predominantly includes the existence of Douglas-fir trees, with grand fir, Sitka spruce, redwood and western hemlock also used (Meiselman 1987, Williams 1986). Some authors have suggested that this species is associated with old growth or fairly dense mature forest with large trees (Carey et al. 1991, Williams 1986). However, habitat records reviewed by Maser (1966) suggested that this species also uses young second growth Douglas-fir trees 7"-15" DBH, and also habitats described as broken, isolated, and scattered by clearcuts, open grassland, bracken fern and cultivated fields; or 30–50-year-old stands with a few interspersed older trees, but little evidence of dense forest. It is known from the experience of foresters working for GRT that Sonoma Tree Voles also nest in redwood trees, Bay Laurel trees and snags, and are often found near water on GRT property. There also seems to be an affinity for nesting near waterfalls, perhaps because of the higher humidity in the vicinity of a waterfall since this species gets all of its moisture from the vegetation it consumes. Numerous tree voles have been documented and protected in the past on the landowner's property. If a tree is found to contain an active nest it will be retained, along with associated screen trees, where feasible. Sufficient protection will be afforded to prevent adverse impacts on their population.

Townsend's Big Eared Bat (*Corynorhinus townsendii)* (COTO*)*: (CDFW Species of Special Concern)
(note: the following was taken from CWHRS Townsends Big Eared Bat by J. Harris, and updated by pers. comm., M. Baker, Nov. 12, 2015)
Distribution, Abundance, and Seasonality
Townsend's big-eared bat is found throughout California, but the details of its distribution are not well known. This species is found in all but subalpine and alpine habitats and may be found at any season throughout its range. Once considered common, Townsend's big-eared bat now is considered uncommon in California.
Specific Habitat Requirements
Feeding: Small moths are the principal food of this species. Beetles and a variety of soft-bodied insects also are taken. Captures their prey in flight using echolocation, or by gleaning from foliage. Flight is slow and maneuverable. Capable of hovering.
Cover: Requires caves, mines, tunnels, buildings, or other human-made structures for roosting. COTO are also known to roost in basal hollows of large trees (>42" dbh) or perhaps stumps if the stumps are closed at the top. The roost entrance in buildings, caves, and mines has been reported to be as small as 1 square foot in size (Pierson & Rainey 1998). The roost entrance in basal hollows has been reported ranging from 1 to 5.9 feet wide, and 2.6 to 14 feet high in size (Fellers & Pierson 2002). Basal hollow roost entrances greater than 2 square feet that extend 1 foot or more upward into the tree above the top of the entrance to buffer changing microclimates and are greater than 3 feet above the ground for protection from predators. The only light penetrating the roost area originates from the roost entrances so that the internal roost area remains semi-dark to dark, however COTO are also known to roost in complete darkness and away from cave and mine entrances to roost also. COTO roost in a range of light conditions in anthropogenic structures and in basal hollows.
COTO may use separate sites for night, day, hibernation, or maternity roosts. Hibernation sites are cold, but not below freezing. Individuals may move within the hibernaculum to find suitable temperatures.

Maternity roosts are warm. Roosting sites are the most important limiting resource. Disturbance of roosts is noted as the reason for the species' recorded population declines.

Reproduction

Maternity roosts are found in caves, tunnels, mines, and buildings. Small clusters or groups (usually fewer than 100 individuals) of females and young form the maternity colony. Maternity roosts are in relatively warm sites.

Water

Drinks water. Relatively poor urine-concentrating ability in comparison to other southwestern bats.

Foraging Pattern

Prefers mesic habitats for foraging. Gleans moths from trees, shrubs, or bushes. COTO also feed along habitat edges, including riparian corridors along streams and smaller tributaries, forest edges, and occasionally in more open habitat with large shrubs and scattered trees.

SPECIES LIFE HISTORY

Activity Patterns

Nocturnal. Hibernates. Peak activity is late in the evening preceded by flights close to the roost. Bats at hibernacula from October to April. Seasonal Movements/Migration: This relatively sedentary species makes short movements to hibernation sites. Of 1500 banded bats, the longest movement was 32.2 km (20 mi) (Pearson et al. 1952).

Home Range

In early studies it was reported that colonies usually are at least 16-19 km (10-12 mi) apart. A density of 1 bat/126 ha (1/310 ac) was reported on Santa Cruz Island (Pearson et al. 1952). The greatest traveled distance recorded for a banded individual is 64 kilometers (Kunz 1999). This species shows high site fidelity if undisturbed. Territory: Not territorial. Males are solitary in spring and summer. Females form maternity colonies. Hibernates singly or in small clusters, usually several dozen or fewer.

Reproduction

Most mating occurs from November-February, but many females are inseminated before hibernation begins. Sperm is stored until ovulation occurs in spring. Gestation lasts 56-100 days, depending on temperature, size of the hibernating cluster, and time in hibernation. Births occur in May and June, peaking in late May. A single litter of 1 is produced annually but not all females reproduce every year. Young are weaned in 6 wk. and fly in 2.5-3 wk. after birth. Growth rate depends on temperature. The maternity group begins to break up in late August. Females mate in their first autumn, males in their first or second autumn. About half of young females return to their birth site after their first hibernation. Subsequent return rates are 70-80%. Maximum recorded age is 16 years.

Niche

Forages with many other species. Relatively specialized on moths, and slow, maneuverable flier. Gleans, and captures prey in the air by echolocation. Roosting sites may be shared with other species. Rabies is found in this species, but incidence is usually less than 1%.

Comments

This species is extremely sensitive to disturbance of roosting sites. A single visit may result in abandonment of the roost. All known nursery colonies in limestone caves in California apparently have been abandoned. Numbers reportedly have declined steeply in California. Especially sensitive to injury by wing banding (Humphrey and Kunz 1976).

Although this THP is within the historic range of the Townsends big-eared bat (COTO) no bats of this species have ever been known to occur on GRT property and there are no caves, mines, or abandoned buildings within the THP, which are currently considered the preferred habitat based on available literature; however, no targeted COTO surveys have taken place. Within the THP area there are large old snags and large old growth redwood stumps that could contain hollows sufficient for roosting. During layout of the plan no evidence of COTO was found which, given that COTO are widespread, but low-density in California and bats are nocturnal and cryptic in general, may be expected outside of targeted

survey efforts by bat biologists.
Measures that have been incorporated in this THP to avoid adverse impact include:
1. Retaining snags and goosepens except where they pose a safety risk.
2. Carefully inspecting large basal hollows.
3. Retaining large hardwoods.

American Badger *(Taxidea taxus):* (Status: CDFW Species of Special Concern)
Distribution includes most of North America and along the California coast north to Humboldt County. This species is well adapted to a variety of habitats but, prefers open grasslands and shrublands with little ground cover. During their inactive period in the winter months they remain in their home area and may retreat to underground burrows for several days or weeks during extreme weather events (IUCN Red List 2019). Their primary diet consists of small mammals associated with grasslands. Other prey includes snakes, lizards, birds, scorpions, and various insect species. A major factor leading to habitat loss is forest expansion into grassland habitats. Beginning in the early to mid-20th century, fire suppression efforts have allowed forest ingrowth into grasslands once maintained by routine control burning. Recent forest encroachment has likely confined prey species to smaller, less contiguous areas; therefore, decreasing suitable habitat for the American badger. There is no suitable habitat for the American Badger within the THP area. No occurrences have been recorded within the assessment area, and as such, the proposed THP is not likely to result in a significant adverse impact to Badger habitat within the assessment area.

Fish

Fisheries Habitat
The following are the Class I watercourses and bodies of water within the biological assessment area associated with the proposed THP for aquatic life: Big Pepperwood Creek, "Little Pepperwood Creek", Rockpile Creek, and Gualala River. Additional information may be included below for upstream and downstream areas even though they are outside the assessment area.

Current Fish Species in the Gualala River Watershed, California
Common Name, Scientific Name

Anadromous
Coho salmon, *Oncorhynchus kisutch*
Steelhead trout, *Oncorhynchus mykiss*
Pacific lamprey, *Lampetra tridentata*

Freshwater
Gualala Roach, *Lavinia symmetricus parvipinnis*
Coast range sculpin *Cottus aleuticus*
Prickly sculpin, *Cottus asper*
Riffle sculpin, *Cottus gulosus*
Threespine stickleback, *Gasterosteus aculeatus*

Many of the issues that affect fish survival such as large woody debris, sedimentation and temperature are addressed above in the watershed assessment. The following aquatic species have potential habitat in the watercourses and will be protected by WLPZ protections and other FPA rules as listed elsewhere in the THP: southern torrent salamander, California red-legged frog, tailed frog, foothill yellow legged frog, and the western pond turtle.

The life cycles of anadromous fish involve habitation of both inland freshwater streams and the ocean. Adult fish migrate into inland fresh water from the ocean and spawn. The offspring hatch and live a portion of their lives in freshwater and then migrate into the ocean. In the ocean the fish continue to grow and mature. After several years the fish return to the streams (usually of their birth) and spawn.

The decline of anadromous fish populations in the Gualala River and on the north coast of California has been attributed to many factors. Quantitative assessment of what the decline is caused by is somewhat lacking. Possible factors affecting the anadromous fish include stream habitat conditions, water diversion, ocean conditions, global and regional climate changes, introduction of hatchery bred fish, introduction of exotic species, spread of disease by hatchery stock, predation by birds and mammals, commercial, sport and subsistence fishing, and poaching. Most likely, declines in coho and steelhead populations are caused by a combination of factors with higher temperatures, shallower pools, and limited ocean access to the river (because the mouth is often closed by the gravel bar) being primary causes for declines in populations.

Coho salmon (*Oncorhynchus kisutch)* (Status: Endangered under Federal and State Endangered Species Act). The plan area is located in the Central California Coast ESU for Coho salmon. Coho salmon are riffle spawners that typically utilize smaller streams and gravel. Coho Salmon are anadromous salmonids that require access to stream migration, cold, clean, well oxygenated water and prefer the cover of overhanging vegetation, undercut banks, submerged vegetation, rocks, logs and deep water. Coho typically initiate upstream migration between late October and mid-February. Coho, as a rule, spawn in smaller tributaries than Chinook salmon. Preferred temperatures to Coho are as follows: Spawning migration 4.0 – 14.0$^{\circ C}$ (40.0 – 58.0$^{\circ F}$), Rearing 7.2 – 16.7$^{\circ C}$ (45.0 – 62.0$^{\circ F}$). Redds are laid in gravel that range in size from 1.3 – 10.2 cm in diameter; intergravel mortality occurs when fine sediments exceed 13% of the substrate composition. Embryos hatch after 8 to 12 weeks of incubation. Coho migrate to the ocean at age one and return to fresh water to spawn after 2 to 3 years. Coho are known to exist in the Gualala River.

Protective measures for the Coho salmon and other aquatic wildlife species have been incorporated into the silvicultural methods (see Item #14), soil stabilization measures (Item #18), watercourse protection measures (Item #26), and other provisions in this THP and others within the assessment area. Given the standards and practices in place now, no significant adverse impacts are expected.

Steelhead (*Oncorhynchus mykiss irideus*) (Status: Threatened under Federal and State Endangered Species Act)
The proposed timber harvest plan is located within the Northern California DPS for Steelhead. Summer steelhead ascend spawning watercourses in the spring, and hold in deep pools until the fall, when they spawn. Winter Steelhead enter river systems during fall and winter when water levels are sufficient to permit upstream migration. The effects of timber harvesting concerning this species are elevated water temperatures and sedimentation of spawning gravels. Steelhead mortality at the different life stages are closely affiliated with water temperatures. Preferred temperatures for different stages are as follows: Spawning migration 3.9 - 9.4$^{\circ C}$(39 – 49$^{\circ F}$), Egg development 10.0$^{\circ C}$(56$^{\circ F}$), Rearing 10.0 – 13.0$^{\circ C}$(50 - 56$^{\circ F}$). Steelhead prefer to spawn in gravels 0.6 – 10.2 cm in diameter, with eggs developing in approximately 31 days. When fine sediments exceed 13% of the substrate composition, intergravel mortality can occur. Juvenile steelhead spend 1 to 3 years in freshwater habitats before migrating to the ocean. They typically spend 2 years in the ocean before spawning. Although summer and winter steelhead use the same spawning gravels, they are genetically distinct and do not interbreed. Steelhead can utilize smaller tributaries and smaller sized gravels (2-3 in. in diameter) for spawning. Steelhead are known to exist in the Gualala River.

Measures that are proposed for the protection of coho should also be considered adequate for the protection of steelhead. Protections provided by WLPZs, ELZs, and water drafting requirements ensure no cumulative impacts due to timber operations within the plan area. Given the allowable activities and limitations in the plan, the Forest Practice Rules, and our standards and practices, no significant impacts are expected.

Chinook (*Oncorhynchus tshawytscha*) (Status: Threatened under the Endangered Species Act).
The proposed timber harvest plan is located within the California Coastal ESU for Chinook. Sustained water temperatures greater than 80 degrees Fahrenheit are fatal for adult salmon, which will migrate into the headwaters of smaller Class I waters to spawn when water is sufficient, and debris dams do not prevent access. Chinook salmon are riffle spawners and typically construct redds near the head of riffles in gravel 6 inches or less in diameter. Ideal temperatures for spawning occur between 41-58 degrees Fahrenheit. Chinook salmon prefer to spawn in the main stem of rivers or larger tributaries but will come further up watercourses depending on the stream flow in any given year. Chinook are uncommon in this watershed but would benefit from the same protection measures as Coho and Steelhead.

Measures that are proposed for the protection of coho and steelhead should also be considered adequate for the protection of chinook. Protections provided by WLPZs, ELZs, and water drafting requirements ensure no cumulative impacts due to timber operations within the plan area. Given the allowable activities and limitations in the plan, the Forest Practice Rules, and our standards and practices, no significant impacts are expected.

Summary of Historic (1964-1981) Stream Surveys Conducted in the North Fork Subbasin of the Gualala River (from NCWAP, Appendix 5, pg. 8-11)

Mainstem South Fork Subbasin	Date Surveyed	Habitat Comments	Barrier Comments	Recommendations Management
South Fork	9/23 and 9/24 1964 5/17 and 18/1977	Plentiful spawning areas throughout the stream. Pool: Riffle 95:5. Generally poor shelter consisting of overhanging banks, boulders, logs, aquatic plants and overhanging aquatic plants. Summer flows are limited. Pool: Riffle ratio 7:3. The majority of pools had little to no shelter. Shelter consisted of boulders, aquatic plants, logs, undercut banks, and overhead canopy	Old Log Jams. None Complete. No barriers observed. Each summer a dam is constructed approximately ½ mile below the Wheatfield Fork.	Continue to manage for production of juvenile steelhead trout and coho salmon.
Marshall Creek Marshall Creek Tributary #3 Marshall	9/28/1964	Deposits of good spawning gravel exist throughout the stream from the mouth to the upper fisheries value. Pool: Riffle ratio 50:50. Good shelter provided by logs, boulders, undercut banks, roots, and trees.	No complete barriers.	Should be managed as a steelhead trout and coho salmon spawning and nursery stream.

Creek Tributary #5	9/28/1964	Very limited fisheries value. Watershed severely burned 10 years ago. Lower half mile has spawning gravel available, but summer flow is very low.	Total barrier to fish a half mile above the mouth.	None
	9/29/1964	Summer flows are limited. Some suitable spawning gravel directly above large log jams.	Over 40 log jams in a 1 mile stretch of stream. A number of which form complete fish passage barriers.	Remove log jams.
McKenzie Creek	9/23 and 24/1964	Spawning areas fair to good in the lower 1/3 of stream, excellent in the middle section of stream, and fair in the upper 1/3 of stream; Pool: Riffle ratio 60:40; Good shelter provided by rocks and undercut banks.	7 partial barriers; Large 7 feet high 40 feet dam present 1/6 mile upstream from mouth; Large bedrock falls 1-1/4 miles upstream	Continue to manage as a coho salmon, steelhead trout spawning and nursery area. After removal of falls, possible planting of coho salmon to re-establish a self-sustaining population.

The following pages contain Coho Salmon and Steelhead Trout Data Summary by Decade, for the Gualala River Watershed, California

Decade	Coho Salmon	Steelhead Trout
1940s	A.C. Taft, chief of the Bureau of Fish Conservation, noted that the fishing pressure on the Gualala River increased 200-300% immediately after World War II ended in 1945.	A.C. Taft, chief of the Bureau of Fish Conservation, requested that the entire Gualala River and its tributaries be closed to fishing for small and immature steelhead trout and salmon. Upon his recommendation, the summer closure began in 1945 and remained until 1982.
1950s	In 1952, electrofishing below the confluence of the North Fork revealed that the length frequencies of the fish removed showed a healthy condition (Kimsey 1952). Bruer (1953) wrote that there are millions of young steelhead trout and coho salmon in the Gualala watershed. In 1957, Fisher, cited that the adverse logging conditions and past improper practices had done considerable damage to the headwaters. This was primarily in the form of old logjams, debris and siltation. By 1959, the summer opening was not worthwhile for a person who must travel any distance (Kastner 1959).	During December 1954 through February of 1955, creel surveys were conducted to determine the quality of the steelhead trout fishery on the Gualala River. Five hundred and seven fish were checked. A total catch estimate of 1,352 fish for the season was extrapolated with data from a use count. In 1956, Fisher, concluded that the Gualala remained one of the better Region III steelhead trout streams. It appeared to sustain a good steelhead trout population despite the poor environmental conditions over a considerable portion of its headwaters. He speculated that unaffected tributary streams must have provided good spawning conditions.
1960s	Stream surveys were conducted in 1964. The species presence and relative abundance of salmonids were estimated from observations recorded while walking upstream along the banks. These surveys had no quantitative basis from which to estimate populations. Where coho salmon were observed during these stream surveys the management recommendations included "possible planting to re-establish a self-supporting run" (Table 3-5). Based on CDFG's management prescriptions of the time, this recommendation likely indicated that the native coho salmon populations were not self-sustaining prior to 1964. CDFG reported population estimates of 4000 coho salmon in 1965. This population estimate was made without any supporting data thus is not reliable. The estimate was ranked "C without data" the lowest quality rating designated by the California Fish and Wildlife Plan, Volume III. In 1969, 90,000 coho salmon were planted.	Steelhead trout were present during stream surveys in 1964. Only one creel census survey was conducted on January 24, 1962. The result of the survey showed 11 steelhead trout caught by 18 anglers. Total angler hours were 56.5 resulting in a catch-per-unit-effort of 0.20 fish/hour. CDFG reported steelhead trout population estimates of 16,000 in 1965. This population estimate was made without any supporting data, thus is not reliable. The estimate was ranked "C without data", the lowest quality rating designated by the California Fish and Wildlife Plan, Volume III.

1970s	Hatchery plants of coho salmon; 1970, *30,000*; 1971, *30,000*; 1972, *15,000*; 1973, *20,000*; 1975, *10,000*. Total number of coho salmon planted in the 70s, *105,000*. Some streams were surveyed in 1970 with methods similar to those conducted in 1964 (Table 3-5). It is not known how many of the coho salmon observed during these stream surveys were from the 120,000 planted in 1969-1970. No mention of marked or unmarked hatchery coho salmon were found in the planting records or stream reports. In the mid-1970s, the CDFG's Coastal Steelhead Project was conducted, in part, on the Gualala River, California. In 1972-73, the creel censuses began in November and resulted in high counts of coho salmon catches with 831 total coho salmon counted. All other years, the creel censuses began in December after the peak of the coho salmon run had passed. In the 1973-74 survey fifty-two coho salmon were counted, in the 1974-75 survey ten coho salmon were counted, in the 1975-76 survey ten coho salmon were counted and in the 1976-77 survey no coho salmon were counted.	Some streams were surveyed in 1970 with methods similar to those conducted in 1964 (Table 3-5). The steelhead trout observed during these stream surveys were assumed native as planting did not occur until 1972. The steelhead trout planted during the 1970s were 12,750 in 1972; 20,300 in 1973; 15,600 in 1974; 24,600 in 1975; and 10,070 in 1976, a total of 83,320. The Mad River Hatchery yearling steelhead trout were marked by a fin-clip. CDFG reports cite origins of brood stocks as Mad River Hatchery, South Fork Eel River and San Lorenzo River. In 1972-73, L.B. Boydstun, CDFG fish biologist, estimated that the fishing effort on the Gualala River had probably increased over 60% since the early 1950s, when the only other creel censuses were conducted. In spite of the increased pressure during the 1972-73 season, the steelhead trout catch was around 25% of what it was during the 1953-54 and 1954-55 seasons. He attributed the poor catch to smaller populations. During the 1972-73 creel census, 288 steelhead trout were caught. No recognizable hatchery fish from the spring planting in 1972 were observed. During 1975-76 and 1976-77, steelhead trout population estimates were made as part of a five-year study. This study utilized creel census, use counts, adult tagging, and downstream migrant trapping in conjunction with the planting of steelhead trout. The goal of the project was to estimate winter adult steelhead trout populations, estimate angler harvest rates and evaluate the contribution of hatchery steelhead trout to the fishery. This program focused on enhancing the Gualala River as a sport-fishing stream. The steelhead trout population estimate was 7,608 in 1975-76 and 4,324 in 1976-77, 95% confidence intervals. Two years of data is not sufficient to establish a population trend. Adult steelhead trout population data does not exist after 1977. Harvest estimates were made at the end of the fishing seasons for each of the five years studied. In the 1972-73 season, 288 fish were surveyed. In 1973-74, 1682 steelhead trout were marked for possible recapture. In 1974-75, there were 793 fish counted and in 1975-76, there were 1418 fish counted. Eleven percent of the fish surveyed in 1975-76 were hatchery fish, and a 20.3 % harvest rate was calculated. In the 1976-77 season, there was a 19.8% harvest rate with no hatchery fish recorded. No creel census results were documented from the 76-77 season. The surveys typically began in December. The 1972-73 survey began in November.

1980s	From 1985-1989, 102,000 coho salmon were planted.	From 1983-89, 301,770 steelhead trout were planted in the Gualala River. The year totals of steelhead trout planted were; 12,500 in 1983; 13,400 in 1984; 9,700 in 1985; 57,450 in 1986; 26,250 in 1987; 108,750 in 1988 and; 73,700 in 1989. Bag seines were employed five times during the years of 1984-1986, to sample the game and non-game fishes of the Gualala River estuary. The purpose of this survey was to assess the impact of proposed water diversions on aquatic species, in general, and juvenile salmonids, in particular. On Robinson Creek, one station was three-pass electro-fished and showed a steelhead trout density of 0.85 per meter. Since electrofishing data were collected only in 1983 on Robinson Creek, insufficient data exists in which to make comparisons. Three pass electrofishing data were collected on a lower and upper site in the Little North Fork in 1988 and 1989. The surveys resulted in an average steelhead trout density of 0.45 per meter on the Little North Fork. In 1989, juvenile steelhead trout population on Fuller Creek (approx. 6 mile long, 3 rd order stream) was estimated at 62 with a standard error of 8.599. Four stations were fished with a two or three pass depletion electro-fish method. These stations were located on South Fork and Mainstem of Fuller Creek. The intent of this survey was to assess the impacts from the upstream logging. Station 4 was upstream of the falls on the South Fork, where resident rainbow trout were observed. Young-of-the-year and one year and older steelhead trout, western roach, and three-spined stickleback were found during these surveys.

1990s	Over three years, 45,000 juvenile coho salmon from the 1995-1998 brood years were planted in the Little North Fork. The juveniles were from the Noyo River Egg Collecting Station run by CDFG in Fort Bragg, CA. During snorkel surveys, Gualala Redwoods, Inc. observed coho salmon young-of-the-year on the Little North Fork, Robinson and Dry Creek in 1998 Between July 1, 1999, and June 30, 2000, spawner and electrofishing surveys were conducted on the Little North Fork Gualala River. These surveys were conducted to determine whether the planting of coho salmon during the 1996-98 periods was effective. No coho salmon were found.	In 1990, a total of 41,300 steelhead trout were planted in the Gualala River. Since1993, the Gualala River Steelhead Project rescued steelhead trout juveniles from streams in danger of drying up during the summer months. Rescued fish were kept in two Doughboy pools at the hatchery on Doty Creek, a tributary to the Little North Fork of the Gualala River. The fish are released in the North Fork Subbasin and main stem Gualala River after the first substantial winter rains increase stream flows. From 1993-1997 and 1999-2000, 37,030 steelhead trout have been rescued and 20,328 have been released. During 1990-93, 95, 98, 99 and 2000 three-pass electrofishing data were collected on a lower and upper site in the Little North Fork. No effort was recorded in 1990-1992. Both sites showed small fluctuations in young-of–the year populations. Both sites showed a slight increase in one year old fish from 1995-2000. Two year and older steelhead trout numbers were identical at the lower site and slightly increased at the upper site from 1998-2000. In 1995, one-pass electrofishing surveys were conducted on Fuller Creek and South Fork Fuller Creek. Young of the year, year plus and two year plus steelhead trout were observed. The results were not comparable to the 1989 survey, due to differences in sampling techniques. Gualala Redwoods, Inc. conducted snorkel surveys in 1997, 1998 and 1999. In 1997-98, one year and older steelhead trout were observed in Buckeye Creek and South Fork. In 1998, one year and older steelhead trout were observed in the Wheatfield Fork. In 1999, one year and older steelhead trout were observed in Little North Fork, Robinson Creek, North Fork and Doty Creek.

2000-2002	Between July 1, 1999, and June 30, 2000, spawner and electrofishing surveys were conducted on the Little North Fork, a tributary to the North Fork by CDFG. These surveys were conducted to determine whether the planting of coho salmon during the three-year period of 1995/96-1997/98 was effective. Robinson Creek and Dry Creek were surveyed in 1999, 2000, and 2001, no coho salmon were found (CDFG unpublished data) Historical coho salmon streams listed by Brown and Moyle (1991) were electro-fished in September 2001. The method used was the modified ten-pool protocol (Attachment D). The streams electro-fished were North Fork, Doty Creek, South Fork, Franchini Creek, Wheatfield Fork, Haupt Creek, Tombs Creek, House Creek, Pepperwood Creek and Marshall Creek. This survey was specifically aimed at establishing coho salmon presence in the streams sampled. Coho salmon were not found in any of the streams surveyed. Coho Salmon Status Review (2001) stated no known remaining viable coho salmon populations in the Gualala River system. In September 2002, coho salmon young-of-the year were present on Dry Creek, a tributary of the North Fork during a snorkel survey and two sites on the Little North Fork and Doty Creek during electrofishing. Coho young-of-the-year were present on McGann Creek, rescued and released (R. Dingman, pers. comm.).	In 2000-2001, 7,600 and 5,450 steelhead trout were planted on the North Fork between Elk Prairie and Dry Creek. During snorkel surveys, Gualala Redwoods, Inc. observed one year and older steelhead trout on: Little North Fork, Robinson, North Fork, and Dry Creek in 2000 and 2001; on the mainstem of Buckeye Creek in 2000 and 2001; and on the South Fork in 2000 and 2001. February-April 2001, a volunteer effort steelhead trout spawning surveys observed redds on Wheatfield Fork, Tombs Creek, Britain Creek, House Creek, and South Fork. Redds were observed on Rockpile Creek in 2001 (K. Morgan, pers. comm).
2003 to 2019	The last observed coho were in Dry Creek in 2004.	The survey in 2008 shows steelhead in every creek surveyed which included Dry, Robinson, Big and Little Pepperwood, Buckeye the Little North Fork, the North Fork, the South Fork and Wheatfield forks of the Gualala. Since then, surveys have been conducted in 2009 and 2011to 2018 in most of the watercourses listed above with steelhead present in all surveys although numbers have been depressed since 2016 probably as a result of the drought.

Amphibians

Southern torrent salamander *(Rhyacotriton variegatus)*: (Status: Federal Special Concern, CDFW Species of Special Concern)
The range of this species in California coincides with the extent of humid coastal forests in the northwestern part of the state, up to approximately 3,900' above sea level, south to Mendocino County (Anderson 1968). The specific habitat of southern torrent salamanders includes cold mountain streams, springs, seeps, waterfalls, and moss-covered rock rubble with flowing water in humid coastal coniferous forests (Anderson 1968, CWHR 1979, Bury and Corn 1988, Welsh 1990). These salamanders seem to inhabit the splash zone and are rarely found more than one meter from water (Anderson 1968, and Nussbaum and Tait 1977). Southern torrent salamanders range includes Del Norte, Humboldt, western Siskiyou, Trinity and Mendocino Counties. Marginal suitable habitat does exist within the assessment area but not within the THP. The THP is south of the recognized range, and none of these salamanders have been discovered on GRT property. WLPZ protections and operations will prevent any damage to individuals that may be present and will preserve potential habitat.

California Red-Legged Frog (*Rana draytonii*): (Status: Federally Threatened, CDFW Species of Special Concern)
Some of the following habitat description is excerpted from: U.S. Fish and Wildlife Service. 2002. Recovery Plan for the California Red-legged Frog (*Rana draytonii*). U.S. Fish and Wildlife Service, Portland, Oregon. viii + 173 pp.
General Habitat: The frog uses a variety of areas, including various aquatic, riparian, and upland habitats usually below 3,500 feet in elevation.
Breeding Habitat: Breeding sites of the California red-legged frog are in a variety of aquatic habitats; larvae, tadpoles, and metamorphs have been collected from streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, springs and lagoons. Breeding adults are often associated with deep (greater than 0.7 meter [2 feet]) still or slow-moving water and dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988). Reis (1999) found the greatest number of tadpoles occurring in study plots with water depths of 0.26 to 0.5 meters (10 to 20 inches). California red-legged frogs also frequently breed in artificial impoundments such as stock ponds.
Dispersal and Use of Uplands and Riparian Areas: During periods of wet weather, starting with the first rains of fall, some individuals may make overland excursions through upland habitats. Most of these overland movements occur at night. Frogs have been observed to make long-distance movements that are straight-line, point to point migrations rather than using corridors for moving in between habitats. During dry periods, the California red-legged frog is rarely encountered far from water. California red-legged frogs have been known to travel up to 1.4 km straight line from the breeding site, however, the majority of frogs never travel further than 30 meters from the breeding site.
Summer Habitat: California red-legged frogs often disperse from their breeding habitat to forage and seek summer habitat if water is not available. This summer habitat could include spaces under boulders or rocks and organic debris, such as downed trees or logs, or in mammal burrows and moist leaf litter; industrial debris; and agricultural features, such as drains, watering troughs, abandoned sheds, or hay-ricks. California red-legged frogs use large cracks in the bottom of dried ponds as refugia.
Water Quality: California red-legged frogs are sensitive to high salinity, which often occurs in coastal lagoon habitats. Observations indicate that California red-legged frogs were absent when temperatures exceed 22 degrees Celsius (70 degrees Fahrenheit), particularly when the temperature throughout a pool was this high and there are no cool, deep portions.
Predators and Disturbance: Raptors, bobcats, racoons, foxes, rough-skinned newts, otters, herons and other predators are known to be in or around the project area. Falling, skidding, log hauling and other vehicle traffic associated with logging could disturb or kill individuals.
Suitable Habitat**:** The THP area contains Class II and III watercourses. There are Class I watercourses

adjacent to the THP. The Class III watercourses flow only in response to rain, and do not offer suitable habitat. Class II watercourses in the plan area may exhibit shallow pools but when flowing the current may be too fast to offer breeding habitat. Class II watercourses may have water present into spring and summer and can act as a corridor for migration however telemetry studies indicate that the frogs that do migrate usually just go in a straight line to their destination. Some areas of the THP may provide habitat in the form of shallow standing water but the canopy is quite dense, and the areas dry out early in the year, so the habitat does not appear to be optimal. The Class II watercourses have no-cut zones adjacent to them and then have limited selection harvesting outside of that zone. See THP Item 26 for specifics on watercourse protection measures. There have been no reported observations of CRLF within the assessment area.

Foothill Yellow-Legged Frog (*Rana boylii*): (Status: CDFW Species of Special Concern)
The North Coast population is abundant in the Gualala River and other stream systems and are not listed. Adult foothill yellow-legged frogs are moderate in size (between 1.5 and 3 inches long) with yellow color under their legs. They inhabit partially shaded, rocky perennial streams and their life cycle is synchronized with the seasonal timing of streamflow conditions. Adult frogs move throughout stream networks from winter refugia to mating habitat where eggs are laid in spring and tadpoles rear in summer. These frogs need perennial water where they can forage through the summer and fall months. The primary cause of mortality in eggs is desiccation. This makes drafting from shallow watercourses where the water level is lowered a concern for this species, however there is no habitat at risk of this within the plan area.

This species is also occasionally found in other riparian habitats including moderately vegetated backwaters, isolated pools, and slow-moving rivers with mud substrates. (Don T. Ashton, Amy J. Lind, and Kary E. Schlick; 1997) Threats include predators such as garter snakes, bullfrogs, herons and raccoons. Other threats include droughts, floods and human disturbance. Populations of *R. boylii* have declined in southern and central California south of the Salinas River, Monterey County, and in the west slope drainages of the Sierra Nevada and southern Cascade Mountains east of the Sacramento and San Joaquin Rivers. In the Coast Ranges north of the Salinas River R. boylii stills occurs in significant numbers in some coastal drainages. (Jennings and Hayes 1994).

These frogs do occur in suitable habitat in the assessment area. Any adult frogs that may exist near the THP will be protected by WLPZ requirements and additional protections required in ASP zones. The limitations adjacent to watercourses contained in the plan for protection of the red-legged frog, as well as fish, will also protect the foothill yellow-legged frog and its habitat. Operations of this THP under stated plan restrictions and allowable practices will not likely result in a take, nor have any adverse impact on the species.

Pacific Tailed Frog (*Ascaphus truei*): (Status: CDFW Species of Special Concern)
This species is restricted to perennial montane streams in steep-walled valleys with dense vegetation. Permanent water is critical and individuals are rarely found more than 40 feet from streams. Although considered uncommon, experienced observation reveals abundant populations in suitable habitat. Preferred habitat includes montane hardwood-conifer, redwood, Douglas-fir and ponderosa pine forests with perennial streams in steep-walled, densely-vegetated valleys. Adult frogs consume a wide array of prey, taken along stream banks and in the water. Aquatic and terrestrial insects (larval and adult), spiders and snails are all consumed. Tadpoles derive their energy by grazing diatoms on submerged rocks; small quantities of filamentous algae are also consumed. Conifer pollen is consumed in large quantities when available. Cover is sought under submerged rocks and logs in the stream, or under similar objects close to the stream. Tadpoles require cool stream temperatures (15C or less). Tadpoles require rocks around 2½ inches in diameter to which they attach themselves via a large oral sucker; turbulent water is preferred to

smooth, swiftly flowing water. The breeding period typically occurs in the early fall with the eggs being laid during the following summer. Eggs hatch in about 1 month with aquatic larvae requiring 2 to 3 years to fully transform. Metamorphosis usually takes place in the fall. There is marginal habitat within the BAA, but no optimal habitat exists within the THP boundary.
Conservation measures include WLPZ measures for watercourses as well as for springs, which have been shown to correlate with healthy populations. The implementation of WLPZ protection measures as well as ASP protections required by the FRPs are highly likely to avoid take and adverse impacts to this species. There are many occurrences of this species in the CNDDB 9 quad search, however none occur within the THP area, and no occurrences were observed in the THP area during plan layout and fieldwork.

California giant salamander (*Dicamptodon ensatus*): (Status: CDFW Species of Special Concern)
The California giant salamander's distribution ranges from extreme southern Mendocino County south to Sonoma, Napa, Marin, and Santa Cruz counties. They are most commonly found in habitats characterized by coast redwood, Douglas-fir/tanoak, and true oak woodland. This species co-occurs and hybridizes with the coastal giant salamander (*Dicamptodon tenebrosus)* in a narrow hybrid zone which extends south of Manchester, CA to just south of Point Arena, CA. The exact boundaries to this hybrid zone still remain ill-defined on both a north-south and east-west gradient. More systematics and population genetic work is needed utilizing contemporary molecular methods to delineate the range of this species.

Terrestrial forms of the California giant salamander are found on land under the forest canopy, underneath rocks, logs, other coarse and large woody debris, and in subterranean burrows. Most terrestrial individuals are found in moist areas near watercourses. During rainy periods, adults may be very active and move overland to forage. Larvae are found in cool, clear streams with rocky substrates. Larvae are generally abundant in streams with cool water temperatures (< 18 °C), low levels of siltation and substrate embeddedness. Larvae utilize rocks, woody debris, and detritus as cover in streams. Small larvae may be found several inches beneath the stream bottom in gravel to avoid predation by larger conspecific larvae and other predators. Larvae have been observed in heavily silted small streams using the silt as camouflage. They may be more tolerant of warmer water temperature conditions and the presence of silt compared to other co-occurring headwater amphibian species (i.e. *Ascaphus* and *Rhyacotriton*).

Very little specific life-history information has been reported for this species but is thought to be similar to the coastal giant salamander (*D. tenebrosus*). Adult and neotenic forms breed in small and medium-sized streams with rocky substrates during the early spring when high flows recede. Seventy to 100 eggs are individually attached on the underside of rocks or woody debris in slow moving portions of streams. Females may guard and defend nests until larvae hatch and disperse. Complete metamorphosis of larvae may take several summers, and different age classes are regularly seen in streams where they are abundant. Neotenic forms (reproductive adults with larval characteristics) may occur in perennial bodies of water. Larvae feed on a variety of aquatic invertebrates, though prey selection changes with body size and metamorphosis, and may include fish, smaller conspecific larvae, amphibians. Adults regularly feed on banana slugs (*Ariolimax columbianus*) and other small vertebrate prey such as rodents.

Habitat for the species does exist within the THP area, but no observations have been made within the THP or assessment area. Protections from WLPZ measures for watercourses as well as for seeps and springs should avoid any negative impacts to California giant salamander populations. If present, no impact from the proposed timber management activities on the California giant salamander is anticipated.

Red-bellied newt (*Taricha rivularis*): (Status: CDFW Special Concern)
The red-bellied newt is distributed from southern Humboldt, western Lake, Mendocino, and northern Sonoma counties. It is one four species in the genus *Taricha* residing in California and has the smallest

range.

This species breeds in flowing sections of small to mid-sized streams with rocky/cobble substrates in oak woodland, Douglas-fir/tanoak, and coast redwood forests. Adults utilize terrestrial habitats such as burrows, loose rock formations, fallen trees, course woody debris, and remnant logging debris for cover and foraging during the dry season (May-October).

Emergence of terrestrial adults begin after the onset of the wet season in November and December. This species is a long-distance migrant and may travel several miles overland to natal streams for breeding. Breeding occurs from February to May, with March and April representing the peak months when large numbers of adults congregate in streams to mate. Multiple adult males can be seen amplexing with females in "mating balls" to stimulate breeding. The male will deposit a spermatophore (sperm packet) on a small rock, then the female picks it up with her vent. Oviposition generally occurs on the underside of rocks in the fast-flowing section of streams, or on submerged roots along the stream bank. Egg masses consist of 6-16 eggs and form single flattened clusters one-egg layer thick. Developmental rates are a function of stream temperature, and the period from hatching to metamorphosis ranges from 4-6 months. Following breeding, adults migrate from streams to terrestrial habitats. Red-bellied newts are thought to be long lived. Twitty (1966) noted that many recaptured newts marked as reproductive adults were at least 17 years old. Others have suggested they may live 20-30 years, but this has yet to be verified. Newts forage on a variety of aquatic and terrestrial invertebrate prey, small fish, and larval amphibians.

WLPZ measures apply to all occupied watersheds reduce sedimentation and maintain cool water temperatures conducive for breeding adults, oviposition, and larval rearing. Additional considerations should be given to seeps, springs, and even ponds immediately adjacent to occupied watercourses as these habitats have been demonstrated to be important both for foraging and refugia during the dry season. Adult newts, in general, are more tolerant of warmer terrestrial environments and water temperatures compared to headwater stream amphibian species (e.g. *Ascaphus, Rhyacotriton,* and *Dicamptodon)*. Several publications have suggested that industrial logging has had an impact on *T. rivularis* due to much of its range being owned by privately held companies (Reilly et al. 2014). While many watersheds on industrial forestlands were intensively harvested over the past 100 years, they still have large breeding populations of *T. rivularis*. In general, most logging activities are scheduled during the dry season, which may further minimize direct mortalities along active roadsides when newts are less likely to be migrating overland in large numbers. Additional voluntary measures, such as wet season restrictions, drift fences, migration culverts, and new road design may further reduce mortalities; however, the feasibility of these measures has yet to be explored.

Desirable habitat does exist within the THP boundary, but no observations have been made within the THP or assessment area. The species was not observed during THP layout. WLPZ protection measures for watercourses and springs should address any negative impacts to red-bellied newt populations. If present, no impact from the proposed timber management activities on the red-bellied newt is anticipated.

Insects

Behren's Silverspot Butterfly (*Speyeria zerene behrensii)*: (Status: Federally Endangered)
The historic range of Behren's silverspot butterfly is based on six known locations which extended from near the City of Mendocino, Mendocino County, south to the area of Salt Point State Park, Sonoma County (USFWS 2003). The current known range of the Behren's silverspot butterfly is limited to a small number of sites located from the Point Arena-Manchester State Park area south to the Salt Point area. South of Salt Point in coastal Sonoma County, populations of Zerene Fritillary occur, which have similarities to both the Behren's and Myrtle silverspot subspecies.

Adult Behren's silverspot butterflies feed on nectar, which is their only food source, besides internal reserves present when they emerge from the pupae. Observations of nectar feeding are few but based on observations of this and closely related silverspot subspecies, plants in the sunflower family (Asteraceae) dominate as nectar sources, including thistles (Cirsium spp); gumplant (Grindelia stricta); goldenrods (Solidago spp); tansy ragwort (Senecio jacobaea), California aster (Aster chilensis), pearly everlasting (Anaphalis margaritacea), seaside daisy (Erigeron glaucus), and yarrow (Achillea millefolium). Reported nectar species from other plant families include: yellow sand verbena (Abronia latifolia), sea-pink (Armeria maritima) and western pennyroyal (Monardella undulata).
The Behren's silverspot butterfly inhabits coastal terrace prairie habitat west of the Coast Range in southern Mendocino and northern Sonoma Counties, California. This habitat is strongly influenced by proximity to the ocean, with mild temperatures, moderate rainfall, and frequent summer fog. Coastal terrace prairie is a dense grassland dominated by perennial grasses, on sandy loam soils on marine terraces below about 1,000 feet elevation and within the zone of coastal fog.
The primary threats to the Behren's silverspot butterfly, cited at the time of listing, are over collecting, and habitat destruction, fragmentation and degradation due to urban development, alien plant invasion and competition, and excessive livestock grazing. Other factors include potential genetic problems associated with small populations, the lack of natural, periodic fires to maintain coastal prairie habitats, and the inadequacy of existing regulatory mechanisms to protect the species and its habitat. The THP and assessment area do not offer suitable habitat for this species, therefore no negative impact is expected.

Western Bumble Bee *(Bombus occidentalis occidentalis):* (Status: State Candidate for Listing (June 18, 2019))
Distribution: The western bumble bee was formerly found throughout much of California but is now reduced in abundance and distribution and mostly restricted to high meadows and coastal environments. Historical range overlaps biological assessment area for THP.
Habitat: Requires floral resources, undisturbed nest sites and overwintering sites. Nests, forages, and overwinters in meadows and grasslands with abundant flowers. Nesting habitat is typically underground, such as in old animal burrows, but also possibly above ground such as in cavities in logs. Overwintering sites probably in friable soil or under plant litter and debris.
Life history: Flight period in California is from early February to late November, peaking in late June and late September. Western bumble bees primarily nest in underground cavities such as old squirrel burrows on open west-southwest facing slopes bordered by trees. Colonies can contain as many as 1,685 workers and produce up to 360 new queens. Little is known about overwintering sites or hibernacula.
Conservation measures: Threats include habitat loss and degradation, disease, competition, toxins, and climate change. Thus, protection of suitable habitat in meadows and grasslands is important. Use practices that ameliorate or reduce the frequency of ground disturbance of nesting habitat and overwintering habitat.
Likelihood of "take" or significant adverse impacts resulting from proposed operation: Highly unlikely. No meadows or grasslands are located within the plan. Potential logs and cavities in wildlife trees are to be retained. The THP area lacks suitable habitat for this species and therefore no "take" or adverse impacts are anticipated.

Crotch's Bumble Bee *(Bombus crotchii)*: (Status: State Candidate for Listing (September 30, 2022)
Distribution: The Crotch's bumble bee was formerly found throughout the southern two-thirds of California including the Central Valley. The species reduced distribution is mostly restricted to areas near Sacramento and southern coastal locations. Historical range may have once overlapped the biological assessment area for THP.
Habitat: Requires floral resources, undisturbed nest sites and overwintering sites in grasslands and shrublands.

Life history: Flight period in California is from late February to late October. Nesting habitat is typically underground, such as in old animal burrows but also above ground in log cavities, grasses and rockpiles. Overwintering sites are not well understood; however bumble bees generally select disturbed soil, plant litter and organic debris.
Conservation measures: Threats include habitat loss and degradation, disease, competition, toxins, and climate change. Thus, protection of suitable habitat in meadows and grasslands is important. Use practices that ameliorate or reduce the frequency of ground disturbance of nesting habitat and overwintering habitat.
Likelihood of "take" or significant adverse impacts resulting from proposed operation: Highly unlikely. No operations in meadows or grasslands are proposed in the plan. The THP area lacks suitable habitat and is located on the extreme margins of the historical distribution for the species and therefore no "take" or adverse impacts are anticipated.

Suckley's Cuckoo Bumble Bee *(Bombus suckleyi):* (Status: State Candidate for Listing (September 30, 2022))
Distribution: The Suckley cuckoo bumble bee's historical range includes the Klamath Mountain region in northern California, as well as portions of 11 other states and three Canadian provinces.
Habitat: Suckley's cuckoo bumble bee prefers meadows largely confined to mountainous regions. Because this species relies on its host, the Western bumble bee, selected habitat must overlap with the needs of the host species. These resources would typically be found in open (non-forested) meadows in proximity to seeps and other wet meadow environments. Overwintering sites probably in friable soil or under plant litter and debris. Nesting habitat is typically underground, such as in old animal burrows, but also possibly above ground such as in cavities in logs. Reproducing has only been observed in nests of the western bumble bee.
Life history: The flight periods for females in California is from late May to late October, peaking in June. The flight period for males in California is from early July to late September; peaking in late July, with a second pulse in late August and early September.
Conservation measures: Threats include habitat loss and degradation, disease, competition, toxins, loss of primary host species (western bumble bee), and climate change. Thus, protection of suitable habitat in meadows and grasslands is important. Use practices that ameliorate or reduce the frequency of ground disturbance of nesting habitat and overwintering habitat.
Likelihood of "take" or significant adverse impacts resulting from proposed operation: Highly unlikely. No meadows or grasslands are located within the plan. The THP area lacks suitable habitat for this species and therefore no "take" or adverse impacts are anticipated.

Monarch butterfly - California overwintering population *(Danaus plexippus pop. 1*): (Status: Federal Proposed Threatened)
North American monarchs that overwinter along the Pacific coast, mostly in California, are often called the "western monarch". Taxonomically these are part of *Danaus plexippus.* The extent to which they interbreed with eastern monarchs that overwinter in the Mexican mountains is uncertain, but apparently substantial because microsatellite analyses suggest that the western and eastern Monarch populations are panmictic (Lyons et al. 2012). The distinction between eastern and western monarch winter habitats is also not as absolute as it was formerly thought to be some monarchs from the western states overwinter with the eastern ones in the Mexican mountains.
D. plexippus are a migratory species, making massive migrations from August-October to hibernate along the California coast and central Mexico. They commonly occur in closed-cone coniferous forest habitat. This species roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby. *D. plexippus* feed on flower nectar from all milkweeds, dogbane, lilac, red clover, lantana, thistles, goldenrods, blazing stars, ironweed and tickseed sunflower. The majority of overwintering sites are found within 1.5 miles of the Pacific Ocean or San Francisco Bay which has

moderate temperatures. Sites are typically found at low elevations (200-300ft) and situated on slopes oriented to the south, southwest, or west which provide the most solar radiation, or in shallow canyons or gullies. Monarchs require very specific microclimatic conditions at overwintering sites including dappled sunlight, high humidity, fresh water, and an absence of freezing temperatures or high winds. Fall or winter-blooming flowers provide nectar which may be needed to maintain lipid levels necessary for spring migration.
The THP area lacks suitable habitat for the monarch. No CNDDB occurrences of this species have been recorded within the assessment area. No individuals were detected during THP field operations. Potentially significant impacts to this species resulting from this project are not anticipated.

Lotis Blue Butterfly *(Plebejus anna lotis):* (Status: Federally Endangered)
The Lotis blue butterfly has been known to exist in a few sites along the north coast of California. The known habitat of this butterfly is a rare type of coastal bog that has been highly impacted both by development and climate change. Human impacts have likely altered the successional stages of these habitat types and therefore impacted the butterfly's ability to survive. There is no suitable habitat within the plan area, and detections of the butterfly in the area have not been reported since 1983. No impacts to the species are expected because of the timber operations.

Botanical Resources
Botanical surveys focusing on potential rare plant habitat have been conducted for the THP area. Please see Section V for the Botanical Survey Report. A scoping list was developed to inform the survey by conducting a 9-quad query of the California Native Plant Society (CNPS) Electronic Inventory of Rare or Endangered Vascular Plants of California and the California Natural Diversity Database (CNDDB). Past THPs were also reviewed to develop a survey strategy. See results of the preliminary botanical scoping list below.

The THP area contains the following baseline conditions regarding botanical resources:

- **Competition** – The species present in the THP and species that could potentially exist in the THP are struggling to establish with the competition of grasses, shrubs, and other vegetation that may shade out the plants. Disturbance for some of the species is needed for proliferation. Other species exist in riparian areas.

Botanical Resources - Past Projects
The main activities that may have contributed to past adverse impacts to botanical resources include legacy timber harvest operations and modern road building, particularly loss of growing space and heavy equipment use within riparian areas. Conversely, modern forest practice regulations and fire exclusion have resulted in a lack of disturbance, negatively impacting disturbance-dependent plant species. The absence of semi-frequent, small-scale disturbance may have resulted in a reduction in species diversity within the assessment area.

Botanical Resources - Reasonably Foreseeable Probable Future Projects
Future projects within the assessment area will comply with the FPRs and are not expected to result in a significant adverse impact. Continuing small-scale disturbance via timber operations during successive harvest entries may result in a positive impact on species diversity and abundance of disturbance-dependent species. More sensitive hydric species will be protected by FPR WLPZ and wet area restrictions.

Botanical Resources - Proposed THP
No occurrences of rare plants were identified within the THP area during the botanical survey. Any sensitive hydric or aquatic plant species shall be protected by WLPZ and wet area restrictions. Disturbance-dependent species are expected to benefit from the small-scale disturbance of timber

operations. Please see the Botanical Survey Report in Section V for more information.

Botanical Resources Conclusion

The existing conditions within the BAA regarding botanical species indicate that there was not a significant impact in the past, and there is not a present significant adverse impact to botanical resources in the assessment area. Future projects are not expected to require extensive new road construction, therefore no significant loss in growing space is expected. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on botanical resources reveals that there are no significant cumulative impacts, and that current conditions will be maintained through the project implementation.

Rare Plant Scoping List (CNDDB & CNPS 9-Quad Search):

Scientific Name	Common Name	CRPR	G Rank	S Rank	CESA	FESA	Blooming Period
Agrostis blasdalei	Blasdale's bent grass	1B.2	G2G3	S2	None	None	May-Jul
Astragalus agnicidus	Humboldt County milk-vetch	1B.1	G2	S2	CE	None	(Mar)Apr-Sep
Astragalus rattanii var. rattanii	Rattan's milk-vetch	4.3	G4T4	S4	None	None	Apr-Jul
Brasenia schreberi	watershield	2B.3	G5	S3	None	None	Jun-Sep
Calamagrostis bolanderi	Bolander's reed grass	4.2	G4	S4	None	None	May-Aug
Calochortus uniflorus	pink star-tulip	4.2	G4	S4	None	None	Apr-Jun
Calystegia collina ssp. oxyphylla	Mt. Saint Helena morning-glory	4.2	G4T3	S3	None	None	Apr-Jun
Calystegia purpurata ssp. saxicola	coastal bluff morning-glory	1B.2	G4T2T3	S2S3	None	None	(Mar)Apr-Sep
Carex californica	California sedge	2B.2	G5	S2	None	None	May-Aug
Carex saliniformis	deceiving sedge	1B.2	G2	S2	None	None	(May)Jun(Jul)
Castilleja ambigua var. ambigua	johnny-nip	4.2	G5T4	S3S4	None	None	Mar-Aug
Castilleja mendocinensis	Mendocino Coast paintbrush	1B.2	G2	S2	None	None	Apr-Aug
Ceanothus gloriosus var. exaltatus	glory brush	4.3	G4T4	S4	None	None	Mar-Jun(Aug)
Ceanothus gloriosus var. gloriosus	Point Reyes ceanothus	4.3	G4T4	S4	None	None	Mar-May
Coptis laciniata	Oregon goldthread	4.2	G4?	S3?	None	None	(Feb)Mar-May(Sep-Nov)
Cuscuta pacifica var. papillata	Mendocino dodder	1B.2	G5T1	S1	None	None	(Jun)Jul-Oct
Eastwoodiella californica	swamp harebell	1B.2	G3	S3	None	None	Jun-Oct
Epilobium septentrionale	Humboldt County fuchsia	4.3	G4	S4	None	None	Jul-Sep
Erigeron biolettii	streamside daisy	3	G3?	S3?	None	None	Jun-Oct
Erigeron supplex	supple daisy	1B.2	G2	S2	None	None	May-Jul

Erysimum concinnum	bluff wallflower	1B.2	G3	S2	None	None	Feb-Jul
Fritillaria roderickii	Roderick's fritillary	1B.1	G1Q	S1	CE	None	Mar-May
Gilia capitata ssp. pacifica	Pacific gilia	1B.2	G5T3	S3	None	None	Apr-Aug
Gilia capitata ssp. tomentosa	woolly-headed gilia	1B.1	G5T2	S2	None	None	May-Jul
Glyceria grandis	American manna grass	2B.3	G5	S3	None	None	Jun-Aug
Hemizonia congesta ssp. tracyi	Tracy's tarplant	4.3	G5T4	S4	None	None	(Mar-Apr)May-Oct
Hesperevax sparsiflora var. brevifolia	short-leaved evax	1B.2	G4T3	S3	None	None	Mar-Jun
Hesperocyparis pygmaea	pygmy cypress	1B.2	G1	S1	None	None	
Horkelia marinensis	Point Reyes horkelia	1B.2	G2	S2	None	None	May-Sep
Horkelia tenuiloba	thin-lobed horkelia	1B.2	G2	S2	None	None	May-Jul(Aug)
Hosackia gracilis	harlequin lotus	4.2	G3G4	S3	None	None	Mar-Jul
Iris longipetala	coast iris	4.2	G3	S3	None	None	Mar-May(Jun)
Kopsiopsis hookeri	small groundcone	2B.3	G4?	S1S2	None	None	Apr-Aug
Lasthenia californica ssp. bakeri	Baker's goldfields	1B.2	G3T1	S1	None	None	Apr-Oct
Lasthenia californica ssp. macrantha	perennial goldfields	1B.2	G3T2	S2	None	None	Jan-Nov
Lathyrus palustris	marsh pea	2B.2	G5	S2	None	None	Mar-Aug
Leptosiphon aureus	bristly leptosiphon	4.2	G4?	S4?	None	None	Apr-Jul
Lilium maritimum	coast lily	1B.1	G2	S2	None	None	May-Aug
Lycopodium clavatum	running-pine	4.1	G5	S3	None	None	Jun-Aug(Sep)
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	4.2	G3G4	S3S4	None	None	Jun-Oct
Piperia candida	white-flowered rein orchid	1B.2	G3?	S3	None	None	(Mar-Apr)May-Sep
Potamogeton epihydrus	Nuttall's ribbon-leaved pondweed	2B.2	G5	S2S3	None	None	(Jun)Jul-Sep
Sidalcea calycosa ssp. rhizomata	Point Reyes checkerbloom	1B.2	G5T2	S2	None	None	Apr-Sep
Sidalcea malachroides	maple-leaved checkerbloom	4.2	G3	S3	None	None	(Mar)Apr-Aug
Sidalcea malviflora ssp. purpurea	purple-stemmed checkerbloom	1B.2	G4G5T1	S1	None	None	May-Jun
Sulcaria spiralifera	twisted horsehair lichen	1B.2	G3G4	S2	None	None	
Toxicoscordion fontanum	marsh zigadenus	4.2	G3	S3	None	None	Apr-Jul
Trifolium buckwestiorum	Santa Cruz clover	1B.1	G2	S2	None	None	Apr-Oct
Trifolium trichocalyx	Monterey clover	1B.1	G1	S1	CE	FE	Apr-Jun
Usnea longissima	Methuselah's beard lichen	4.2	G5	S4	None	None	
Veratrum fimbriatum	fringed false-hellebore	4.3	G3	S3	None	None	Jul-Sep

(3) Aquatic and Near-Water Habitat Conditions

Pools and Riffles
These habitats are found within the assessment area along the Gualala River. Riffles are areas of swifter flowing water, where the surface is turbulent. Young-of-the-year steelhead like low gradient riffles but coho generally does not. The flowing water delivers insects for food and the broken surface provides cover from predators. Glides (flatwater) are slow moving areas in the stream, where the surface is smooth. Often, streams suffering from cumulative watershed effects have a large percentage of flatwater habitats, such as glides and runs, and riffles. Pools often have filled in and represent a small percentage of habitat types. Plunge pools are formed where water falls over a boulder or log. The falling water scours a hole where juvenile and adult fish often hide. Backwater pools are formed as water swirls around an obstacle such as a root wad, boulder, or stream bank.

Large Woody Debris
Large woody debris (LWD) is a very important component in the creation of pool habitat in streams. Rainville et al. (1985) found that in nearly 80% of the pools surveyed in small streams, LWD was the structural agent forming the pool or associated with the pool. In general the larger the size of the woody debris the greater its stability in the stream channel. Heavier pieces require higher flows for mobilization and longer pieces are more likely to be caught by the stream bank and its vegetation (Spence et al., 1996). Reeves et al. (1993) found "that wood is a primary element influencing habitat diversity and complexity in streams. Consequences of decreased amounts of wood include loss of cover and structural complexity, decreased availability and abundance of habitat units, and reduced varieties of current velocities and other hydraulic features."

During the 1950s and 60s LWD was considered an impediment problem to fish passage and the Department of Fish and Game removed large amounts of LWD from North Coast streams.

The amount of large woody debris present in the watercourses in the assessment area varies widely but is not a limiting factor within the Biological Assessment Area. A significant amount of well distributed LWD exists within the plan area and is providing adequate cover.

Near-Water Vegetation
The area of vegetation near streams is known as the riparian zone. A riparian zone helps maintain good stream habitat for salmon and steelhead in the following ways:

- Helps maintain cool water temperatures through provision of shade and creation of a cool and humid microclimate over the stream
- Provides food resources for the aquatic ecosystem in the form of leaves, branches, and terrestrial insects
- Stabilizes banks through provision of root cohesion on banks and floodplains
- Filters sediment from upslope sources
- Filters chemicals and nutrients from upslope sources
- Supplies large wood to the channel which maintains channel form and improves in-stream habitat complexity
- Helps maintain channel form and in-stream habitat through the restriction of sediment input or slowing of sediment moving through the system
- Moderates downstream flood peaks through temporary upstream storage of water

Estimates of canopy cover on the watercourses within the assessment area range from 70% to 100%, with an average of 85% canopy. Please see the stream-side vegetation section within the Watershed Resources section above.

(4) Biological Habitat Conditions

Snags/den/nest trees
Snags, den trees, nest trees and their recruitment are required elements in the overall habitat needs of more than 160 wildlife species. Many of these species play a vital role in maintaining the overall health of timberlands. Snags of greatest value are >16" DBH and 20 ft. in height. All snags on the plan area will be retained except where state and federal safety laws require their removal. Small, medium and large size snags in varying decay classes exist in the assessment and project area.

For clarification, the following table describes the 5 classes of decaying snags (adapted from Holloway et al. 2007):

Brown's Snag Decay Classes	Description/Characteristics
Decay Class 1	Recently dead tree with intact tops and the majority of fine branching present.
Decay Class 2	Trees with loose bark, intact tops, and most of the fine branches.
Decay Class 3	Trees with <50% of coarse branches and <50% bark.
Decay Class 4	Trees with broken tops and few or no coarse branches, less>6 m in height.
Decay Class 5	Trees with broken tops and no coarse branches, less than or equal to 6 m in height.

Conifers and hardwoods that show active signs of use by wildlife will be retained. Standing culls greater than 30" dbh and greater than 100' tall will be retained. Specific trees to be retained are obvious wildlife trees displaying multiple (meaning two or more) wildlife habitat attributes such as basal hollows, small cavities, internal rot or mistletoe broom, crevice cover, broken or multiple crowns, large (greater than 7 inches diameter) lateral limbs, epicormic branching, stick nests and tree vole nests. These trees will be evaluated by the RPF, or supervised designee, and retained by marking "NO" or "W" in any color paint or not marking with a horizontal line in blue paint (which would indicate a harvest tree). These trees will provide for future snag recruitment.

A few large Douglas-fir and sugar pine snags were observed during plan layout and these will be protected as wildlife trees. Requirements specified in this plan are to save all snags and large decadent trees (standing culls) that don't represent a safety risk for the LTO and are not required to be felled pursuant to Section II, Item 33. Aggregated Variable Retention silviculture will leave areas of unharvested forest between the harvested portions of the THP. Large snags with high biological value within selection units will also be retained, and if screen trees are needed to provide protection for the snag, those will also be retained. The implementation of aggregated retention areas, retention of all snags and decadent trees, in combination with the heavily forested condition within the assessment area, is expected to maintain or increase the potential for the future development of snags and decadent trees throughout the BAA.

There were no dens located in the plan area during THP layout. Any den located during operations will be flagged off and protected. No known nest trees of any rare or endangered species exist in the plan area. Nest trees located within the THP will be protected per 14 CCR 919.2.

Downed large, woody debris
Large, downed logs (particularly conifers) in the upland and near-water environment in all stages of decomposition provide an important habitat for many wildlife species. Large woody debris of greatest value consists of downed logs >16" diameter at the large end and >16 feet in length. Large, down woody debris is a vital component of a properly functioning ecosystem. Large logs serve as "sponges" and maintain moist refugia for numerous insects, amphibians and mammals during the hot summer months. The THP area currently has a healthy amount of large woody debris from the last harvest. The logs from the older entries were very large, therefore the residual logs and buckskins are quite large and scattered throughout the THP, and in the immediate surrounding area.

Multistory Canopy
Multistoried stands are defined as stands composed of two or more canopy layers. Multistoried stands contribute to vertical heterogeneity of stands and influence species diversity. While a majority of the plan area currently contains a generally uneven-aged stand structure with trees in a wide variety of age and size classes, there is not a well-differentiated over or understory. The stands are situated in an unbalanced or irregular condition with larger overstory trees either clumped in patches or very widely spread out.

Road Density
The primary concerns for excessive road density are the disturbance, displacement and fragmentation of wildlife habitats and mortality of wildlife. For example, declines have been noted in the use of areas adjacent to frequently traveled roads by deer and bear. Deer and bear populations have a permanent home range within the assessment area. Much of the BAA within the plan submitter's property has an extensive road network that has been used and maintained for decades.

Hardwood Cover
Hardwoods are present in varied densities and size classes throughout the BAA. Principle species present include tanoak, live oak, chinquapin, California bay-laurel, madrone, and bigleaf maple. The majority of the tree cover in the BAA is provided by conifer trees. The BAA contains hardwoods of the age and size classes necessary for nesting, and foraging habitat for most bird species. Cavities favored by wildlife are more often found in the larger trees and provide potential nesting sites for birds, bats, and rodents. Oak mast and madrone berries are an important food item for deer, squirrels, birds, etc. Berry and mast-bearing trees occur throughout the BAA as food sources and cover for bird and mammal species. Selected hardwoods shall be retained such as tanoak, Pacific madrone, chinquapin, and California bay laurel which will be recruited for habitat diversity, food and/or cover for the many bird and mammal species in the immediate area. Since the THP area is adjacent to areas with abundant hardwood stocking and does not have enough throughout the THP to warrant reduction in most areas, the control of tanoaks does not create adverse cumulative effects.

Late Seral (Mature) Forest Characteristics
Individual effects on wildlife and cumulative effects of the loss of late successional forests and individual large trees through even-aged management or because of repeated entries from uneven aged management have been recognized by the Board of Forestry and addressed by memorandum to RPF's ("Disclosure, Evaluation and Protection of large old trees" Duane Shintaku 2005).

Some of the issues relating to the reduction of large old trees are:
1) loss of late succession stands and late succession continuity;
2) loss of decadent and deformed trees that are of special value to wildlife by providing nesting platforms, nesting cavities for birds as well as basal cavities for mammals;
3) loss of high quality downed large woody debris recruitment; and
4) loss of other special habitat elements such as loose bark that provides for bat roosting sites and nest

sites for smaller birds, perching opportunities for aerial hunters, foraging opportunities for woodpeckers and other insect eaters, territorial perches, etc.

The greatest impact to a late successional and larger tree resource occurred nearly 100 years ago with the logging of the old growth trees present in the watersheds associated with this THP. The goal of contemporary forestry is to maintain the elements of this habitat type that remain and recruit additional late seral stage elements while still harvesting timber products.

No Late Succession Forest Stands as defined in 14 CCR 895.1 are known to remain on the GRT ownership. There are elements of late seral forest scattered across ownership in the form of individual or small clusters of old growth trees that have been left for the following reasons:

1) They are rotten, hollow or busted and previous entries did not take them because of the lack of economic value;
2) They are sound but hanging over Class I or Class II watercourses where the current rules protect them from harvesting for the sole intention of eventual LWD recruitment into the stream or river;
3) They are sound but are on an unstable area or in an area that is inaccessible; and
4) They contain a known nest site, have some other significant wildlife value, or are being left as part of a wildlife habitat retention area or grouping.

By far the most common reason for sound late seral trees that are still on the property is that they are hanging over watercourses, especially adjacent to the Gualala River but also many of the main tributaries have scattered residuals. Though there are a number of single, decadent, residual trees scattered across the property, sound merchantable late seral trees outside a WLPZ are infrequent. No numbers have been collected regarding the number of residual large old trees per acre across the property, but the number is very likely far less than 0.1 per acre (considering conifers only).

Recruitment of Late Seral Elements

Wildlife agencies desire that some trees be recruited over time so that the special habitat elements that late seral trees provide do not continue to decrease because of the loss of the existing trees through mortality and decay. There are several ways that the rules accomplish this.

1) The 2009 Salmonid (ASP) rules require the thirteen largest trees per acre within the Class I and large Class II watercourse protection zones be left.
2) The ASP rules also require that the first 30 feet adjacent to a Class I and variable widths adjacent to Class II watercourses be no-cut zones.
3) Large trees on landslides and on the edges of landslides are often left.
4) Some of the largest trees on the property are in inaccessible areas and although there is no guarantee that someday these won't be taken by helicopter, GRT has no plans to yard with helicopters at this time.
5) Much of the timber on GRT lands is 65 to 105 plus year old second growth which means on the higher site areas there are already some very large second growth trees. The biggest of these trees are often Douglas-fir and many of these Douglas-fir trees already have conk on them as a result of past logging injury or just as a result of natural processes. Since Douglas fir trees often make better wildlife trees than comparably sized redwood trees, and because they have lower economic value (and trees with a lot of conk have little to zero economic value), these are the first trees to be marked as wildlife trees.
6) GRT will continue to leave hardwoods that are 24" or larger. Many hardwoods in this size class are late seral and most of these have high value as wildlife trees. Additionally, all hardwoods in WLPZs are left.

Late Seral Habitat Continuity
As stated above, there is no late seral stage habitat present within the THP that meets the definition of late seral stage forest stated above. However, there are some individual large second growth trees throughout the assessment area. Although these trees individually contribute to special habitat elements present within the assessment area, the RPF has not identified any areas that are a minimum of 20 acres with multistory canopy, large snags and downed logs that lead to an increased level of stand decadence. Generally, these areas with larger trees exist in a narrow strips along watercourses, confined to the channel or Core Zone, which are no-harvest, equipment exclusion zones.

Special Habitat Elements
Although there is not a continuous habitat of late seral stage forest present within the THP, there are a few scattered old-growth trees that will be retained as wildlife trees throughout the harvest area. This generally includes retaining the individual old growth tree as well as any screen trees that have interconnecting branches with the retained old growth tree.

Biological Resources - Past Projects
Past projects within this assessment area across all ownerships are similar to those discussed within the Watershed Resources Assessment section above. The total BAA acreage is approximately 4,928 acres. Over the past 10 years, the BAA has been managed through 202 acres (approximately 2%) of even-aged management, 41 acres of special prescription, 261 acres of unevenaged management, and 17 acre of no harvest.

Historic timber harvesting which took place within the assessment area may have impacted the populations of certain species by displacing or removing habitat in the past. Although there have been impacts to species on a regional level, there is not a significant impact on species within the BAA and project area due to past projects.

Biological Resources - Future Projects
Timber harvesting has been the primary activity within the BAA and this use is expected to continue. Adverse impacts to species and habitats is expected to be at an insignificant level in the future as projects continue to follow state and local regulations and no-take measures.

Biological Resources - Proposed THP
The THP includes required protection measures for listed species, considerations for habitat, and multiple practices that will result in a net positive effect on Biological Resources in the THP area:

- Measures for Occupied Nests: Should an occupied nest site of a listed bird species be discovered during the timber operations, the timber operator will protect the nest tree, screening trees, and replacement trees, and will apply the provisions of 14 CCR 919.2(d), and will immediately notify the Department of Fish and Wildlife, the Department of Forestry, and the landowner or his agent. Appropriate measures will be devised through consultation with the agencies and the landowner and representative. A minor amendment will then be filed reflecting such additional protection as is agreed between the operator and the Director after consultation with the Department of Fish and Wildlife. The specific protection measures to be implemented will be based on the establishment of buffer zones, compliance with year-round restrictions, and the established critical periods for each species.

- Measures for Fish: Impacts to all fish species that occur or have habitat located within the assessment area will be minimal. The watercourse protection measures listed throughout the plan provides for canopy retention, LWD recruitment and sedimentation prevention. There will be no timber harvesting operations within Class I or II-S core zones. In addition, an Erosion Control

Plan has been prepared, which will further ensure sedimentation of the watercourses is minimized and that the beneficial uses of water are not adversely impacted by the proposed operations.

- Measures for Amphibians: Impacts to all amphibian species that occur or have habitat located within the assessment area will be minimal. The watercourse protection measures listed throughout the plan provides for canopy retention, protection for springs, protection for wet areas, LWD recruitment and sedimentation prevention. In addition, an Erosion Control Plan has been prepared, which will further ensure sedimentation of the watercourses is minimized and that the beneficial uses of water are not adversely impacted by the proposed operations.

- Measures for Plants: No rare plants were discovered during the botanical survey for this THP. Post Approval Discovery Protection Measures: Should a listed plant species be discovered during timber operations, a 50-foot EEZ shall be flagged around the area and CAL FIRE, CDFW, and the plan submitter or his agent shall be immediately notified. If protections are required, an amendment shall be filed reflecting such additional protection as is agreed between the plan submitter and the Director after consultation with CDFW. During the pre-operations meeting with the LTO, the RPF will explain the characteristics of wet areas, the location of mapped wet areas, and the importance of protecting them. The RPF will also explain the importance of not operating heavy equipment on saturated soils. The combination of botanical surveys, existing WLPZ protections, site conditions, population presence and the general protections listed above will further ensure that the botanical resources are not adversely impacted by the proposed operations.

- Measures to benefit pool habitats: These are described under Large Woody Debris discussion. This project as proposed has little or no potential to negatively impact pool habitat conditions. The limited use of equipment and other harvesting related activities in the WLPZ, and the Forest Practice Rules will reduce the potential for impacts associated with the operation. Not harvesting in the core zone of Class I or II-S watercourses may provide LWD for the future of these lower order streams.

- Measures to benefit canopy: There will be no timber harvesting within any Class I or II WLPZ where current canopy levels are less than 50%. Heavy equipment limitations within WLPZs established in the plan will help to protect near water vegetation on the watercourses. Please see the discussion of stream-side vegetation above under the "Watercourse Condition" heading for a further analysis of near-water vegetation.

- Measures to benefit dens and nests: There were no dens located on the plan area however, non-listed wildlife that utilize dens were observed or sign of their presence was observed, and den sites are expected to occur within the BAA. Any den located during operations will be flagged off and protected. No known nest trees of any rare or endangered species exist on the plan area. Nest trees located within the plan area will be protected as per 14 CCR 919.2.

- Measures to benefit LWD: Some naturally fresh-fallen debris exists, which is anticipated to be merchantable, and will be harvested if located outside the WLPZ. This harvest of LWD will be offset by recruiting additional LWD in the form of breakage or defective segments of proposed harvest trees. Overall, the harvest operation will add to the woody debris already on site and the slash will enhance wildlife habitat. No broadcast burning is proposed. Not harvesting in the core zone of Class I or II-S watercourses may provide LWD for the future of these lower order streams.

- Silviculture: The silvicultural methods and management techniques to be utilized during this

- harvest will retain all ages and sizes of trees, including larger and older trees and will result in more of a multistory canopy structure in the future. Within the BAA, where un-evenaged management is applied, multistoried stands will be maintained or developed.

- Road Construction: New road construction is limited to 150' ridgetop road spur.

- Measures to benefit hardwoods: Although hardwoods will be damaged in the falling of conifers and may be removed to benefit conifers, large hardwoods shall be retained, especially those with rotten cavities.

Biological Resources Conclusion

The distribution and amount of forested habitat within the assessment area provides a diverse forest environment suitable for wildlife needs. No key habitat elements will be lost because of these operations, and there are no significant special habitat elements present in the project area. There are no other known wildlife or fishery resource concerns. Past human activity on a large regional scale has impacted species, but within the BAA, there are no significant impacts from past projects or known concerns. Future projects are not expected to have significant adverse impacts on biological resources. The THP's impact on wildlife habitat has been evaluated within the project area and within the BAA. This broadens the context within which the THP has been analyzed and thus provides a better understanding of how the individual THP impacts wildlife habitat within an assessment area. The proposed THP includes measures to increase or maintain the quality of certain habitats. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on Biological Resources reveals that there are no significant cumulative impacts, and that current conditions will be maintained or enhanced through the project implementation.

Identification of Information Sources: C. Biological Resources

U.S. Fish and Wildlife Service. 2002. Recovery Plan for the California Red-legged Frog (Rana aurora draytonii). U.S. Fish and Wildlife Service, Portland, Oregon. viii + 173 pp.

California Red Legged Frog Movement and Habitat Use , Dr. Gary Fellers, Western Ecology Research Center, July 2007

CNPS Inventory web site, http://www.rareplants.cnps.org/

California Department of Fish and Wildlife web site (public and subscription based data) https://www.wildlife.ca.gov/

Raptors of California, Hans and Pam Peeters, 2005 University of California Press

The Audubon Society Field Guide to North American Bird, John Whitaker, Alfred Knopf Inc 1992

The Audubon Society Field Guide to North American Bird, Bebler and King, Alfred Knopf Inc 1992

California Mammals, E.W. Jameson and Hans Peeters, University of California Press, Berkeley, 1988.

California's Wildlife, Vol. I - Amphibians and Reptiles, California Statewide Wildlife Habitat Relationships System, May 2, 1988.

California's Wildlife, Vol. II - Birds, California Statewide Wildlife Habitat Relationships System, November, 1990.

California's Wildlife, Vol. III - Mammals, California Statewide Wildlife Habitat Relationships System, April, 1990.

CWHRS Townsends Big Eared Bat J. Harris updated 2000

Petition to List COTO Center for Biological Diversity 2013.

Field Guide to the Birds of North America, National Geographic Society, 1987.

Scats and Tracks of the Pacific Coast, James Halfpenny, 1999 Falcon Publish

The Jepson Manual: Higher Plants of California, James C. Hickman, editor. University of California Press, Berkeley, 1993.

FRAP Multi-source Land Cover Data v02_2 (FVEG02_2, 2002)

CA Resources Agency Ownership Data (GOVLANDS, July 2002)

NCWAP North Coast Watershed Assessment Program, March 2003

Gualala Redwoods Inc. Stream Reports For The Years 1995 To 2013

Gualala River Watershed Technical Support Document by North Coast Regional Water Quality Control Board 2001

Environmental Protection Agency. Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992. 2002.

Dennis Halligan. GRI Westside THP Fisheries Report. 2000. NRM 1434 Third St. Eureka, CA 95501

Holloway G.L., Caspersen J.P., Vanderwel M.C., Naylor B.J. (2007): Cavity tree occurrence in hardwood forests of central Ontario. Forest Ecology and Management, 239: 191–199.

Gualala River Watershed Literature Search And Assimilation By Patrick Higgins 791 Eighth Street, Suite N, Arcata, CA 95521 707-822-9428

Pam Town, Biologist, Deery, Idaho.

California's Wildlife Volume I, II and III, Published by CDFG, April 1990

GRT Database On Fish Habitat-GRT Gualala CA

GRI property wide Rare Plant Assessment by Clare Golec, updated 2001

Nest Site Selection And Breeding Status Of Ospreys In The Gualala Redwoods, HJW

Wildlife Species With Special Status That May Be Present On Gualala Redwoods Or Other HJW Managed Properties By Lawrence Kobernus 1995 Updated By Troy Leopardo 1999

CDF Guidelines For Species Surveys. RPF Mass Mailing July 1999

Northwest Weeds, Ronald Taylor, Mountain Press Publishing 1990

Pacific Coast Berry Finder, Gleen Keator, Natural Study Guild 1978

Personal Communications
Mark Pugsley, Forest Manager, Gualala Redwood Timber, LLC.

John Bennett, Retired Forest Manager, Gualala Redwood Timber, LLC.

D. Recreation Resources

The assessment area for recreation is the THP area plus 300 feet.

Recreation - Baseline Conditions
The THP area is privately held timber property that is closed to general public access. However, public recreation activities are sometimes allowed that are compatible with the company's management goals in select portions of GRT property. Portions of the landowner's property are utilized occasionally by local residents for hiking, bird watching, picnicking, bicycling, fishing, hunting, and other recreational purposes. The THP area is behind locked gates and there are no public access points within the plan area. Public recreation is not a permitted activity within the THP or assessment area, and any incident of this occurring is a result of trespass. A temporary bridge will be installed at the end of the appurtenant road system to facilitate log hauling across the North Fork Gualala at the confluence with the South Fork. This mainstem reach of the Gualala River is designated as "Recreational" under the California Wild and Scenic Rivers Act.

Recreation - Past Projects
Private land ownership within the assessment area has always focused on timber production and early, historic uses such as homesteading and grazing. To the RPF's knowledge the THP area has never been used recreationally and offers no desirable recreation opportunities. The temporary bridge mentioned above has been used numerous times for past harvest plans.

Recreation - Reasonably Foreseeable Probable Future Projects
Future projects within the assessment area will likely continue to lack recreation opportunities. If a new ownership adjacent to the project area focuses on or offers recreation to a significant amount of people in the future, future projects within the THP area will account for and assess the impact to that recreational resource. The temporary bridge on the North Fork is expected to continue to be used as a summer crossing in the future.

Recreation - Proposed THP
The temporary bridge installation is not expected to have a significant adverse effect on recreation resources because it is only seasonally present and does not impede access to recreational activities. The THP area itself offers no public recreational opportunities. There are no measures in the THP to benefit recreation because it is not an objective of the landowner/adjacent landowners.

Recreation Resource Conclusion

The existing conditions within the Recreation Assessment Area indicate that there are no recreational resource opportunities, and that recreation has never been a part of the land management approach. Future projects likely will not impact recreation, but if recreation does increase in the assessment area, future projects will account for this change. As proposed the THP activities are not expected to have a significant impact on recreation. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on recreation reveals that there are no significant cumulative impacts, and that current conditions will be maintained through the project implementation.

Identification of Information Sources: D. Recreation Resources

California Dept. of Forestry and Fire Protection Guidelines for Assessment of Cumulative Impacts; CDF, August 13, 1991.

Cumulative Impacts Assessment Workshop Binder; CLFA, Redding, Ca., September 1991.

Personal Communications
Mark Pugsley, Forest Manager, Gualala Redwood Timber, LLC.

John Bennett, Retired Forest Manager, Gualala Redwood Timber, LLC.

E. Visual Resources

The visual resource 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." Technical Rule Addendum #2 further refers to viewing by "the public".

Visual - Baseline Conditions

The plan area is located entirely behind a locked gate that is accessed only by the landowner and a limited number of people that have been granted permission to utilize the road. Adjacent to the THP, the project is entirely surrounded by forested lands. After a complete assessment, it was determined that the variations in aspects, topography, forested conditions, and lack of public access result in substantial view blockages from the nearest frequently accessed viewpoints (CA Highway 1, Gualala Road, Old Stage Road, Fish Rock Road). This makes the plan area difficult, if not impossible, to see from most public locations. There is no public location within 3 miles of the project from which the project would be visible to any member of the public, let alone significant numbers of people. There are no large open vista points that look directly at the plan. There may be small, isolated areas that contain a view of the plan area from opposing ridges, but these locations are owned by either the plan submitter or other timber companies. A temporary bridge will be installed at the end of the appurtenant road system to facilitate log hauling across the North Fork Gualala at the confluence with the South Fork. This mainstem reach of the Gualala River is designated as "Recreational" under the California Wild and Scenic Rivers Act. With many views being impeded by trees, vegetation, or other obstructions, impacts to the viewshed are expected to be minimal and insignificant.

Visual - Past Projects

Past projects within the assessment area have resulted in the current stands of dense trees with some pockets that are brush dominated that comprise the project area. The previous silvicultural practices

resulted in an aesthetic alteration to the forest canopy by removing a substantial portion of trees disrupting the canopy intactness. Reforestation efforts and natural regeneration have since resulted in a canopy that is generally intact with some scattered gaps. These projects have had aesthetic impacts that are typical of industrial forestlands throughout the region. The temporary bridge mentioned above has been used numerous times for past harvest plans.

Visual - Reasonably Foreseeable Probable Future Projects

Future projects within the assessment area will likely continue to have no effect on the visual resources due to the aspect and objectives of the landowner. The temporary bridge on the North Fork is expected to continue to be used as a summer crossing in the future.

Visual - Proposed THP

The landowner is aware of public perception and the selected uneven-aged silviculture prescriptions, in part, reflect that concern. The silvicultural prescriptions proposed in this plan provide for significant retention as a visual objective. Form, texture and color will not be significantly altered in portions of the plan area where road, skid trail, or harvest management is proposed. Management activities will be visually subordinate to the characteristic landscape. In the middle ground view, small unconnected areas (gaps in canopy, skid trails opened during operations, etc.) will be visible from available vantage points, due to the steep mountainous characteristics, bisecting draws, and viewing angles. In the foreground the retention of eye level vegetation and tall trees will obstruct the view of harvesting activities. Uneven-aged management will provide sufficient residual trees and vegetation that will not be visually displeasing. The temporary bridge installation on the North Fork is not expected to have a significant adverse effect on visual resources because it is only seasonally present and does not detract from the aesthetic character of the area.

Visual Resource Conclusion

The existing conditions within the Visual Assessment Area indicate that there are no impacts to visual resources and that it has not been impacted in the past. Future projects likely will not impact visual quality. The proposed THP activities will not have a significant impact on visual resources. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on visual quality reveals that there are no significant cumulative impacts, and that current conditions will be maintained through the project implementation.

Identification of Information Sources: E. Visual Resources

California Dept. of Forestry and Fire Protection Guidelines for Assessment of Cumulative Impacts; CDF, August 13, 1991.

Cumulative Impacts Assessment Workshop Binder; CLFA, Redding, Ca., September 1991.

National Agriculture Imagery Program (NAIP). 2010, 2012 and 2014 Imagery

Personal Communication

Mark Pugsley, Forest Manager, Gualala Redwood Timber, LLC.

John Bennett, Retired Forest Manager, Gualala Redwood Timber, LLC.

F. Traffic Resources: Assessment

The traffic assessment area includes the first roads not part of the logging area on which logging traffic must travel and those roads commonly used by logging traffic.

The haul route to be used to transport forest products from the project site to destination sawmills include a mainline permanent/seasonal road and multiple seasonal spur roads located on the Plan Submitter's property. Prior to reaching California State Route 1, trucks will travel on the following County roads: Gualala Road and Old State Highway.

Traffic - Baseline Conditions

This assessment area provides for the inclusion and assessment of non-appurtenant private and publicly owned roads which may be impacted by the proposed project. Specifically, the road to be assessed pertinent to this plan is Gualala Road/Old State Highway. There are no current or potential maintenance issues with this road, or any of the approaches and encroachments.

Logging traffic will exit the plan area and enter Gualala Road just west of the Green Bridge which spans the North Fork Gualala River. Gualala Road and subsequently Old State Highway have seen a steady flow of log truck traffic off of the GRT ownership for the last 30 years.

Traffic - Past Projects

The roads in the assessment area have a history of being utilized by logging traffic that extends at least 80 years. Often the logging industry was one of the reasons behind the construction of these roads. Past projects within the assessment area that would contribute to traffic impacts and maintenance issues for these roads, aside from residential traffic, are log hauling, heavy equipment hauling, and other related logging traffic.

Traffic - Reasonably Foreseeable Probable Future Projects

Future projects within the assessment area will likely maintain the level of traffic effects and condition of the roads similar to the past and current project. As GRT lands are managed for forest products, continued use of these roads is expected to occur annually although the exact quantity of vehicle traffic on these roads will vary annually.

Traffic - Proposed THP

Timber is expected to be primarily hauled west along Gualala Road/Old State Highway to SR 1 where it will travel south to Annapolis Road. From Annapolis Road logs will be hauled east to Skaggs Spring Road and proceed east towards US 101. From there trucks are expected to use various public roads to access sawmills. The listed routes above are expected to be utilized to some extent by all logging traffic to access and leave the plan area during operations. As discussed above, all the proposed routes routinely see logging traffic.

Traffic Resource Conclusion

The existing conditions within the Traffic Assessment Area indicate that there is no impact on traffic resources and that it has not been impacted in the past. Future projects likely will not have an impact on traffic resources. The proposed THP activities will not have a significant impact on traffic. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on traffic reveal that there is no significant cumulative impact, and that current conditions will be maintained through the project implementation.

Identification of Information Sources: F. Traffic Resources

California Dept. of Forestry and Fire Protection Guidelines for Assessment of Cumulative Impacts; CDF, August 13, 1991.

Cumulative Impacts Assessment Workshop Binder; CLFA, Redding, Ca., September 1991.

Personal Communication

Mark Pugsley, Forest Manager, Gualala Redwood Timber, LLC.

John Bennett, Retired Forest Manager, Gualala Redwood Timber, LLC.

G. Greenhouse Gases: Assessment

The assessment area for climate effects is the proposed project area, transportation routes to manufacturing facilities, and the milling of forest products. However, qualitative consideration of the carbon cycle in wood products is addressed as a cumulative effect.

There are 16.6 million acres of productive public and private timberland (statutorily available for harvest) in California (California Department of Forestry 2003). Gualala Redwood Timber owns approximately 28,000 acres in northwestern California. This represents 0.0017% of the total timberland, and 0.0038% of the 7.3 million acres of the private timberlands in the state.

912.9 Technical Rule Addendum #2 states the following concerning analysis of GHG impacts:
GREENHOUSE GAS (GHG) IMPACTS
Forest management activities may affect GHG sequestration and emission rates of forests through changes to forest inventory, growth, yield, and mortality. Timber Operations and subsequent production of wood products, and in some instances energy, can result in the emission, storage, and offset of GHGs. One or more of the following options can be used to assess the potential for significant adverse cumulative GHG Effects:
1. Incorporation by reference, or tiering from, a programmatic assessment that was certified by the Board, CAL FIRE, or other State Agency, which analyzes the net Effects of GHG associated with forest management activities.
2. Application of a model or methodology quantifying an estimate of GHG emissions resulting from the Project. The model or methodology should at a minimum consider the following:
a. Inventory, growth, and harvest over a specified planning horizon
b. Projected forest carbon sequestration over the planning horizon
c. Timber Operation related emissions originating from logging equipment and transportation of logs to manufacturing facility.
d. GHG emissions and storage associated with the production and life cycle of manufactured wood products.
3. A qualitative assessment describing the extent to which the Project in combination with Past Projects and Reasonably Foreseeable Probable Future Projects may increase or reduce GHG emissions compared to the existing environmental setting. Such assessment should disclose if a known 'threshold of significance' (14 CCR§ 15064.7) for the Project type has been identified by the Board, CAL FIRE or other State Agency and if so whether or not the Project's emissions in combination with other forestry Projects are anticipated to exceed this threshold.

Our approach to evaluating this concern is consistent with approach #2 itemized above. Current project

parameters were applied to the CalFire model and summarized on the following pages support our conclusion that the project will result in a net reduction in atmospheric carbon dioxide over time (break projected at 16 years). This is possible due two primary processes:

1) Wood products used for building store carbon typically for decades deferring their conversion through the natural carbon cycle process.
2) Forests growing at faster rates store more carbon at a correspondingly faster rate. Younger forests grow more quickly and have lower decay rates than older decadent stands of timber.

Other factors not quantified by the model include:

- A reduction in fire hazard as a result of the planned harvest due to the fact that overgrown roads will be opened and rehabilitated providing much improved access for wildfire fighting equipment in the event of a forest fire.
- California consumes far more natural resources, including wood than we produce. This is a type of economic/environmental colonialism which amongst its many other negative attributes increases carbon emissions associated with moving bulky resources long distances. Locally produced wood products have a lower per unit "carbon cost" than those imported from abroad. Time will show that real solutions to this issue will be more consumer based than producer based.

Greenhouse - Gas Baseline Conditions

Climate Change Overview

The scientific literature on the phenomenon of global warming, and impact of greenhouse gas emissions on the State of California, as well as to the remainder of the Earth, is growing, conflicted, and politically charged. Consensus is growing on the occurrence of global warming, although there is considerable debate regarding the causes (Bast and Taylor, 2007; Ferguson, 2006). The Stern Review of the Economics of Climate Change (2006) was a comprehensive report commissioned by the British government and provided projections of economic cost based on assumptions of impacts. Studies of past and present temperatures show a natural variability of Earth's climate. Past climates were as warm as (and even warmer than) what we currently experience, and such warm periods were typically, relatively short-lived respites from ice-age conditions that dominated the past half-million years (Ferguson, 2006).

Regardless of the aforementioned issue, the State of California has recognized climate change and global warming as a threat to health, safety, and the economy. Global warming could result in reductions in water supply due to changes in snowpack levels, adverse health impacts from increases in air pollution, adverse impacts on agriculture caused by changes in quantity and quality of water supplies and significant increases in diseases and pests, increased risk of catastrophic wildfires, and significant impacts to consumers and businesses due to increased costs of goods and services (AB 1493, 2002). In response, the State of California has enacted legislation and policies designed to reduce greenhouse gas emissions and to increase energy efficiency (AB 1493, 2002; AB 32, 2006; Gov. Schwarzenegger Executive Order S-3-05). The Executive Order established greenhouse gas emission targets using 1990 thresholds and established the California Climate Action Team to coordinate the State's efforts to reduce and report on progress of those efforts and on impacts of global warming to the State. The 2008 “Approved Scoping Plan” calls for a reduction in annual emissions from a per capita amount of 14 tons of CO2 to 10 tons per person of CO2 by 2020 (CARB 2008). According to the CARB 2020 California Greenhouse Gas Emission Inventory, California statewide GHG emissions dropped below the 2020 GHG limit in 2016 and have remained below that limit since then (CARB 2020).

Carbon dioxide (CO2) is considered the greenhouse gas (GHG) that has the greatest effect on the dynamic of global warming due to the fact that it composes the vast majority of the releases by human activities. There are two basic ways carbon emissions are reduced. First is efficiency, where technology or

conservation reduces carbon emissions through the use of less energy (electricity, fuel, heat, etc.) to accomplish an activity. Second is storage, which can be accomplished through geologic or terrestrial sequestration.

Forest activities can result in emissions through harvesting, wildfire, pest mortality and other natural and anthropogenic events. However, forestry is a net sink for carbon, the primary greenhouse gas. Plants absorb CO2 from the air and use the carbon as a building block of plant tissue through the process of photosynthesis. Worldwide forests store approximately 2,000 billion tons (Gt) +/- 500 of CO2 (National Energy Technology Laboratory, 2000). An acre of mature redwood can store between 600-700 tons/ac of CO2, which is the highest of any forest type on Earth. Though redwood forests can store the largest amounts of GHGs per acre of any forest type, the expanse of this forest type is not significant on a global level. The most recent draft Greenhouse Gas Inventory shows the forestry sector to be a net sink with emissions of 6.1 MMT CO2 EQ. and emissions reductions of 21 MMT CO2 EQ (Bemis, 2006).

The forest sector offers the ability to reduce emissions through a suite of possible activities: 1) substitute wood products for more energy-intensive products, 2) reduce demand for energy in growing timber, harvesting, and wood processing, 3) reduce biomass burning (wildfires), 4) afforest marginal croplands, 5) reduce conversion of forestland to non-forest use, 6) improve forest management, 7) reduce harvest, 8) increase agro-forestry, 8) plant trees in urban areas, 9) other combinations (Joyce and Nungesser, 2000). This proposed THP uses several of the activities which are considered to have the effect of reducing the overall forest emissions and improving the storage of GHGs. The harvest will add to the carbon stored in wood products, while at the same time increase the rate of carbon storage by maintaining a healthy, fast-growing forest. Forest management may result in a reduced risk for wildfire and will maintain maximum sustained productivity of quality forest products. By maintaining timber management there is a reduced risk of deforestation through conversion of the land to non-forest uses. A key finding of the updated AB 1504 California Forest Ecosystem and Harvested Wood Product Carbon Inventory: 2019 Reporting Period, is that there has been an 18% increase in the rate of forestland conversion from the 2018 reporting period due to an increase in forestland converting to grassland. It is important to maintain productive healthy forests through active management in order to disincentivize timberland conversions to other uses that may not sequester as much carbon (Christensen et. Al., 2021).

CEQA Analysis Related to Climate Change

The California Global Warming Solutions Act of 2006 (AB 32) is California's legislative effort aimed at reducing GHG emissions. Pursuant to AB 32, CARB must develop an implementation program and adopt control measures to achieve the maximum technologically feasible and cost-effective GHG reductions. AB 32 requires CARB to prepare a Scoping Plan to achieve reductions in GHG emissions in California. On June 26, 2008, GARB staff presented the initial draft of the AB 32 Scoping Plan for Board review. The Scoping Plan was first considered by the Board in 2008 and must be updated every five years. CARB has updated the Scoping Plan in 2014 (First Update) and again in 2017 (2017 Scoping Plan). The latest update is the 2022 Scoping Plan. Details below regarding the scoping plan are taken from the CARB 2022 Scoping Plan FAQ page:

The first Scoping Plan (2008) laid out the goal of reducing greenhouse gas (GHG) emissions back down to 1990 levels by 2020. The 2013 update measured progress and fine-tuned programs toward the 2020 goal and highlighted the need to focus on short-lived climate pollutants. The 2017 update shifted focus to the SB 32 goal of a 40 percent reduction below 1990 levels by 2030 by laying out a detailed cost-effective and technologically feasible path to this target and assessed progress towards achieving the AB 32 goal of returning to 1990 GHG levels by 2020. The 2020 goal was ultimately reached in 2016–four years ahead of the schedule called for under AB 32. The 2022 update both assesses progress towards achieving the State's 2030 emissions reduction goal and draws on a decade and a half of proven regulations, incentives, and carbon pricing policies alongside new approaches to outline a balanced and aggressive

course of effective actions to achieve carbon neutrality by 2045 or sooner. This includes an unprecedented pace of actions to develop the clean energy foundation on which to build the low-carbon economy.
(...)
The 2022 update presents the scenario recommended by CARB staff out of four scenarios that were analyzed for achieving California's ambitious goals. The proposed scenario builds on existing programs for the deployment of clean fuels and technologies, and for the first time brings California's forests, wetlands, and agricultural lands into the process with the potential to leverage sustainable management to use these landscapes for carbon storage. The scenarios also reflect the need for additional methods of capturing carbon dioxide that include pulling it from the smokestacks of facilities, or drawing it out of the atmosphere, and then safely and permanently storing it. This update aims to more effectively integrate equity and environmental justice throughout, and to ensure that vulnerable communities are not disproportionately impacted by climate change. The draft incorporates five dozen recommendations from the AB 32 Environmental Justice Advisory Committee.

In addition to the 2022 Scoping Plan, the California Forest Carbon Plan completed in May of 2018 presents an assessment of forest health across California based on the best currently available information. This plan provides a description of anticipated future conditions given the ongoing and expected impacts of climate change on forested ecosystems and lays out a set of forest management goals to move the state's forests towards a more ecologically resilient state. These goals include:

1. Enhance: Expand and improve forest management to enhance forest health and resilience, resulting in enhanced long-term carbon sequestration and storage potential.
2. Protect: Increase protection of California's forested lands and reduce conversion to non-forest uses, resulting in a more stable forested land base.
3. Innovate: Pursue innovations in wood products and biomass utilization in a manner that reduces or offsets GHG emissions; promotes land stewardship; and strengthens rural economies and communities.

The Forest Carbon Plan provides guidance and input to the Natural and Working Lands Implementation Plan described in the California's 2017 Climate Change Scoping Plan. The Forest Carbon Plan describes a significant deficit in forest management in California, both on private lands and nonfederal public forestlands. To address the forest health and resiliency needs on a state-wide basis on nonfederal lands, the plan states forest treatments need to increase to 500,000 acres per year to make an ecologically significant difference at the landscape scale. The plan further describes the treatments to include those that generate revenue from harvest materials, such as commercial thinning and regeneration harvests.

Greenhouse Gas - Past and Future Projects

Carbon Sequestration and Emissions Resulting from Intensive Forest Management

Forestlands are, in general, a carbon sink where CO2 is captured and fixed by the process of photosynthesis, which removes carbon from the atmosphere and sequesters carbon in wood fiber. (OFRI 2007, U.S.E.P.A. 2005). In California, forested lands are the largest land-based carbon sink with trees and underbrush drawing carbon from the atmosphere and storing it in their cellulosic structure and in forest soils (CA Forest Carbon Plan 2018). Forests in the North Coast, Cascade Northeast and North Sierra regions were estimated to produce a net benefit of 7.2 million metric tons of CO2 equivalents removed from the atmosphere each year (California Energy Commission 2004). Growing forests sequester and store more carbon over time until growth stagnates as trees reach a mature age. Older trees sequester carbon through new growth at a declining rate, but they remain pools of stored carbon until they decay through decline, death, or consumptive use.

Managed commercial forests make a significant contribution to the sequestration of carbon and reduction of GHG. (IPCC 2007; Mader 2007; OFRI 2006; U.S.E.P.A. 2005). Several studies have documented a

positive net effect of carbon sequestration by commercial timberlands where forests are grown, harvested, and processed into wood products. (James et al. 2007; Perez-Garcia et al. 2005; Lippke et al. 2004). Even when CO2 emissions from timberland management, timber harvest, and forest products uses are considered, the long-term, sustainable, and intensive management of commercial timberlands to produce wood products generates a net carbon sequestration benefit that reduces GHG. These studies investigated timber harvest at various rotation ages relative to no harvest and perpetual old growth stands. They found that intensive forest management can produce net positive carbon sequestration benefits because carbon is sequestered through repeated cycles of tree growth while a substantial percentage of harvested and milled wood is sequestered for decades or centuries in buildings. Life cycle assessment studies have shown that wood products have a much smaller "carbon footprint" compared to other building materials. It is estimated that at the end of 100 years an average of 46 percent of the solid wood products manufactured from the log are still in use, and if the wood placed in landfills is included the average over the 100-year period is 76% percent (US Dept of Energy- 1605(b) Tables).

The proposed project is one of numerous past, present, and future timber harvest projects on the GRT ownership that combine to produce substantial net carbon sequestration benefits over time. GRT timberlands are sustainably managed in accordance with the Forest Practice Rules which ensure sustained yield and strict environmental protection for wildlife and water quality. Timber harvests are scheduled across the ownership within management blocks, where uneven aged timber stands are reentered every 15-20 years. Harvested timber is converted to wood products that sequester carbon as building materials.

Not all of GRT timberland is dedicated to intensive forest management. Large areas of the ownership remain un-harvested or lightly harvested to provide various fish, wildlife, and ecosystem benefits. In addition to these areas, extensive riparian protection zones extend like a web across the property. There are also numerous geologic features across GRT ownership which will experience little or no timber harvesting. These wildlife, riparian, and geologic areas will be managed to develop into late succession forest stands, which will provide critical habitat for wildlife, protecting water quality and is a diversification of GRT portfolio for carbon sequestration.

Following each timber harvest, such as the project, GRT manages slash to reduce fire risk and enhance forest soils that will host the next rotation of forest growth. Where necessary to facilitate site occupancy of desired tree species, Selection and Group Selection areas are promptly replanted and regenerated with healthy seedlings that combine with advanced regeneration and stump sprouts from harvested redwoods that immediately begin to fix carbon through photosynthesis. Because the plantings require a substantial investment, there is a strong financial incentive to efficiently and effectively re-establish growing forests and timber production on harvested property. For the same reason, there is a strong incentive to protect growing tree stands from mortality that adds to forest fuels and to aggressively prevent and suppress wildfires before they can become catastrophic. The proposed project and similar past, present, and future projects have the cumulative benefit of reducing the risk of catastrophic fire and related adverse impacts to GHG and carbon sequestration.

The project will also result in minimal impacts to the carbon stored in the duff layer and the soil. Because harvesting minimizes duff and soil disturbance, and very limited broadcast burning occurs, the carbon stored in the duff layer is essentially intact following harvesting. Powers, et al (2005) found that the absolute mass of soil carbon showed little change over time. Redwood/Douglas-fir forests that include sprouting species such as redwood and tanoak are likely to have less fluctuation in soil carbon given that the root systems of these species continue to survive following harvest.

Effects of Climate Change on Timberlands

Regardless of the benefits that the project and similar past, present, and future projects will have on

diminishing GHG emissions and promoting carbon sequestration, climate change is likely to occur. The rate and direction of climate change remains very uncertain (IPCC 2007). It is a certainty that the earth's climate has changed in the past with variable cooling and warming trends, but no models exist to reliably predict the rate and direction of climate change or the regional or localized effects on temperatures, precipitation, growing seasons, drought, vegetation, and wildlife (IPCC 2007).
In the face of uncertainty, the impacts of climate change must be assessed in terms of the resilience of GRT timberlands should climate changes occur. There are several indications that GRT timberlands have been and continue to be resilient. After more than a century of timber harvest, most of which occurred without the benefits of modern forest practices regulations and best management practices, GRT timberlands remain commercially productive and viable. A key tree species on the property is the coast redwood (*Sequoia sempervirens*), which is the epitome of resilience, having persisted for millennia in the coastal climate of northern California. The redwood tree is not expected to be threatened by pests that might be advantaged by global warming, and it is expected to persist at the southern end of its range even if climate change brings higher temperatures and less precipitation. (Battle 2006). The redwood tree also benefits from coppice regeneration, which means that it regenerates from the stump after a tree has been harvested. As such, much of the living root system of redwood trees persists and the genetic diversity of each individual tree is preserved on the landscape as cut trees are replaced by genetically identical sprouts that grow from the same root system. For the same reason, the regeneration and growth of redwood forests after harvest occurs quickly and with more certainty because young trees have the benefit of mature root systems.

In addition to redwood, the plan submitter's ownership grows hearty and resilient species such as Douglas-fir, a species that thrives in open stands following harvest. Douglas-fir grows in a variety of climates throughout western North America and are believed to have rapidly colonized vast areas following the end of the last Ice Age. Through its substantial and continuous investment in their timberlands, the plan submitter has a strong incentive to nurture healthy and resilient forest stands on its property.

Greenhouse Gas - Proposed THP

The proposed project will result directly and indirectly in carbon sequestration and temporary, insignificant CO2 emissions. Carbon sequestration is achieved through a repeating cycle of planting and growing of trees that remove CO2 from the atmosphere and store carbon in tree fiber. When a tree is harvested, most of the carbon filled tree fibers become lumber that is sequestered in buildings while a new rotation of trees is planted and grown. Some of the tree fibers such as branches and tops are left in the forest where they are sometimes burned to reduce fire hazard. However, the vast majority of this material is left to decay and will emit CO2 over time; but, it also supplements the forest soils and forest duff layer where carbon is stored that serves as a substrate for more tree growth. In addition, redwood is a dominant species on GRT's timberlands and redwood slash decays more slowly than slash from hardwood and whitewood species. Further, when CO2 is released by decaying slash, it is offset by rapid regeneration of tree stands (including sprouts from redwood and hardwood species) and other vegetation that sequesters carbon. Some of this carbon-filled tree fiber, such as bark, shavings, and chips are used in other engineered building products or as fuel used to generate electricity. When this wood fiber is burned to generate electricity the stored carbon is released into the atmosphere, but it is being done in a controlled setting, which also fills a huge demand by our society. Another factor to consider is that when wood biomass is used to generate electricity it directly reduces the amount of fossil fuels required which are non-renewable energy sources and generate CO2 in more substantial quantities. Another point worth mentioning is that if this wood fiber were left to decompose naturally its stored carbon emissions would still nonetheless occur.

Using the CAL FIRE GHG calculator, it is estimated that GHG emissions for this project will be **1,247**

metric tons of CO2. It is also estimated that the CO2 sequestration associated with this project will result in **64,270 metric tons of CO2 sequestered over the 100-year planning horizon**. *See GHG calculation worksheets in Section V for more information.* This sequestration total includes emissions from site preparation, non-biological emissions associated with harvesting and non-biological emissions associated with milling. GHG emissions associated with this project are insignificant relative to global CO2 emissions that are thought to affect climate. There is virtually no opportunity to reduce these emissions in a manner that would meaningfully benefit the climate because they are already miniscule. (U.S.E.P.A. 2005). An acre of managed forest may be entered with equipment once every 15-20 years with emissions measured in hours of equipment operation over that time period. Few if any other land uses can match the low intensity of CO2 emissions over space and time that are associated with commercial forestry. In urban areas of California, a typical California household will operate one or more vehicles every day and the demands of that household will induce a variety of additional CO2 emissions for other forms of commerce, power production, and consumption. In rural areas, even a typical farm acre in California will be subject to equipment operation for several hours or days every year over 20 years - not once every 20 years.

The insignificant GHG effects of the proposed project are further diminished by the effects of carbon stored in wood products produced from harvest and by the forest stewardship principals used by GRT, which strives to increase forest stocking over time.

On the project scale, the beneficial impacts on carbon sequestration and the project-related CO2 emissions related to global warming are negligible and undetectable at the global scale. The CO2 emissions from vehicles used to implement the project over several weeks or months are dwarfed by the CO2 emissions from other routine daily activities engaged in by all Californians such as a single morning commute for even one city. Also, the implementation of new standards for diesel engines recently adopted by the CARB (CARB 2022) will help to reduce emissions. When considering the impacts of this project on climate it is doubtful that a measurable change could be detected, even at the microclimate level.

Greenhouse Gas Conclusion

This plan, alone or in combination with other harvest plans in the past in the watershed, ownership, Mendocino County, or State of California is not expected to have an adverse impact on climate change. Carbon from trees harvested will be stored for decades or longer in the form of the wood products cut from the logs. Importantly, additional carbon will be sequestered in the future as newly planted, sprouting, and growing crop trees occupy and grow on the site. Therefore, in combination with the goals of the State, future projects likely will not impact Climate Resources. The proposed THP activities will not have a significant impact on GHG. The stands will take less than 10 years for Selection, less than 13 years for Transition, and less than 31 years for Variable Retention to recoup carbon lost and emitted during harvest and milling operations. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on GHG reveals that there is no significant cumulative impact, and that current conditions will be maintained through the project implementation.

Identification of Information Sources - G. Greenhouse Gases

AB 1493, Pavley, Chapter 200, Statutes 2002, Findings and Declarations.

AB 32, Nunez, 2006, Air pollution, California Global Warming Solutions Act, 2006

Bast, J. and Taylor, J., 2007. Scientific Consensus on Global Warming. Results of an international survey

of climate scientists. Second Edition. The Heartland Institute, Chicago Illinois, c. 2007

Battles, John J., et al. 2006 Climate Change Impact on Forest Resources: A Report From: California Climate Change Center.

Bemis, G., 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. Staff Final Report. California Energy Commission, December 2006. CEC-600-2006-013-SF. 117 pages.

Board of Forestry and Fire Protection (2008); Report (Draft) to ARB on Meeting AB 32 Targets. California Environmental Protection Agency - Air Board, (2008): News Release 08-103, December 12, 2008 "ARB adopts landmark rules to clean up pollution from 'big rigs'."

California Energy Commission. 2004. Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands in California. http://www.energy.ca.gov/reports/CEC-500-2004-069/CEC-500-2004-069F.PDF

Ferguson, R. 2006. Issues in the Current State of Climate Science. A Guide for Policy Makers and Opinion Leaders. The Center for Science and Public Policy. Washington, D. C. March 2006.

Governor Arnold Schwarzenegger, State of California Executive Order S-3-05, Greenhouse gas emission reduction targets, June 1, 2005.

Joyce and Nungesser, 2000. Ecosystem Productivity and the Impact of Climate Change. USDA Forest Service Gen. Tech. Rep. RMRS-GTR-59. (pgs. 46-68) 2000.

James, C; B. Krumland, and P. Eckert. 2007. Carbon Sequestration in California Forests; Two Case Studies in Managed Watersheds. http://www.spi-ind.com/html/pdf forests/CARBONSEQUESTRATION.pdf

Lippke, B.; J. Perez-Garcia, J. Bowyer, J. Meil. 2004. CORRIM: Life Cycle Environmental Performance of Renewable Building Materials. Forest Products Journal 54(6): 8-19

Mader, S. 2007. Climate Project: Carbon Sequestration and Storage by California Forests and Forest Products.
http://www.foresthealth.org/pdf/CH2M%20Hill%20Forest%20Carbon%20Study.pdf

Robert F. Powers, Mcfarlane, Karris J, Stephen H Schoenholtz, Steven S. Perakis (in review); Soil Organic Matter Quality in Intensively Managed Ponderosa Pine Stands in California. 2005.

National Energy Technology Laboratory, 2000. Terrestrial Sequestration Program, Capture and Storage of Carbon in Terrestrial Ecosystems. Program Facts. U.S. Department of Energy, National Energy Technology Laboratory, November 2000, 4 pages.

Stern, N. 2006. The Economics of Climate Change: the Stern Review. http://www.hm-treasury.gov.uk/independent reviews/stern review economics climate change/stern review report.cfm

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

U.S. Department of Agriculture, Forest Service. 2007. Forest Inventory and Analysis 2007. http://www.fs.fed.us/pnw.fia

U.S. Department of Energy. 2005. 1605(b) Tables. http://www.eia.doe.gov/oiaf/1605/index.html

U.E. Environmental Protection Agency (U.S.E.P.A.). 2005. Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture. http://www.epa.gop/sequestration/pdf.greenhousegas2005.Pdf

U.S. Fish & Wildlife Service and National Marine Fisheries Service (FEIS). 2006. Final Environmental Impact Statement for Authorization for Incidental Take and Implementation of a Multiple Species Aquatic Habitat Conservation Plan and Candidate Conservation Agreement with Assurances: Green Diamond Resource Company, Del Norte and Humboldt Counties, California.

U.S. Senate, Environment and Public Works committee. 2008. Minority Report: More than 650 International Scientists Dissent Over Man-Made Global Warming Claims. http://epw.senate.gov/public/index.cfm?FuseAction=Minority.Blogs&ContentRecordid-2158072e-802a-23ad-4 5tD-274616db87e6

California Forest Carbon Plan, California Department of Forestry and Fire Protection, California Natural Resources Agency, California Environmental Protection Agency, May 2018.

CARB. (2008). Climate Change Scoping Plan - a framework for change. Sacramento, CA: California Air Resources Board.

CARB. (2018). An Inventory of Ecosystem Carbon in California's Natural and Working Lands. Sacramento, CA: California Air Resources Board.

CARB. (2020). An Inventory of Ecosystem Carbon in California’s Natural & Working Lands. California Air Resources Board.

CARB 2022, California Greenhouse Gas Emissions for 2000 to 2020: California Air Resources Board, October 26, 2022.

CARB 2022, 2022 Scoping Plan for Achieving Carbon Neutrality. California Air Resources Board,

November 16, 2022.

Christensen, G., Gray, A., Kuegler, O., Tase, N., & M, R. (2021). California Forest Ecosystem and Harvested Wood Product Carbon Inventory: 2019 Reporting Period Update. Sacramento: California Department of Forestry and Fire Protection and California Board of Forestry.

EPA. (2020). Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018. U.S. Environmental Protection Agency.

Forest Climate Action Team. (2018). California Forest Carbon Plan - Managing our Forest Landscapes in a Changing Climate. Sacramento.

H. Wildfire Risk and Hazard: Assessment

Fire is an integral part of California's forested ecosystems in the past and today, and as such is always a factor that must be considered while managing California forestlands. This analysis seeks to assess the fire risk of the Plan area both before and after harvest operations and characterize the fire risk going forward into the future. The assessment area includes the project boundary plus 300 feet and the residential homes and dwellings within the vicinity of the project.

Wildfire Risk and Hazard - Baseline Conditions

The plan area fire fuel conditions are typical of north coast timberlands with a high amount of ground and ladder fuels, mostly a result of fire suppression, or a lack of vegetation management. Huckleberry and tanoak brush can be dense in some areas of the project, and other areas have an open understory with a buildup of leaf litter and small branches.

1. Fire Severity Zoning

Wildland fire hazard responsibility areas of the State are generally classified as state, local or federal. The plan area lies within a state responsibility area (SRA). FRAP mapping indicates the assessment area is located in an area of Moderate and High Fire Hazard Severity.

2. Existing and probable future fuel conditions including vertical and horizontal continuity of live and dead fuels.

Hazardous fuels are live and dead vegetation that has accumulated and increases the likelihood of unusually large wildland fires. When fire encounters areas of heavy fuel loads (continuous brush, downed vegetation or small trees) it can burn these surface and ladder fuels and may quickly move from a ground fire into a crown fire.

Current fuel conditions within the assessment area are typical of coast redwood forest type; predominantly closed canopy, well stocked stand of mature conifers with a minor to moderate tanoak component, a moderate to high conifer regen and brush component and low to moderate herbaceous fuel component. Commercial Thinning units are densely stocked with a completely closed canopy structure. There is currently a significant density of ladder fuels in the VR stands and in portions of the Group Selection stands where previous hardwood treatment has not occurred. Where hardwood treatment has occurred, there is a relatively high density of surface fuels in the form of partially suspended and downed tanoaks in various stages of decay. There are also pockets of sugar pine mortality distributed throughout scattered ridgetop locations, resulting in some areas of high-density standing dead fuel; however, these locations are small and isolated. Section III of the plan describes the vegetation community in the THP

area and regional information (i.e., topography, aspect, climate regime) which provide background and insight for the assessment of wildfire risk. The probable future fuel conditions are expected to be significantly lighter than the pre-harvest stands as a result of the extraction of mature, overstory crop trees, thinning of redwood clumps, removal of dying, diseased and high defect trees, road and skid trail opening, and hardwood treatment in the VR units. Although the hardwood treatment in VR units will result in a temporary increase in dead fuels, the net fuel reduction outweighs the creation of fuels. Ladder fuels will be removed during operations in these units, and crown separation will be achieved, reducing the risk of a crown fire.

3. Location of known existing public and private Fuelbreaks and fuel hazard reduction activities.
Within and adjacent to the plan area there are no known designated public or private fuelbreaks. There are no known CAL FIRE fuel treatment program projects adjacent to the plan area. Timber harvesting maintains, reuses and creates skid trails and truck roads, whose presence, by definition, is a fuel break. Fuel hazard reduction and slash treatment, where the condition or location exists, is addressed in Section II of the plan. During logging active operations there will be hand tools and equipment on site that can be used to construct fire lines or to support CAL FIRE in fire suppression activities.

4. Road access for fire suppression resources.
In the event of wildfire, the plan area is well situated for fire suppression resource access and response time. The South Coast Volunteer Fire Department station is less than 2 miles from the nearest plan access gate. Additional resources, both State and Volunteer, are located in the nearby communities of Sea Ranch and Point Arena. Access to the plan area is gained from Gualala Road. Some appurtenant roads associated with the area are permanent rocked roads, but the majority of the appurtenant roads within the plan area and property are seasonal roads with native soil, rolling dips and waterbars. Gates are generally left open during the day while active logging operations are occurring which would allow access for fire suppression resources. Gate openings can accommodate over-sized loads. Roads on an actively managed forest are designed to facilitate logging vehicles. An externality of this is that these same roads can readily facilitate safe and rapid access for fire suppression vehicles and landing present an opportunity to safely stage vehicles and unload firefighting equipment (Moghaddas 2007). Unsurprisingly, roads are among the greatest predictors of where control of fire is obtained (Narayanaraj 2011) and escaped fires in unroaded areas are 2.3 times larger in size for the California Coast Range compared to areas with road access (Johnston 2021). In the absence of harvesting, many of these roads would quickly deteriorate to a condition that greatly restricts the use of roads during fire suppression activities. This project in conjunction with the landowners' continued timber harvesting is expected to improve and maintain road access within the project area.

<u>Wildfire Risk and Hazard - Past Projects</u>
Within the project area fuel conditions are largely the result of past timber harvesting. The THP area has been harvested under evenaged regeneration methods in the 1950s and (most of the area) again in the 1990s, with a small area harvested in the 2010s under selection. Past management has resulted in areas with a high density of small diameter trees and moderate crown continuity along with patches of dense brush and regen. The legacy roads, particularly WLPZ roads, are now overgrown and impassable, but the upper slope and ridgetop roads built to facilitate cable yarding in the 1990s are in good condition. Prescribed fire was used historically as a tool to reduce slash after harvests, however due to liability concerns and state agency enforcement this practice stopped being utilized. Past timber harvesting and the 30-year gap in active management of the stand have contributed to the current fuel loading and correlated fire risk.

<u>Wildfire Risk and Hazard - Future Projects</u>

Forests managed for timber production, particularly in the redwood region, are expected to pass through cycles of fuel loading. Immediately following a harvest entry, the stand will typically have reduced fuel loading through the removal of crown and ladder fuels. The opening of roads and skid trails will create linear fuel break networks throughout the stand, reducing brush and other surface fuels. The redistribution of crown fuels in the form of slash to the forest floor will temporarily increase surface fuel loading for a period of approximately 5 years until the material decomposes and new growth establishes in the understory. This cycle of vegetation removal and regrowth is expected to be balanced over time as the stand enters an uneven-aged management regime, with entries occurring approximately every 10-20 years. Fire prevention is a major objective of the landowner, who has an economic interest in protecting the timber resource. The future is likely to hold more opportunities to use prescribed fire as a fuel reduction tool for landowners, as well as commercializing small diameter trees, which are generally accepted approaches to reducing surface and ladder fuels.

Wildfire Risk and Hazard - Proposed THP

A 20-year study through UC Berkeley and others (Low et al., 2023), found that "fuel treatments in conifer-dominated forests can conserve forest structure in the face of wildfire." Their results indicated "that continued application of shaded fuel breaks is not only a sound strategy to ensure forest persistence through wildfire but may also be compatible with restoration objectives aimed at allowing for the use of more ecologically beneficial fire across landscapes." Although the THP does not propose a shaded fuel break, the Commercial Thin, Selection, and Group Selection silviculture prescriptions will create a post-harvest overstory stand that resembles a shaded fuel break, achieving both vertical and horizontal fuel discontinuity and a patchwork mosaic that may interrupt the spread of wildfire. The proposed VR units will significantly reduce crown fuels through the removal of merchantable timber and redistribute residual fuels to the forest floor where it will rapidly decompose.

This THP proposes the first entry into the stand in 30+ years, in which time fuels have continued to accumulate. The silvicultural prescriptions will result in a net decrease in fuel loading within the THP area. Surface fuel loading may be temporarily elevated following harvest in the form of slash; however, these fine fuels decay rapidly in contact with soil and contribute to nutrient cycling and the creation of humus (the organic layer of forest soil). After this entry the landowner will enter the cycle of uneven-aged management mentioned above. The reopening of grown-over roads and skid trails will create linear fuel breaks throughout the stand and disrupt the continuity of surface fuels. Fire suppression access will be improved within the THP and appurtenant road system by preparing the network for log truck traffic. The landowner restricts public access within the GRT ownership, which also decreases the chance of human-caused ignitions.

Timber Operations rely on the Forest Practice rules to regulate fire prevention during timber operations. Fire Prevention Rules are posted at the entrance to logging operations during fire season when burning permits are required. These rules list the requirements for smoking, warming fires, maintenance of power saws and equipment, resources required and warning of additional safeguards when fire danger is high. The timber operator is required to have a Fire Box on all active landings containing one backpack pump-type fire extinguisher filled with water, two axes, two McLeod fire tools, and a sufficient number of shovels so that each employee at the operation can be equipped to fight fire. The LTO is also required to have a serviceable chainsaw, and all vehicles shall have a shovel and an axe.

Wildfire Risk and Hazard Conclusion

When viewed at a landscape level, management is required across much of the landscape to effectively reduce fire risk. This can be achieved on both industrial and nonindustrial ownerships. Through the maintenance of road networks, larger landowners, such as GRT, can maintain access for fire agencies during a fire. With the landowner's long-term focus on uneven-aged management, an increase in fire resilience can be expected. Although past projects contributed to the current fuel

loading on site, the risks are also part of a regional issue. Future projects, the FPRs and the proposed THP are all expected to have a positive impact on fuel loading in the project area and immediate surrounding area by reducing fuels and managing the fuels that are created by the operations. An evaluation of interactions of proposed project activities with the impacts of Past Projects and Reasonably Foreseeable Probable Future Projects on Wildfire Risk and Hazard reveals that there is no significant cumulative impact, and that current conditions will be improved through the project implementation.

Identification of Information Sources- H. Wildfire Risk and Hazard

CAL FIRE, Fire Hazard Severity Zone Maps

Low, Kathryn E., et al. "Shaded Fuel Breaks Create Wildfire-Resilient Forest Stands: Lessons from a Long-Term Study in the Sierra Nevada." Fire Ecology, vol. 19, no. 1, 2023, https://doi.org/10.1186/s42408-023-00187-2.

Prichard, Susan J., et al. "Adapting Western North American Forests to Climate Change and Wildfires: 10 Common Questions." *Ecological Applications*, vol. 31, no. 8, 2021, https://doi.org/10.1002/eap.2433.

Sabalow, Ryan, and Dale Kasler. "'Self-Serving Garbage.' Wildfire Experts Escalate Fight over Saving California Forests." *Sacramento Bee*, 14 Oct. 2021.

The National Wildfire Coordinating Group web site: https://www.nwcg.gov/

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