DEPARTMENT OF FORESTRY AND FIRE PROTECTION
NORTHERN REGION HEADQUARTERS
135 Ridgeway Ave.
Santa Rosa, CA 95401
(707) 576-2959
Website: www.fire.ca.gov

OFFICIAL RESPONSE OF THE DIRECTOR OF THE CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION TO SIGNIFICANT ENVIRONMENTAL POINTS RAISED DURING THE TIMBER HARVESTING PLAN EVALUATION PROCESS

THP NUMBER: 1-22-00029-MEN

SUBMITTER: Gualala Redwood Timber, LLC

COUNTY: Mendocino

END OF PUBLIC COMMENT PERIOD: May 13, 2022

DATE OF OFFICIAL RESPONSE/DATE OF APPROVAL: June 10, 2022

The California Department of Forestry and Fire Protection has prepared the following response to significant environmental points raised during the evaluation of the above-referenced plan. Comments made on like topics were grouped together and addressed in a single response. Where a comment raised a unique topic, a separate response is made. Remarks concerning the validity of the review process for timber operations, questions of law, or topics or concerns so remote or speculative that they could not be reasonably assessed or related to the outcome of a timber operation, have not been addressed.

Sincerely,

DocuSigned by:
AE5E25725914422...

Adam Deem, RPF #2759
Forester II
Review Team Chair

cc: Unit Chief
RPF
Plan Submitter
Dept. of Fish & Wildlife, Reg. 1
Water Quality, Reg. 1
Public Comment Writers

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Summary of Review Process

Common Forest Practice Abbreviations

AB 32	Assembly Bill 32
ARB	Air Resources Board
BOF	Board of Forestry
CAA	Confidential Archaeological Addendum
CAL FIRE	Department of Forestry & Fire Protection
CAPCOA	Calif. Air Pollution Control Officers Assoc.
CCR	Calif. Code of Regulations
CDFW/DFW	California Dept. of Fish & Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CGS	California Geological Survey
CIA	Cumulative Impacts Assessment
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
CSO	California Spotted Owl
DBH/dbh	Diameter Breast Height
DPR	Department of Pesticide Regulation
EPA	Environmental Protection Agency
FPA	Forest Practice Act
FPR	Forest Practice Rules
GHG	Greenhouse Gas
ha^{-1}	per hectare
LBM	Live Tree Biomass
LTO	Licensed Timber Operator
LTSY	Long Term Sustained Yield
m^{-2}	per square meter
MAI	Mean Annual Increment
MMBF	Million Board Feet
$MMTCO_2E$	Million Metric Tons CO_2 equivalent
NEP	Net Ecosystem Production
NEPA	National Environ. Policy Act
NMFS	National Marine Fisheries Service
NPP	Net Primary Production
NSO	Northern Spotted Owl
NTMP	NonIndust. Timb. Manag. Plan
OPR	Govrn's Office of Plan. & Res.
PCA	Pest Control Advisor
Pg	Petagram = 10^{15} grams
PHI	Pre-Harvest Inspection
PNW	Pacific NorthWest
PRC	Public Resources Code
RPA	Resource Plan. and Assess.
RPF	Registered Professional Forester
[SIC]	Word used verbatim as originally printed in another document
SPI	Sierra Pacific Industries
SYP	Sustained Yield Plan
tC	tonnes of carbon
Tg	Teragram = 10^{12} grams
THP	Timber Harvest Plan
TPZ	Timber Production Zone
USFS	United States Forest Service
USFWS	U.S. Fish & Wildlife Service
WAA	Watershed Assessment Area
WLPZ	Watercourse. & Lake Prot. Zone
WQ	California Regional Water Quality Control Board
yr^{-1}	per year

Notification Process

In order to notify the public of the proposed timber harvesting, and to ascertain whether there are any concerns with the plan, the following actions are automatically taken on each THP submitted to CAL FIRE:

- Notice of the timber operation is sent to all adjacent landowners if the boundary is within 300 feet of the proposed harvesting, (As per 14 CCR § 1032.7(e))
- Notice of the Plan is submitted to the county clerk for posting with the other environmental notices. (14 CCR § 1032.8(a))
- Notice of the plan is posted at the Department's local office and in Cascade Area office in Redding. (14 CCR § 1032))
- Notice is posted with the Secretary for Resources in Sacramento. (14 CCR § 1032.8(c))
- Notice of the THP is sent to those organizations and individuals on the Department's current list for notification of the plans in the county. (14 CCR § 1032.9(b))
- A notice of the proposed timber operation is posted at a conspicuous location on the public road nearest the plan site. (14 CCR § 1032.7(g))

Plan Review Process

The laws and regulations that govern the timber harvesting plan (THP) review process are found in Statute law in the form of the Forest Practice Act which is contained in the Public Resources Code (PRC), and Administrative law in the rules of the Board of Forestry (rules) which are contained in the California Code of Regulations (CCR).

The rules are lengthy in scope and detail and provide explicit instructions for permissible and prohibited actions that govern the conduct of timber operations in the field. The major categories covered by the rules include:

*THP contents and the THP review process
*Silvicultural methods
*Harvesting practices and erosion control
*Site preparation
*Watercourse and Lake Protection
*Hazard Reduction
*Fire Protection
*Forest insect and disease protection practices
*Logging roads and landing

When a THP is submitted to the California Department of Forestry and Fire Protection (CAL FIRE) a multidisciplinary review team conducts the first review team meeting to assess the THP. The review team normally consists of, but is not necessarily limited to, representatives of CAL FIRE, the Department of Fish and Game (DFW), and the Regional Water Quality Control Board (WQ). The California Geological Survey (CGS) also reviews THP’s for indications of potential slope instability. The purpose of the first review team meeting is to assess the logging plan and determine on a preliminary basis whether it conforms to the rules of the Board of Forestry. Additionally, questions are formulated which are to be answered by a field inspection team.

Next, a preharvest inspection (PHI) is normally conducted to examine the THP area and the logging plan. All review team members may attend, as well as other experts and agency personnel whom CAL FIRE may request. As a result of the PHI, additional recommendations may be formulated to provide greater environmental protection.

After a PHI, a second review team meeting is conducted to examine the field inspection reports and to finalize any additional recommendations or changes in the THP. The review team transmits these recommendations to the RPF, who must respond to each one. The director's representative considers public comment, the adequacy of the registered professional forester's (RPF's) response, and the recommendations of the review team chair before reaching a decision to approve or deny a THP. If a THP is approved, logging may commence. The THP is valid for up to five years, and may be extended under special circumstances for a maximum of 2 years more for a total of 7 years.

Before commencing operations, the plan submitter must notify CAL FIRE. During operations, CAL FIRE periodically inspects the logging area for THP and rule compliance. The number of the inspections will depend upon the plan size, duration, complexity, regeneration method, and the potential for impacts. The contents of the THP and the rules provide the criteria CAL FIRE inspectors use to determine compliance. While CAL FIRE cannot guarantee that a violation will not occur, it is CAL FIRE's policy to pursue vigorously the prompt and positive enforcement of the Forest Practice Act, the forest practice rules, related laws and regulations, and environmental protection measures applying to timber operations on the timberlands of the State. This enforcement policy is directed primarily at preventing and deterring forest practice violations, and secondarily at prompt and appropriate correction of violations when they occur.

The general means of enforcement of the Forest Practice Act, forest practice rules, and the other related regulations range from the use of violation notices which may require corrective actions, to criminal proceedings through the court system. Civil, administrative civil penalty, Timber operator licensing, and RPF licensing actions can also be taken.

THP review and assessment is based on the assumption that there will be no violations that will adversely affect water quality or watershed values significantly. Most forest practice violations are correctable and CAL FIRE's enforcement program seeks to assure correction. Where non-correctable violations occur, civil or criminal action may be taken against the offender. Depending on the outcome of the case and the court in which the case is heard, some sort of supplemental environmental corrective work may be required. This is intended to offset non-correctable adverse impacts. Once a THP is completed, a completion report must be submitted certifying that the area meets the requirements of the rules. CAL FIRE inspects the completed area to verify that all the rules have been followed including erosion control work.

Depending on the silvicultural system used, the stocking standards of the rules must be met immediately or in certain cases within five years. A stocking report must be filed to certify that the requirements have been met. If the stocking standards have not been met, the area must be planted annually until it is restored. If the landowner fails to restock the land, CAL FIRE may hire a contractor to complete the work and seek recovery of the cost from the landowner.

General Discussion and Background

The following summary is provided for some of the over-arching concerns expressed in public comment. Specific issues raised within comments will be addressed in the next section.

CEQA Analysis

A CEQA analysis is not required to be perfect, but it must be accurate and adequately describe the proposed project in a manner that allows for informed decision-making. It must include an assessment of impacts based upon information that was "reasonably available before submission of the plan." (Technical Rule Addendum #2)

CEQA clearly establishes that the Lead Agency has a duty to minimize harm to the environment while balancing Competing Public Objectives (14 CCR §15021)[1]. These duties are further refined in the Z'berg-Nejedly Forest Practice Act (PRC §4512(c)[2]) and PRC §4513(b)[3] for how the mandate to provide "maximum sustained production of high quality timber products" is to be balanced with other environmental considerations. The term "while giving consideration to" is further defined in 14 CCR §895.1 as follows:

> ***While Giving Consideration*** *means the selection of those feasible silvicultural systems, operating methods and procedures which substantially lessen significant adverse Impact on the environment and which best achieve long-term, maximum sustained production of forest products, while protecting soil, air, fish and wildlife, and water resources from unreasonable degradation, and which evaluate and make allowance for values relating to*

[1] Duty to Minimize Environmental Damage and Balance Competing Public Objectives

CEQA establishes a duty for public agencies to avoid or minimize environmental damage where feasible.

(1) In regulating public or private activities, agencies are required to give major consideration to preventing environmental damage.

(2) A public agency should not approve a project as proposed if there are feasible alternatives or mitigation measures available that would substantially lessen any significant effects that the project would have on the environment.

(b) In deciding whether changes in a project are feasible, an agency may consider specific economic, environmental, legal, social, and technological factors.

(c) The duty to prevent or minimize environmental damage is implemented through the findings required by Section 15091.

(d) CEQA recognizes that in determining whether and how a project should be approved, a public agency has an obligation to balance a variety of public objectives, including economic, environmental, and social factors and in particular the goal of providing a decent home and satisfying living environment for every Californian. An agency shall prepare a statement of overriding considerations as described in Section 15093 to reflect the ultimate balancing of competing public objectives when the agency decides to approve a project that will cause one or more significant effects on the environment.

Note: Authority cited: Section 21083, Public Resources Code; Reference: Public Resources Code Sections 21000, 21001, 21002, 21002.1, and 21081; San Francisco Ecology Center v. City and County of San Francisco, (1975) 48 Cal. App. 3d 584; Laurel Hills Homeowners Association v. City Council, (1978) 83 Cal. App. 3d 515.

Discussion: Section 15021 brings together the many separate elements that apply to the duty to minimize environmental damage. These duties appear in the policy sections of CEQA, in the findings requirement in Section 21081, and in a number of court decisions that have built up a body of case law that is not immediately reflected in the statutory language. This section is also necessary to provide one place to explain how the ultimate balancing of the merits of the project relates to the search for feasible alternatives or mitigation measures to avoid or reduce the environmental damage.

The placement of this section early in the article on general responsibilities helps highlight this duty to prevent environmental damage. This section is an effort to provide a careful statement of the duty with its limitations and its relationship to other essential public goals.

[2] (c) The Legislature thus declares that it is the policy of this state to encourage prudent and responsible forest resource management calculated to serve the public's need for timber and other forest products, while giving consideration to the public's need for watershed protection, fisheries and wildlife, sequestration of carbon dioxide, and recreational opportunities alike in this and future generations.

[3] (b) The goal of maximum sustained production of high-quality timber products is achieved while giving consideration to values relating to sequestration of carbon dioxide, recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment.

> *range and forage resources, recreation and aesthetics, and regional economic vitality and employment.*

What is missing from the Act, Rules or CEQA Guidelines is the weight that is to be applied to the evaluation of the other resources specified. Clearly, there are certain legal restrictions on the degradation of specific values (e.g. water quality standards) but many of the elements that must be considered have a qualitative, not quantitative mandate for evaluation. This allows the Plan Submitter and the Lead Agency to exercise "professional judgement[4]" when preparing and evaluating plans.

What is also evident from an examination of the entire record (i.e. information provided by the Plan Submitter, submitted as public comment and information supplemented to the record by CAL FIRE) is that there is disagreement amongst experts about what the appropriate course of action is or what the feasible alternatives to the project may be. Again, CEQA provides guidance on this topic, with respect to both the adequacy of the record, and on differences of opinion; even between recognized experts:

> *15151. Standards for Adequacy of an EIR*
> *An EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.*
>
> > *Note: Authority cited: Section 21083, Public Resources Code; Reference: Sections 21061 and 21100, Public Resources Code; San Francisco Ecology Center v. City and County of San Francisco, (1975) 48 Cal. App. 3d 584.*
> >
> > *Discussion: This section is a codification of case law dealing with the standards for adequacy of an EIR. In Concerned Citizens of Costa Mesa, Inc. v. 32nd District Agricultural Assoc. (1986) 42 Cal. 3d 929, the court held that "the EIR must contain facts and analysis, not just the agency's bare conclusions or opinions." In Browning-Ferris Industries of California, Inc. v. San Jose (1986) 181 Cal. App. 3d 852, the court reasserted that an EIR is a*

[4] *14CCR §897(d) Due to the variety of individual circumstances of timber harvesting in California and the subsequent inability to adopt site-specific standards and regulations, these Rules use judgmental terms in describing the standards that will apply in certain situations. By necessity, the RPF shall exercise professional judgment in applying these judgmental terms and in determining which of a range of feasible (see definition 14 CCR 895.1) silvicultural systems, operating methods and procedures contained in the Rules shall be proposed in the plan to substantially lessen significant adverse Impacts in the environment from timber harvesting. The Director also shall exercise professional judgment in applying these judgmental terms in determining whether a particular plan complies with the Rules adopted by the Board and, accordingly, whether he or she should approve or disapprove a plan. The Director shall use these Rules to identify the nature he limits to the professional judgment to be exercised by him or her in administering these Rules.*

> *disclosure document and as such an agency may choose among differing expert opinions when those arguments are correctly identified in a responsive manner. Further, the state Supreme Court in its 1988 Laurel Heights decision held that the purpose of CEQA is to compel government at all levels to make decisions with environmental consequences in mind. CEQA does not, indeed cannot, guarantee that these decisions will always be those which favor environmental considerations, nor does it require absolute perfection in an EIR.*

CAL FIRE has an obligation to explain the rationale for approving a plan. This is often done in the presence of contradicting information and results in different parties being displeased with the results. A competent CEQA analysis is not required to make the "best" choice, but the choice made must be supported by information contained within the record. This is where Lead Agency discretion comes into play. CAL FIRE ultimately bears the responsibility for making a decision and, when presented with public comments, is expected to provide an answer to significant questions raised.

Another expressed concern is over the extent to which the plan, and by extension CAL FIRE, discusses effects that are not deemed to be significant. CEQA provides guidance on how to address impacts within 14 CCR §15130:

> *15130. DISCUSSION OF CUMULATIVE IMPACTS*
>
> *(a) An EIR shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable, as defined in section 15065 (a)(3). Where a lead agency is examining a project with an incremental effect that is not "cumulatively considerable," a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.*
>
> *(1) As defined in Section 15355, a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts. An EIR should not discuss impacts which do not result in part from the project evaluated in the EIR.*
>
> *(2) When the combined cumulative impact associated with the project's incremental effect and the effects of other projects is not significant, the EIR shall briefly indicate why the cumulative impact is not significant and is not discussed in further detail in the EIR. A lead agency shall identify facts and analysis supporting the lead agency's conclusion that the cumulative impact is less than significant.*

(3) An EIR may determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable and thus is not significant. A project's contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact. The lead agency shall identify facts and analysis supporting its conclusion that the contribution will be rendered less than cumulatively considerable.

(b) The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact. The following elements are necessary to an adequate discussion of significant cumulative impacts:

(1) Either:

(A) A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or

(B) A summary of projections contained in an adopted local, regional or statewide plan, or related planning document, that describes or evaluates conditions contributing to the cumulative effect. Such plans may include: a general plan, regional transportation plan, or plans for the reduction of greenhouse gas emissions. A summary of projections may also be contained in an adopted or certified prior environmental document for such a plan. Such projections may be supplemented with additional information such as a regional modeling program. Any such document shall be referenced and made available to the public at a location specified by the lead agency.

(2) When utilizing a list, as suggested in paragraph (1) of subdivision (b), factors to consider when determining whether to include a related project

should include the nature of each environmental resource being examined, the location of the project and its type. Location may be important, for example, when water quality impacts are at issue since projects outside the watershed would probably not contribute to a cumulative effect. Project type may be important, for example, when the impact is specialized, such as a particular air pollutant or mode of traffic.

(3) Lead agencies should define the geographic scope of the area affected by the cumulative effect and provide a reasonable explanation for the geographic limitation used.

(4) A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available; and

(5) A reasonable analysis of the cumulative impacts of the relevant projects. An EIR shall examine reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

(c) With some projects, the only feasible mitigation for cumulative impacts may involve the adoption of ordinances or regulations rather than the imposition of conditions on a project-by- project basis.

(d) Previously approved land use documents, including, but not limited to, general plans, specific plans, regional transportation plans, plans for the reduction of greenhouse gas emissions, and local coastal plans may be used in cumulative impact analysis. A pertinent discussion of cumulative impacts contained in one or more previously certified EIRs may be incorporated by reference pursuant to the provisions for tiering and program EIRs. No further cumulative impacts analysis is required when a project is consistent with a general, specific, master or comparable programmatic plan where the lead agency determines that the regional or areawide cumulative impacts of the proposed project have already been adequately addressed, as defined in section 15152(f), in a certified EIR for that plan.

(e) If a cumulative impact was adequately addressed in a prior EIR for a community plan, zoning action, or general plan, and the project is consistent with that plan or action, then an EIR for such a project should not further analyze that cumulative impact, as provided in Section 15183(j).

Note: Authority cited: Sections 21083, 21083.05, Public Resources Code. Reference: Sections 21003(d), 21083(b), 21093, 21094 and 21100, Public Resources Code; Whitman v. Board of Supervisors, (1979) 88 Cal. App. 3d 397; San Franciscans for Reasonable Growth v. City and County of San Francisco (1984) 151 Cal.App.3d 61; Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692; Laurel Heights Homeowners Association v. Regents of the University of California (1988) 47 Cal.3d 376; Sierra Club v. Gilroy (1990) 220 Cal.App.3d 30; Citizens to Preserve the Ojai v. County of Ventura (1985) 176 Cal.App.3d 421; Concerned Citizens of South Cent. Los Angeles v. Los Angeles Unified Sch. Dist. (1994) 24 Cal.App.4th 826; Las Virgenes Homeowners Fed'n v. County of Los Angeles (1986) 177 Cal.App.3d 300; San Joaquin Raptor/Wildlife Rescue Ctr v. County of Stanislaus (1994) 27 Cal.App.4th 713; Fort Mojave Indian Tribe v. Cal. Dept. Of Health Services (1995) 38 Cal.App.4th 1574; Santa Monica Chamber of Commerce v. City of Santa Monica (2002) 101 Cal.App.4th 786; Communities for a Better Environment v. California Resources Agency (2002) 103 Cal.App.4th 98; and Ass'n of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383.

When an analysis has determined that the impacts are less than significant, a detailed discussion is not required and an abbreviated explanation is acceptable.

About Agency "Activism" (Agency Prohibited from creating "underground regulations")

Another theme is that CAL FIRE should take an activist role in steering plan submitters towards, or in this case away from, certain actions that the comment writer deems deleterious to the natural environment. To do so would be contrary to our purpose and entirely outside of our jurisdictional authority. The plan submitter is responsible for proposing plans consistent with their objectives and CAL FIRE is responsible for determining whether or not the operations as proposed would cause a significant adverse effect on the environment. How an individual THP may or may not align with state goals or other non-regulatory targets is not a factor we can consider when making such a determination.

In fact, if CAL FIRE was to impose a standard not required by regulation, we would likely be found to have created an "underground regulation[5]" and would be open to legal challenge.

[5] https://oal.ca.gov/underground_regulations/

Requirement to augment the record

In addition to information provided by the Plan Submitter and Public Commenters, CAL FIRE is also responsible for considering additional information and adding it to the plan record. This requirement is specified in 14 CCR §898 "*The Director shall supplement the information provided by the RPF and the plan submitter when necessary to ensure that all relevant information is considered.*" Sometimes this information is discovered while reviewing submitted literature and other information is added when the reviewer believes it is relevant to the discussion.

All Concerns Are Treated Equal

From CAL FIRE's perspective, one concern expressed is as good as a thousand. Every concern, no matter who it comes from, is given careful consideration. It is our responsibility to the public and to those we regulate to provide a fair and unbiased review. This Official Response is written with that in mind.

Watersheds as the Focal Point for Cumulative Impacts Evaluation

Because they have defined boundaries and a single outlet, watersheds are an appropriate way to measure impacts to many resources (e.g. watershed, soil productivity) because these resources are bound primarily by the effects of gravity. For example: water flows downhill, landslides move down and not up slope such that upslope or resources in an adjacent watershed would not expect impacts. Most of the early environmental concerns rest upon the choice of assessment area and its appropriateness.

For other resources (e.g. recreation, noise, traffic, visual, fire hazard, greenhouse gas), the watershed boundary is not necessarily a limiting factor. For instance, deer and wolves move between watersheds easily and birds traverse large areas during their normal life cycle. Thus, it makes sense that some other delineation of assessment area for these specific resources would be used. While early THPs typically used the watershed boundary as the basis for evaluating all cumulative effects, contemporary analysis acknowledges the need for more refined boundaries, based upon the resource being evaluated. Even so, in some instances, areas such as the watershed (or multiple watersheds) are used to define the assessment area for resources such as fire hazard or greenhouse gas, because there is a requirement to have some defined boundary (e.g. carbon exchange occurs on a global scale but projects must evaluate site-specific impacts so a smaller area of evaluation is required in order to have a relevant analysis).

The Forest Practice Rules and Technical Rule Addendum #2 provide guidance in the determination of the size and shape of the assessment areas. 14 CCR §898 provides the general direction and reference to the evaluation of significant impacts and states:

> "Cumulative impacts shall be assessed based upon the methodology described in Board Technical Rule Addendum Number 2, Forest Practice Cumulative Impacts Assessment Process and shall be

> guided by standards of practicality and reasonableness. The RPF's and plan submitter's duties under this section shall be limited to closely related past, present and reasonably foreseeable probable future projects within the same ownership and to matters of public record."

Further, 14 CCR §897(b)(2) [Implementation of Act Intent] provides additional context for evaluating timber harvesting plans:

> Individual THPs shall be considered in the context of the larger forest and planning watershed in which they are located, so that biological diversity and watershed integrity are maintained within larger planning units and adverse cumulative impacts, including impacts on the quality and beneficial uses of water are reduced.

Although the Rules acknowledge that different assessment areas may be chosen based upon the resource under consideration, the designation of the planning watershed as an appropriate spatial scale is consistent with 14 CCR §15130(b)(1)(B)(3), which states that:

> "Lead agencies should define the geographical scope of the area affected by the cumulative effect and provide a reasonable explanation for the geographic limitation used."

There are, however, two different systems for classifying watersheds in California.

The CalWater System

The Natural Resource Conservation service established the nationwide classification of watersheds from 1992-1996 (Wikipedia, 2020). The California Resources Agency began a digitization project in 1993 based upon the Hydrologic Basin Planning Maps developed by the State Water Resources Control Board in 1986 (CAL FIRE, 2004). The state and federal systems in California were moved closer together over time, through multi-agency MOUs and integrated into the CalWater system, managed by the California Department of Water Resources (DWR). In 2017, DWR notified the original members of the MOU that going forward the National Hydrography Dataset (NHD) would be the new authoritative dataset (DWR, 2021). The CalWater 2.2.1 system is widely used in California, although the boundaries vary in some cases from the federal designations. Most notably, some watersheds in the Calwater system are broken up using administrative or political boundaries.

The California Forest Practice Rules first included a definition of "Watershed" in the 1992 Rules:

> ***planning watershed*** *means the contiguous land base and associated watershed system that forms a fourth order or other watershed typically 10,000 acres or less in size. Where a watershed exceeds 10,000 acres, the Director may approve subdividing into smaller planning watersheds which shall be a composite of contiguous lower order watersheds and areas draining into the*

> *main channel but not supporting a first order tributary. Smaller planning watersheds shall not be less than 3,000 acres nor exceed 10,000 acres in size as proposed by a plan submitter and approved by the Director. Plan submitters with approval of the director may allow a larger size planning watershed when 10,000 acres or less is not a logical planning unit, such as on the Eastside Sierra Pine type, as long as the size in excess of 10,000 acres is the smallest that is practical. Third order basins flowing directly into the ocean shall also be considered an appropriate planning watershed. This section will stay in effect until such time as the Director prepares and distributes maps identifying planning watersheds using the above criteria.*

The 1997 Rules were revised as follows:

> ***Planning Watershed*** *means the contiguous land base and associated watershed system that forms a fourth order or other watershed typically 10,000 acres or less in size. Planning watersheds are used in planning forest management and assessing impacts. The Director has prepared and distributed maps identifying planning watersheds plan submitters must use. Where a watershed exceeds 10,000 acres, the Director may approve subdividing it. Plan submitters may propose and use different planning watersheds, with the director's approval. Examples include but are not limited to the following: when 10,000 acres or less is not a logical planning unit, such as on the Eastside Sierra Pine type, as long as the size in excess of 10,000 acres is the smallest that is practical. Third order basins flowing directly into the ocean shall also be considered an appropriate planning watershed.*

Initially, plan preparers were directed to come up with their own watersheds, based upon the 10,000 acre target. The California Resources Agency (CRA) Department of Forestry and Fire Protection (CDF) contracted with Tierra Data Systems for the original digital production in 1993, based on Hydrologic Basin Planning Maps published in hardcopy (CAL FIRE, 2004). Once this was finished, it was distributed to RPFs for use in plans. The system was then maintained by an interagency group called the "California Interagency Watershed Mapping Committee". Changes were made to boundaries and information over time, with the newest changes made in 2004 (version 2.2.1).

The CalWater system is broken down into 6 categories:

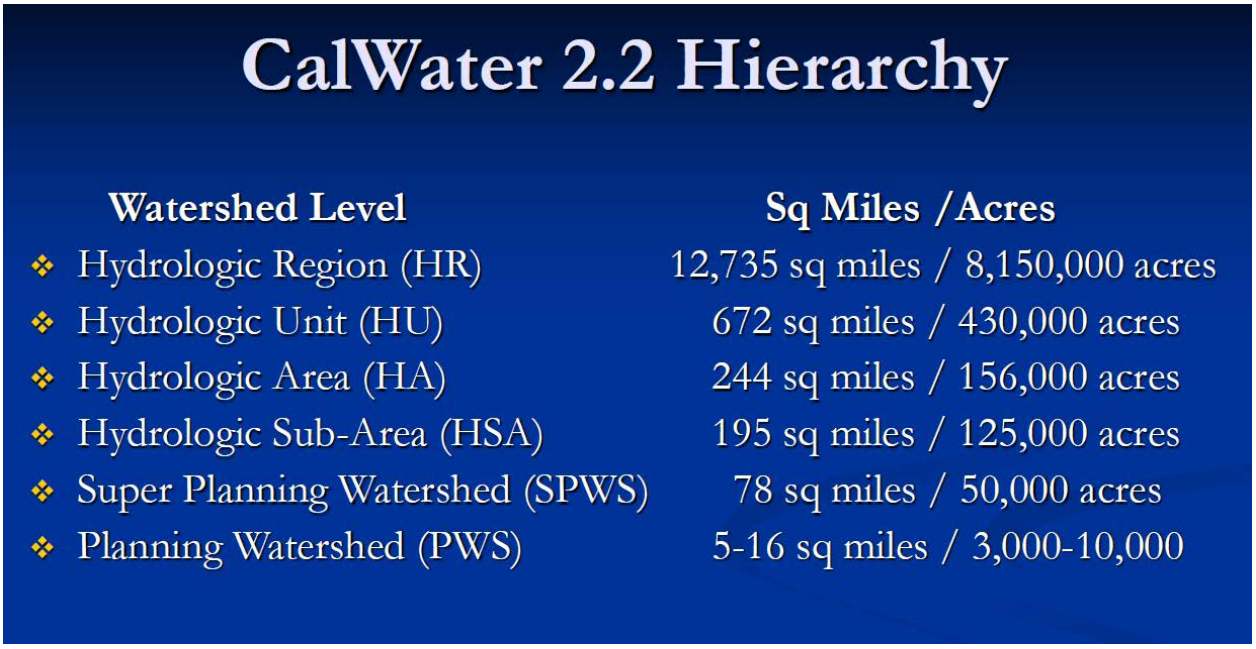

Figure 1 CalWater 2.2.1 Hierarchy (Meyers, 2004)

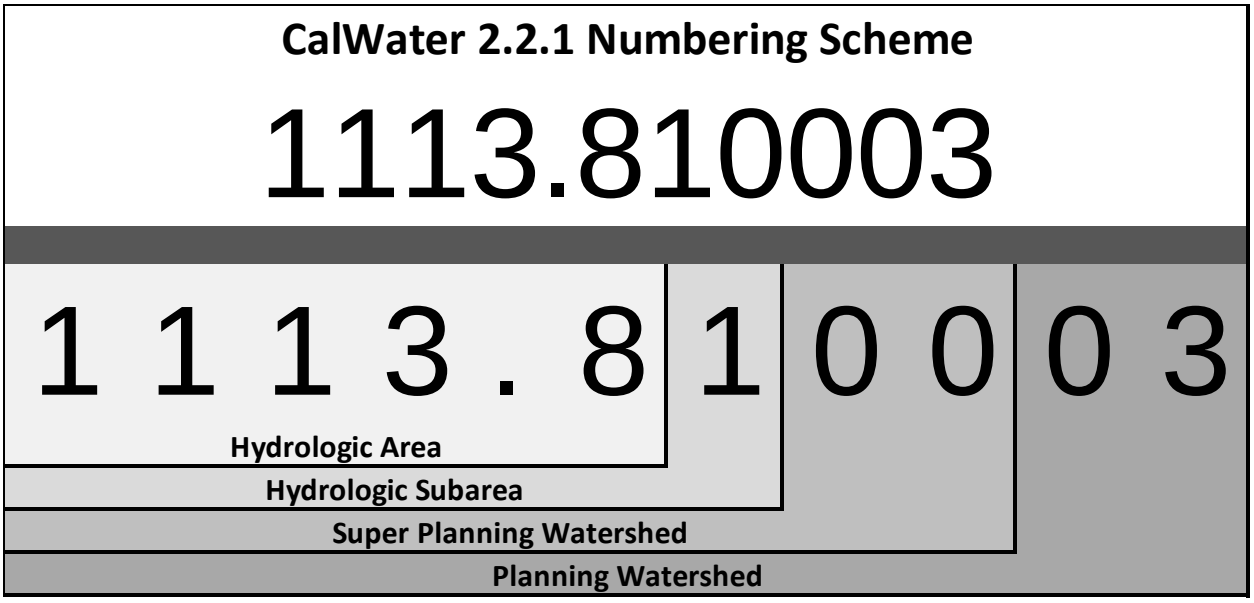

Figure 2 A breakdown of the CalWater 2.2.1 numbering scheme

The Federal Hydrologic Unit Maps (HUC)

Initially begun in 1978 by the USGS, this is an ongoing project to designate all hydrologic units in the US (USGS, 2020). In 1999, a multi-agency MOU was formed between state and federal agencies to bring the CalWater system into compliance with the federal model. There are still differences between the watershed boundaries established by both systems, but both represent logical approaches to watershed delineation that are widely used for assessment purposes.

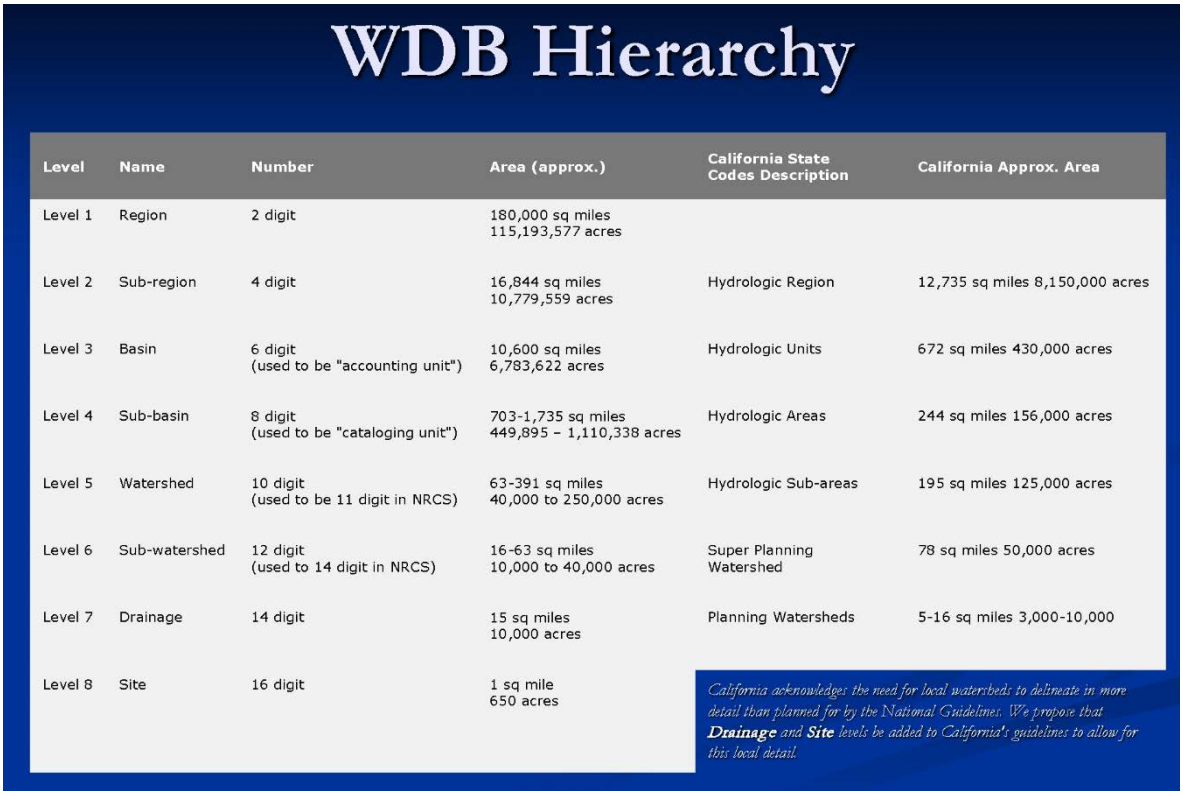

Figure 3 Federal Watershed Boundary Hierarchy (Meyers, 2004)

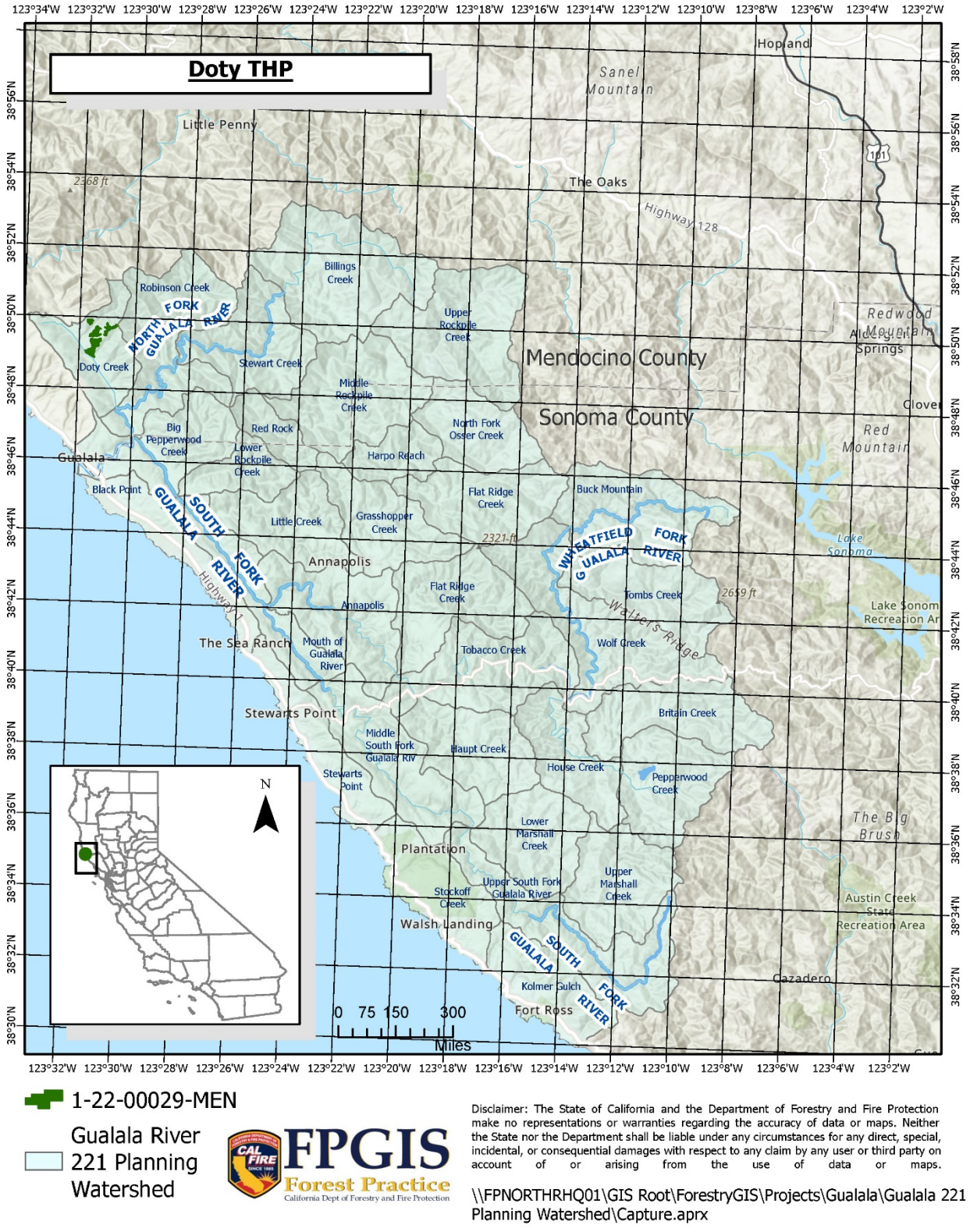

Figure 4 CalWater 2.2 Watersheds of the Gualala River HA

The use of CalWater Planning Watersheds (14 CCR §895.1) is an accepted method for determining the impacts of proposed timber operations on Watershed Resources. The rationale is that all impacts from the proposed operation will only be seen within the area that is

drained by that watershed, and areas downstream of that watershed. Areas that do not receive drainage from the watershed (i.e. adjacent or upstream watersheds), would not be impacted.

Planning watersheds are defined in 14 CCR §895.1 as:

> "the contiguous land base and associated watershed system that forms a fourth order or other watershed typically 10,000 acres or less in size. Planning watersheds are used in planning forest management and assessing impacts. The Director has prepared and distributed maps identifying planning watersheds plan submitters must use. Where a watershed exceeds 10,000 acres, the Director may approve subdividing it. Plan submitters may propose and use different planning watersheds, with the Director's approval."

The methodology used in the Board's rules to determine the size of the Watershed Assessment Area (WAA) was clarified by a letter to all RPFs and LTOs from the Director on January 7, 1992. This letter states on page 4 that:

> The watershed assessment area for assessing cumulative watershed effects (CWEs) should be selected to include an area of manageable size relative to the THP (usually an order 3 or 4 watershed) that maximizes the opportunity to detect an impact. Where there is a choice of combining watersheds with different disturbance levels, the assessment area should be based on the smallest watershed area that includes the most disturbances. The intent is to focus on an area of manageable size, where the presence of cumulative effects related to the proposed project and the benefits or failings of the proposed practices can be reasonably considered. (CAL FIRE, 1992)

The size of the assessment area quoted in the letter above is supported in the Board rules described in 14 CCR § 897(b)(2) and in the definition for "Planning Watershed" found in 14 CCR §895.1. The size of the watershed assessment area found in these regulations is a recommended third or fourth order watershed size, and therefore, the letter from the Director is consistent with the regulations of the Board.

Watersheds may also be used as the basis for other assessment areas. The California Forest Carbon Plan (Forest Climate Action Team, 2018) discusses using watersheds as the basis for Greenhouse Gas emission and sequestration assessments:

> *The watershed level has proven to be an appropriate organizing unit for analysis and for the coordination and integrated management of the numerous physical, chemical, and biological processes that make up a watershed ecosystem. Similarly, a watershed can serve as an appropriate reference unit for the policies, actions, and processes that affect the biophysical system, and providing a basis for greater integration and collaboration. Forests and related climate mitigation and*

> *adaptation issues operate across these same biophysical, institutional, and social gradients.*
>
> *Because of these factors, the Forest Carbon Plan proposes working regionally at the landscape or watershed scale. The appropriate scale of a landscape or watershed to work at will vary greatly depending upon the specific biophysical conditions, land ownership or management patterns, and other social or institutional conditions.*

However, it should be noted that the detailed analysis for the Watershed Assessment Area selected by the RPF does not limit CAL FIRE with respect to consideration of other activities outside the assessment area. The watershed assessment area is more like a window which CAL FIRE can see through to view the combined effects of other related projects, rather than a wall or barrier. CAL FIRE recognizes that environmental elements cannot be truly and completely separated one from another. It is the limitations of analytical processes that require infinitely complex systems to be subdivided into reasonably manageable components.

Further, the RPF is expected to explain and justify the rationale for the chosen assessment area. CAL FIRE must then review this rationale and either accept or reject the defined assessment areas. This occurs with every THP reviewed.

The Board's rules do not require a specific method of cumulative impacts assessment, because the Board determined that no single, available procedure adequately addresses the wide range of site conditions and THP activities found in California. Technical Rule Addendum No. 2, provides the framework of what should be considered and what to look for with respect to conditions that may be at or near some level of concern. As stated in the Addendum, *"The watershed impacts of past upstream and on-site projects are often reflected in the condition of stream channels on the project area."* This is a critical element as it guides the RPF to focus on areas where cumulative watershed effects are known to accumulate. The Addendum then describes factors that can be used to evaluate the potential project impacts. Such factors include gravel embeddedness, pool filling, stream aggrading, bank cutting, bank mass wasting, downcutting, scouring, organic debris, stream-side vegetation, and recent floods. Taken together, they help inform the RPF about the status of the Environmental Setting (14 CCR §15125[6]) with respect to the impacts of past projects, and will form the basis of a determination on the impacts of the proposed project.

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[6] **15125. ENVIRONMENTAL SETTING**
(a) An EIR must include a description of the physical environmental conditions in the vicinity of the project. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant. The description of the environmental setting shall be no longer than is necessary to provide an understanding of the significant effects of the proposed project and its alternatives. The purpose of this requirement is to give the public and decision makers the most accurate and understandable picture practically possible of the project's likely near-term and long-term impacts.
(1) Generally, the lead agency should describe physical environmental conditions as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. Where existing conditions change or fluctuate over time, and where necessary to provide the most accurate picture practically possible of the project's impacts, a lead agency may define existing conditions by referencing historic conditions, or conditions expected when the project becomes operational, or both, that are supported with substantial evidence. In addition, a lead agency may also use baselines consisting of both existing conditions and projected future conditions that are supported by reliable projections based on substantial evidence in the record.
(2) A lead agency may use projected future conditions (beyond the date of project operations) baseline as the sole baseline for analysis o.nly if it demonstrates with substantial evidence that use of existing conditions would be either misleading or without informative value to decision-makers and the public. Use of projected future conditions as the only baseline must be supported by reliable projections based on substantial evidence in the record.
(3) An existing conditions baseline shall not include hypothetical conditions, such as those that might be allowed, but have never actually occurred, under existing permits or plans, as the baseline.

Greenhouse Gas Sequestration

Forest Practice Regulatory Background

The Z'berg-Nejedley Forest Practice Act (Division 4, Chapter 8, PRC) establishes the necessity for Timber Harvesting Plans to conduct commercial timber operations and establishes the Board of Forestry and Fire Protection as the regulatory authority for promulgation of regulations to, among other things:

> …encourage prudent and responsible forest resource management calculated to serve the public's need for timber and other forest products, while giving consideration to the public's need for watershed protection, fisheries and wildlife, sequestration of carbon dioxide, and recreational opportunities alike in this and future generations.

The FPA was initially adopted in 1973. Since that time, the BOF has enacted numerous regulations to support the Act's intent related to sustained yield and has adopted conservation standards for post-harvest stocking that meet or exceed the minimum resource conservation standards specified in PRC §4561 of the Act. The Board has established rules related to demonstration of Timberland Productivity, Sustained Forestry Planning (14 CCR §933.10), demonstration of Maximum Sustained Productivity (14 CCR §933.11), and has defined sustained yield and Long Term Sustained Yield (14 CCR §895.1). Under these various rule provisions, landowners with more than 50,000 acres of timberland are required to demonstrate long-term sustained yield under the management regime they have selected for the ownership. Under this provision, the Department has received and approved long term sustained yield documents covering approximately 3.2 million acres of timberland. For smaller industrial and nonindustrial landowners, they must comply with minimum retention standards specified in the Rules as established by the Board, although they may choose a higher standard.

More recently, amendments were made to the FPA to clarify and refine other mandates related to the assessment of Greenhouse Gas (GHG) impacts:

> 4512.5. Sequestration of carbon dioxide; legislative findings and declarations.
> The Legislature finds and declares all of the following:
> (a) State forests play a critical and unique role in the

(b) When preparing an EIR for a plan for the reuse of a military base, lead agencies should refer to the special application of the principle of baseline conditions for determining significant impacts contained in Section 15229.
(c) Knowledge of the regional setting is critical to the assessment of environmental impacts. Special emphasis should be placed on environmental resources that are rare or unique to that region and would be affected by the project. The EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated and discussed and it must permit the significant effects of the project to be considered in the full environmental context.
(d) The EIR shall discuss any inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans. Such regional plans include, but are not limited to, the applicable air quality attainment or maintenance plan or State Implementation Plan, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, regional blueprint plans, plans for the reduction of greenhouse gas emissions, habitat conservation plans, natural community conservation plans and regional land use plans for the protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains.
(e) Where a proposed project is compared with an adopted plan, the analysis shall examine the existing physical conditions at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced as well as the potential future conditions discussed in the plan.

state's carbon balance by sequestering carbon dioxide from the atmosphere and storing it long term as carbon.

(b) According to the scoping plan adopted by the State Air Resources Board pursuant to the California Global Warming Solutions Act of 2006 (Division 25.5 (commencing with Section 38500) of the Health and Safety Code), the state's forests currently are an annual net sequesterer of five million metric tons of carbon dioxide (5MMTCO2). In fact, the forest sector is the only sector included in the scoping plan that provides a net sequestration of Greenhouse Gas emissions.

(c) The scoping plan proposes to maintain the current 5MMTCO2 annual sequestration rate through 2020 by implementing "sustainable management practices," which include potential changes to existing forest practices and land use regulations.

(d) There is increasing evidence that climate change has and will continue to stress forest ecosystems, which underscores the importance of proactively managing forests so that they can adapt to these stressors and remain a net sequesterer of carbon dioxide.

(e) The Board, the Department, and the State Air Resources Board should strive to go beyond the status quo sequestration rate and ensure that their policies and regulations reflect the unique role forests play in combating climate change.

4551. Adoption of district forest practice Rules and regulations; factors considered in Rules and regulations governing harvesting of commercial tree species; funding.

(a) …

(b) (1) The Board shall ensure that its Rules and regulations that govern the harvesting of commercial tree species, where applicable, consider the capacity of forest resources, including above ground and below ground biomass and soil, to sequester carbon dioxide emissions sufficient to meet or exceed the state's Greenhouse Gas reduction requirements .for the forestry sector, consistent with the scoping plan adopted by the State Air Resources Board pursuant to the California Global Warming Solutions Act of 2006 (Division 25.5 (commencing with Section 38500) of the Health and Safety Code).

(2) …

Technical Rule Addendum #2, Item G:

G. 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.

California Legislative and Administrative Background

Over the years, various efforts by the California Legislature and the Governor to quantify greenhouse gas emissions and develop strategies for avoiding potential negative impacts have occurred. A summary relevant to this THP is provided below:

1. Assembly Bill 32 (AB32), the Global Warming Solutions Act of 2006, was signed into law by Governor Schwarzenegger and represents a comprehensive approach to address climate change. AB32 establishes a statewide goal to reduce greenhouse gas emissions to 1990 levels by 2020. The California Resources Air Board (ARB) is the lead agency for implementing AB32.

   The scoping plan adopted by the ARB in December of 2008 (CARB, 2008) establishes a general roadmap that California will take to achieve the 2020 goals. Targets for the Forestry Sector were established under the "Sustainable Forests" section of the Scoping Plan. The "Sustainable Forest" element was recognized as a carbon sink based on the

current carbon inventory for the Forest Sector and sequestration benefits attributable to forests. Specific recommendations for the sector included:

- Maintaining the current 5 $MMTCO_2E$ reduction target through 2020 by ensuring that current carbon stock is not diminished over time.
- Monitoring of carbon sequestered
- Improving greenhouse gas inventories.
- Determining actions needed to meet the 2020 targets.
- Adaptation
- Focusing on sustainable land-use activities.

Wildfire threat and loss to conversions were recognized as potential threats to the Forest Sector in relation to achieving sector goals.

2. AB 1504 (Chapter 534, Statutes of 2010, Skinner): Requires the Board of Forestry and Fire Protection to ensure that its rules and regulations that govern timber harvesting consider the capacity of forest resources to sequester carbon dioxide emissions sufficient to meet or exceed the state's GHG reduction target for the forestry sector, consistent with the AB 32 Climate Change Scoping Plan goal of 5 million metric tons CO2 equivalent sequestered per year. Currently, these reports are principally prepared by Glenn A. Christensen.

3. SB 1122 (Chapter 612, Statutes of 2012, Rubio): This bill requires production of 50 megawatts of biomass energy using byproducts of sustainable forest management from fire threat treatment areas as determined by CAL FIRE.

4. AB 417 (Chapter 182, Statutes of 2015, Dahle): This bill provides the Board of Forestry and Fire Protection with additional flexibility in setting post timber harvest tree stocking standards in order to, in part, contribute to specific forest health and ecological goals as defined by the Board. The 2020 Forest Practice Rules include the Board's revisions to the "Resource Conservation Standards" under 14 CCR §932.7.

5. In 2015, the Governor issued Executive Order B-30-15 establishing a GHG reduction target for California of 40 percent below 1990 levels by 2030 and 80 percent by 2050 to help limit global warming to 2 degrees Celsius or less as identified by the IPCC to avoid potentially catastrophic climate change impacts. In 2016, the California Legislature passed Senate Bill 32 (Chapter 249, Statutes of 2016), which codifies the Governor's Executive Order. CARB updated the AB 32 Scoping Plan in 2017 to reflect the 2030 target.

6. SB 859 (Chapter 368, Statutes of 2016, Committee on Budget and Fiscal Review): Among other things, calls for CARB, in consultation with CNRA and CAL FIRE, to complete a standardized GHG emissions inventory for natural and working lands, including forests by December 31, 2018 (CARB, 2018).

7. SB 1386 (Chapter 545 Statutes of 2016, Wolk): Declares the policy of the state that the protection and management of natural and working lands, including forests, is an important strategy in meeting the state's greenhouse gas reduction goals, and requires all state agencies, departments, boards, and commissions to consider this policy when

revising, adopting, or establishing policies, regulations, expenditures, or grant criteria relating to the protection and management of natural and working lands.

8. (2018) Accompanying release of the Forest Carbon Plan, Governor Brown's Executive Order B-52-18 on forest management emphasizes the importance of implementing the Forest Carbon Plan. Executive Order B-55-18 also calls for California to achieve carbon neutrality no later than 2045, with carbon sequestration targets to be set in the Natural and Working Lands to help achieve this goal.

These Laws, Regulations and Executive Orders form the background under which CAL FIRE reviews plans for impacts to GHG emissions and sequestration.

National and State-Level GHG Assessments

A variety of assessments have been conducted to calculate the GHG emissions and rates of sequestration related to management of natural and working lands. Due to the rapidly evolving science, accounting methods and policy directions from the executive and legislative branches, specific accounting that conforms from study to study has yet to be achieved. The overall trends, however, do provide meaningful insight within which to make assumptions about how an individual THP fits into the overall objectives of assessing and mitigating potential negative impacts from GHG emissions.

USEPA Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018 (EPA, 2020):
Summary: Forest management falls under the "Land Use, Land Use Change, and Forestry" (abbreviated LULUCF) for consistent reporting with other international efforts. Sequestrations at the national level offset approximately 12% of total US GHG Emissions annually and this carbon pool remains relatively stable over time.

- In 2018, total gross U.S. greenhouse gas emissions were 6,676.6 million metric tons of carbon dioxide equivalent (MMT CO2 Eq). Total U.S. emissions have increased by 3.7 percent from 1990 to 2018, down from a high of 15.2 percent above 1990 levels in 2007. Emissions increased from 2017 to 2018 by 2.9 percent (188.4 MMT CO2 Eq.). Net emissions (including sinks) were 5,903 MMT CO2 Eq. Overall, net emissions increased 3.1 percent from 2017 to 2018 and decreased 10.2 percent from 2005 levels as shown in Table ES-2. The Fdeferreddecline reflects many long-term trends, including population, economic growth, energy market trends, technological changes including energy efficiency, and energy fuel choices. Between 2017 and 2018, the increase in total greenhouse gas emissions was largely driven by an increase in CO2 emissions from fossil fuel combustion. The increase in CO2 emissions from fossil fuel combustion was a result of multiple factors, including increased energy use from greater heating and cooling needs due to a colder winter and hotter summer in 2018 compared to 2017.

- Conversely, U.S. greenhouse gas emissions were partly offset by

carbon (C) sequestration in forests, trees in urban areas, agricultural soils, landfilled yard trimmings and food scraps, and coastal wetlands, which, in aggregate, offset 12.0 percent of total emissions in 2018.

- Within the United States, fossil fuel combustion accounted for 92.8 percent of CO2 emissions in 2018. There are 25 additional sources of CO2 emissions included in the Inventory (see Figure ES-5). Although not illustrated in the Figure ES-5, changes in land use and forestry practices can also lead to net CO2 emissions (e.g., through conversion of forest land to agricultural or urban use) or to a net sink for CO2 (e.g., through net additions to forest biomass).

- Land Use, Land-Use Change, and Forestry (LULUCF)

    - Overall, the Inventory results show that managed land is a net sink for CO2 (C sequestration) in the United States. The primary drivers of fluxes on managed lands include forest management practices, tree planting in urban areas, the management of agricultural soils, landfilling of yard trimmings and food scraps, and activities that cause changes in C stocks in coastal wetlands. The main drivers for forest C sequestration include forest growth and increasing forest area, as well as a net accumulation of C stocks in harvested wood pools.
    - The LULUCF sector in 2018 resulted in a net increase in C stocks (i.e., net CO2 removals) of 799.6 MMT CO2 Eq. (Table ES-5). This represents an offset of 12.0 percent of total (i.e., gross) greenhouse gas emissions in 2018… Between 1990 and 2018, total C sequestration in the LULUCF sector decreased by 7.1 percent, primarily due to a decrease in the rate of net C accumulation in forests and Cropland Remaining Cropland, as well as an increase in CO2 emissions from Land Converted to Settlements.
    - Forest fires were the largest source of CH4 emissions from LULUCF in 2018, totaling 11.3 MMT CO2 Eq. (452 kt of CH4).
    - Forest fires were also the largest source of N2O emissions from LULUCF in 2018, totaling 7.5 MMT CO2 Eq. (25 kt of N2O). Nitrous oxide emissions from fertilizer application to settlement soils in 2018 totaled to 2.4 MMT CO2 Eq. (8 kt of N2O).

CARB AB32 Scoping Plan (CARB, 2017) :

Summary: At the state level, all sectors are cumulatively on track to meet the 2020 targets for GHG reductions and sequestration. The Natural and Working Lands in the state represent a key sector for the long-term storage of carbon in vegetation and soils. During the period of 2001-2010, disturbances (primarily in the form of wildfire) caused significant losses to the total

stored carbon. Meeting state goals will require multi-owner and jurisdictional cooperation as well as trade-offs between competing interests.

- California's natural and working landscapes, like forests and farms, are home to the most diverse sources of food, fiber, and renewable energy in the country. They underpin the state's water supply and support clean air, wildlife habitat, and local and regional economies. They are also the frontiers of climate change. They are often the first to experience the impacts of climate change, and they hold the ultimate solution to addressing climate change and its impacts. In order to stabilize the climate, natural and working lands must play a key role.

- Work to better quantify the carbon stored in natural and working lands is continuing, but given the long timelines to change landscapes, action must begin now to restore and conserve these lands. We should aim to manage our natural and working lands in California to reduce GHG emissions from business-as-usual by at least 15-20 million metric tons in 2030, to compliment the measures described in this Plan.

- California's forests should be healthy carbon sinks that minimize black carbon emissions where appropriate, supply new markets for woody waste and non-merchantable timber, and provide multiple ecosystem benefits.

- AB 32 directs CARB to develop and track GHG emissions and progress toward the 2020 statewide GHG target. California is on track to achieve the target while also reducing criteria pollutants and toxic air contaminants and supporting economic growth. As shown in Figure 1, in 2015, total GHG emissions decreased by 1.5 $MMTCO_2e$ compared to 2014, representing an overall decrease of 10 percent since peak levels in 2004. The 2015 GHG Emission Inventory and a description of the methodology updates can be accessed at: www.arb.ca.gov/cc/inventory/inventory .

FIGURE 1: CALIFORNIA GHG INVENTORY TREND

- Carbon dioxide is the primary GHG emitted in California, accounting for 84 percent of total GHG emissions in 2015, as shown in Figure 2 below. Figure 3 illustrates that transportation, primarily on-road travel, is the single largest source of CO2 emissions in the State.. When these emissions sources are attributed to the transportation sector, the emissions from that sector amount to approximately half of statewide GHG emissions. In addition to transportation, electricity production, and industrial and residential sources also are important contributors to CO2

- Increasing Carbon Sequestration in Natural and Working Lands
    - California's natural and working lands make the State a global leader in agriculture, a U.S. leader in forest products, and a global biodiversity hotspot. These lands support clean air, wildlife and pollinator habitat, rural economies, and are critical components of California's water infrastructure. Keeping these lands and waters intact and at high levels of ecological function (including resilient carbon sequestration) is necessary for the well-being and security of Californians in 2030, 2050, and beyond. Forests, rangelands, farms, wetlands, riparian areas, deserts, coastal areas, and the ocean store substantial carbon in biomass and soils.

    - Natural and working lands are a key sector in the State's climate change strategy. Storing carbon in trees, other vegetation, soils, and aquatic sediment is an effective way to remove carbon dioxide from the atmosphere. …We must consider important trade-offs in developing the State's climate strategy by understanding the near and long-term impacts of various policy scenarios and actions on our State and local communities.

- Recent trends indicate that significant pools of carbon from these landscapes risk reversal: over the period 2001–2010 disturbance caused an estimated 150 MMT C loss, with the majority– approximately 120 MMT C– lost through wildland fire.

- California's climate objective for natural and working lands is to maintain them as a carbon sink (i.e., net zero or negative GHG emissions) and, where appropriate, minimize the net GHG and black carbon emissions associated with management, biomass utilization, and wildfire events.

- Decades of fire exclusion, coupled with an extended drought and the impacts of climate change, have increased the size and intensity of wildfires and bark beetle infestations; exposed millions of urban and rural residents to unhealthy smoke-laden air from wildfires; and threatened progress toward meeting the state's long-term climate goals. Managing forests in California to be healthy, resilient net sinks of carbon is a vital part of California's climate change policy.

- Federally managed lands play an important role in the achievement of the California climate goals established in AB 32 and subsequent related legislation and plans. Over half of the forestland in California is managed by the federal government, primarily by the USDA Forest Service Pacific Southwest Region, and these lands comprise the largest potential forest carbon sink under one ownership in the state... The State of California must continue to work closely and in parallel to the federal government's efforts to resolve these obstacles and achieve forest health and resilience on the lands that federal agencies manage.

California Forest Carbon Plan (Forest Climate Action Team, 2018)

Summary: Current estimated sequestration for the entire forest sector is 32.8 MMT CO2e/year, which is 6.56 times more than the current target of 5 MMT per year. Regional, landscape or watershed level assessments are appropriate scales for examining rates of GHG emissions and sequestration. Wildfire remains the single largest source of carbon loss and remains the largest source of black carbon emissions. Although there are trade-offs with in-forest carbon stores, sustainably managed working forests can further provide climate mitigation benefits.

- When all forest pools are considered, California's forests are sequestering 34.4 MMT CO2e/year, and when land-use changes and non-CO2 emissions from wildfires are accounted for, the total net sequestration is 32.8 MMT CO2e/year.

Table 16. Statewide Average Annual Growth, Removals, Mortality, and Net Change for the Above Ground Live Tree Pool by Disturbance, Owner, and Land Status on Plots Initially Measured between 2001-2005 and Re-Measured between 2011-2015 (thousand metric tons carbon dioxide equivalent per year).

	UNRESERVED FORESTLAND			RESERVED FORESTLAND	ALL FORESTLAND[2]
	Private, Corporate	Private, Non-Corporate	USDA Forest Service	USDA Forest Service	Total
	thousand metric tons CO2 equivalent per year				
Gross tree growth	18,554	13,772	25,983	7,188	**73,253**
Removal - harvest	-10,664	-1,476	-1,467	-22	**-13,645**
Mortality – fire killed	-278	-449	-6,077	-4,689	**-12,566**
Mortality – cut and fire[1]	-466	-49	-326	0	**-842**
Mortality – insects and disease	-488	-435	-3,162	-1,039	**-5,728**
Mortality – natural/other	-2,525	-2,988	-6,743	-2,203	**-16,543**
Net live tree	4,133	8,375	8,208	-765	**23,929**
				95% confidence interval	**4,575**

[1]Mortality – Cut and fire: plots where tree mortality has occurred due to both harvest and fire.

[2]Includes other public forestland.

Source: USDA Forest Service FIA.[267]

- The key findings of the [Forest Carbon Plan] include:
  - California's forested landscapes provide a broad range of public and private benefits, including carbon sequestration.
  - The long-term impacts of excluding fire in fire-adapted forest ecosystems are being manifested in rapidly deteriorating forest health, including loss of forest cover in some cases.
  - Extreme fires and fire suppression costs are increasing significantly, and these fires are a growing threat to public health and safety, to homes, to water supply and water quality, and to a wide range of other forest benefits, including ecosystem services.
  - Reducing carbon losses from forests, particularly the extensive carbon losses that occur during and after extreme wildfires in forests and through uncharacteristic tree mortality, is essential to meeting the state's long-term climate goals.
  - Fuel reduction in forests, whether through mechanical thinning, use of ecologically beneficial fire, or sustainable commercial timber harvest to achieve forest health goals, involves some immediate loss of forest carbon, but these treatments can increase the stability of the remaining and future stored carbon.
  - Current rates of fuel reduction, thinning of overly dense forests, and use of prescribed and managed fire are far below levels needed to restore forest health, prevent extreme fires, and meet the state's long-term climate goals.

  - Where forest stands are excessively dense, forest managers may have to conduct a heavy thinning to restore resilient, healthy conditions, which, among other benefits, will subsequently facilitate the reintroduction of prescribed fire as an ecological management tool.
  - Sustainable timber harvesting on working forests can substantially improve the economic feasibility of these treatments to achieve forest health goals at the scale necessary to make an ecologically meaningful difference.
  - Where forestlands have been diminished due to fires, drought, insects, or disease, they should be reforested with ecologically appropriate tree species from appropriate seed sources.
  - The scale and combination of needed treatments and their arrangement across the landscape is likely to be highly variable and dependent on the local setting.
  - The state must work closely with Federal and private landowners to manage forests for forest health, multiple benefits, and resiliency efficiently at a meaningful scale.

- The watershed level has proven to be an appropriate organizing unit for analysis and for the coordination and integrated management of the numerous physical, chemical, and biological processes that make up a watershed ecosystem. Similarly, a watershed can serve as an appropriate reference unit for the policies, actions, and processes that affect the biophysical system, and providing a basis for greater integration and collaboration. Forests and related climate mitigation and adaptation issues operate across these same biophysical, institutional, and social gradients.

  Because of these factors, the Forest Carbon Plan proposes working regionally at the landscape or watershed scale. The appropriate scale of a landscape or watershed to work at will vary greatly depending upon the specific biophysical conditions, land ownership or management patterns, and other social or institutional conditions.

- Forests are shaped by disturbance and background levels of tree mortality. However, elevated tree mortality from overly dense stand conditions, fire exclusion, lack of or poor forest management practices, and impacts related to drought and climate change can have a substantial effect on the forest carbon balance. Wildfire is the single largest source of carbon storage loss and GHG emissions from forested lands: of the estimated 150 million metric tons of carbon lost from forests from 2001-2010, approximately 120 million metric tons of carbon was lost through wildland fire. Wildfire also is the single biggest source of black carbon emissions. Reducing the intensity and extent of

wildland fires through tools such as fuels reduction, prescribed or managed fire, thinning, and sustainable timber management practices is therefore a top priority.

- In addition to fuels reduction and prescribed and managed fire treatments, sustainable commercial timber harvesting on private and public lands, where consistent with the goals of owners or with management designations and done to maximize forest health goals, can play a beneficial role, both in thinning dense forests and financing additional treatments. Although there are trade-offs with in-forest carbon stores, sustainably managed working forests can further provide climate mitigation benefits. Commercial timber harvest within a sustainable management regime to maximizing forest health goals also creates revenue opportunities to fund additional forest treatments and should be seen as a tool in the maintenance of our forests as healthy, resilient net sinks of carbon.

- In order to support the goals of this Forest Carbon Plan, wood and biomass material generated by timber harvesting, forest health, restoration and hazardous fuels treatments must be either utilized productively or disposed of in a manner that minimizes net GHG and black carbon emissions. Timber and other biomass harvest volumes are expected to increase as a result of the forest management activities outlined above. These volumes will include green and dead trees suitable for timber production, smaller-diameter green and dead trees with little traditional timber value, and tops and limbs.

- Specific Rates of Sequestration/Emission by landowner category:

    - Private Corporate Forestland: Private corporate forestland includes both timberland and other forestland. On private corporate forestland growth is high and exceeds removal and mortality, reflecting the practice of sustained yield as required by California's Forest Practice Act and Rules. These forests are managed to create relatively little annual mortality and the harvested volume is less than forest growth. Rates of removals from harvest and thinning are highest on these lands, but the rate of fire-related mortality is lowest. These forests experience a net gain in carbon at a rate of 0.75 metric tons of CO2e per acre per year, or 4.1 MMT of CO2e per year. In 2012, these lands contributed 70 percent of the total harvest (Figure 16) and are therefore an important contributor to the carbon stored long-term in harvested wood products and reduced emissions from burning wood instead of fossil fuels for energy.

- Private Non-Corporate Forestland: This category represents private ownerships for which timber production may or may not be a primary management objective. The rate of gross growth is high on these lands, while the rate of natural, non-fire related mortality is low. The rate of fire-related mortality is also quite low, although it is higher than on private corporate forestland. As these lands exhibit high growth rates, lower harvest per acre than corporate forestland, and have relatively low levels of mortality, these forest lands see the highest net sequestration rates on the order of 1.33 metric tons of CO2e per acre per year, or 8.4 million metric tons of CO2e per year.

  Private non-corporate forestland has the highest rate of sequestration per acre (Figure 17), and despite making up 10 percent less of the forestland base than USDA Forest Service unreserved forestland, these forests sequester the greatest total amount (Table 16). A net 33 percent increase in carbon stock from private non-corporate forestland came from only 24 percent of the California forestland base (Figure 18, Figure 9). A net 13 percent increase in carbon stock from private corporate forestland came from 15 percent of the forestland base. … Private non-corporate forestlands provided slightly less of a net increase in carbon stocks than all USDA FS forestlands, despite being just half the size.

- Forest carbon is stored in both forest ecosystems and, to a lesser extent, in harvested wood products. The degree to which California forests operate as a sink or source is influenced by land management, weather, and a range of forest health issues (e.g., growth, tree mortality from drought, pest and disease outbreaks, wildfire severity). In recent years, prolonged drought conditions have resulted in elevated tree mortality that is widespread across the southern Sierra. The combination of drought impacts and extensive wildfires has made forests lose significant capacity for storing carbon. For all forestlands, improving forest health and managing to reduce losses from mortality can greatly increase the carbon balance on forestlands. On commercial and other actively managed forestlands in California, efficient uses of long lasting wood products and residues for energy can yield GHG benefits. Key inventory findings include:
  - Based on FIA Program data from 2006-2015, all California forests combined on all ownerships were performing as a net sink and are sequestering carbon at an average rate of 0.79 metric tons of CO2e per acre per year, or 0.22 metric tons of carbon per acre per year.

- Based on FIA Program data from 2006 – 2015, California forests have substantial carbon storage; 1,303 MMT above ground and 734 MMT below ground, for a total of 2,037 MMT.

- Based on remeasurements taken between 2011 and 2015, carbon sequestration in the live tree pool (in-forest) was estimated at 7.4 MMT of CO2e per year on National Forest System unreserved and reserved forestlands, 4.1 MMT on private corporate forestland, 8.4 MMT on private noncorporate timberlands, and 4.0 MMT on other public lands. The net change in the live tree pool across all forestlands is estimated at 23.9 MMT of CO2e per year.

- When other forest pools, soils, non-GHG emissions from wildfire, and changes from land-use are accounted for, the net change is 32.8 MMT CO2e per year, meeting the AB 1504 goal of sequestering 5 MMT CO2e per year, assuming the contribution of flux associated with wood products does not drastically lower rates.

- On a per-acre basis, conifer forest types have enormous carbon capture and storage potential.

- FIA Program data suggest that on private forestland growth is outpacing losses from harvest and mortality (excluding wood product storage), and exceeds that of National Forest System lands.

- FIA Program data show that non-corporate forestland has the greatest net growth (i.e., growth minus mortality and harvest excluding wood product storage).

- Based on FIA Program data, tree mortality from forest health-related causes results in substantial declines in forest carbon. These data indicate that tree mortality rates are highest on federal forest lands in reserve (e.g., wilderness), where mortality is slightly outpacing growth.

CARB California Greenhouse Gas Emissions for 2000 to 2018 (CARB, 2020)
Summary: This inventory is specific to anthropogenic sources so most of the agriculture category relates to commercial agriculture. Emissions related to logging from trucks and equipment would fall under the transportation sector. The Natural and Working Lands Emission Inventory contains more specific emission and sequestration numbers for Forestry.

- California statewide GHG emissions dropped below the 2020 GHG Limit in 2016 and have remained below the 2020 GHG Limit since then.

- Transportation emissions decreased in 2018 compared to the previous year, which is the first year over year decrease since 2013.
- Since 2008, California's electricity sector has followed an overall downward trend in emissions. In 2018, solar power generation has continued its rapid growth since 2013.
- Emissions from high-GWP gases increased 2.3 percent in 2018 (2000-2018 average year-overyear increase is 6.8 percent), continuing the increasing trend as they replace Ozone Depleting Substances (ODS) being phased out under the 1987 Montreal Protocol.

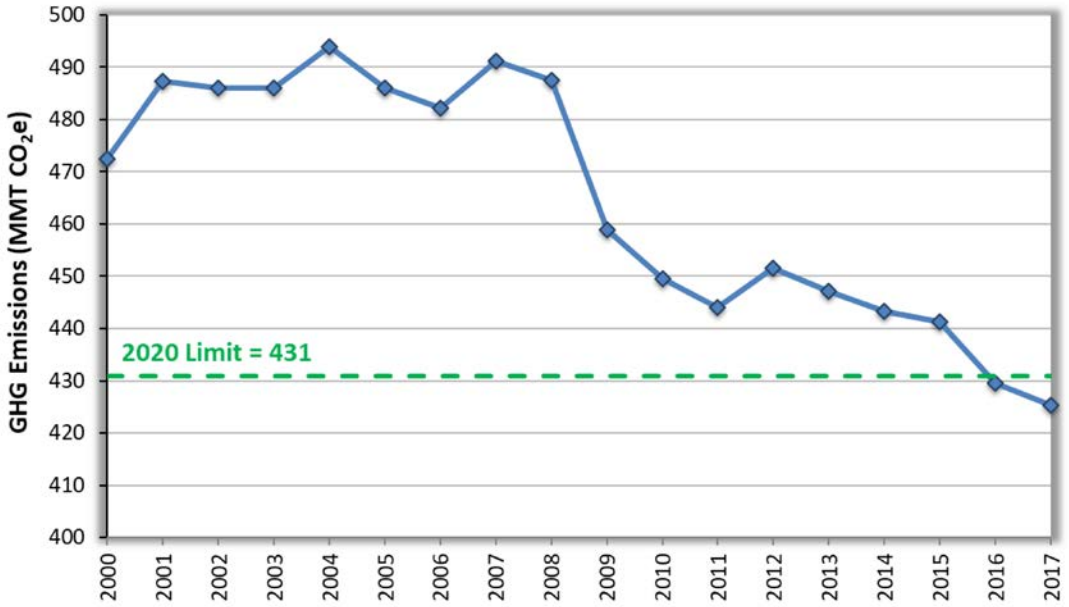


Figure 1. California GHG Emissions Trends. This figure shows the emission trends between 2000 and 2017 as compared to the 2020 statewide GHG limit of 431 $MMTCO_2e$.

- In 2017, emissions from statewide emitting activities were 424 million metric tons of CO2 equivalent (MMTCO2e), which is 5 MMTCO2e lower than 2016 levels. 2017 emissions have decreased by 14 percent since peak levels in 2004 and are 7 MMTCO2e below the 1990 emissions level and the State's 2020 GHG limit. Per capita GHG emissions in California have dropped from a 2001 peak of 14.1 tonnes per person to 10.7 tonnes per person in 2017, a 24 percent decrease.4,19 Overall trends in the inventory also demonstrate that the carbon intensity of California's economy (the amount of carbon pollution per million dollars of gross domestic product (GDP)) is declining. From 2000 to 2017, the carbon intensity of California's economy has decreased by 41 percent from 2001 peak emissions while simultaneously increasing GDP by 52 percent. In 2017, GDP grew 3.6 percent while the emissions per GDP declined by 4.5 percent compared to 2016.22

Figures 2(a)-(c) on the next page show California's growth alongside GHG reductions.

- California's agricultural sector contributed approximately 8 percent of statewide GHG emissions in 2017, mainly from methane (CH4) and nitrous oxide (N2O) sources.

An Inventory of Ecosystem Carbon in California's Natural & Working Lands (NWL)
(CARB, 2020)

This inventory tracks carbon within California ecosystems and how it moves between various "pools". This is a snapshot view that provides for valuable long-term comparisons. These inventories are constantly being improved and some tracking categories have higher levels of certainty than others. Soil is the largest estimated pool of carbon and also has the highest error associated with those estimates. The assessment estimates that a majority of soil carbon loss is associated with the Sacramento-San Joaquin Delta region. Forest and shrublands show a 6% decrease, due to loss from wildfire. During the early iterations of these inventories, it appears prudent to only focus on gross trends.

- The Earth's carbon cycle involves the exchange of carbon between the atmosphere, biosphere (plants, animals, and other life forms), hydrosphere (water bodies), pedosphere (soils), and lithosphere (Earth's crust and mantles, including rocks and fossil fuels). Carbon moves between land types (e.g., forests and grasslands) and carbon pools1 (e.g., wood, roots, and soils) due to natural processes (growth, decay, and succession) and disturbances (e.g., wildfire) or anthropogenic forces such as land use change. The NWL Inventory tracks how much carbon exists in California's ecosystems, where that carbon is located, and estimates how much carbon is moving in and out of the various land types and carbon pools. It provides stored carbon "snapshots" and gives insight into the location and magnitude of NWL carbon stocks at discrete moments in time.

- The NWL inventory includes:
  - Forest and other natural lands (woodland, shrubland, grassland, and other lands with sparse vegetation): live and dead plant materials and their roots
  - Urban land: trees in urban area
  - Cropland: woody biomass in orchards and vineyards
  - Soil Carbon: organic carbon in soils for all land types
  - Wetlands: CO2 and CH4 emissions from wetland ecosystem

- Current NWL Inventory

  - There are approximately 5,340 million metric tons (MMT)2 of ecosystem carbon in the carbon pools that CARB has quantified.3 (To put it into context, 5,340 MMT of carbon in land is equivalent to 19,600 MMT of atmospheric CO2

currently existing as carbon in the biosphere and pedosphere as carbon cycles through the Earth's carbon cycle.) Forest and shrubland contain the vast majority of California's carbon stock because they cover the majority of California's landscape and have the highest carbon density of any land cover type. All other land categories combined comprise over 35% of California's total acreage, but only 15% of carbon stocks. Roughly half of the 5,340 MMT of carbon resides in soils and half resides in plant biomass.

- Soil is the largest carbon reservoir. Using the IPCC default assumptions, most of the estimated net change in soil carbon was due to microbial oxidation of organic soil on the Sacramento-San Joaquin Delta. Disturbance caused by tillage and other agricultural management practices, land conversion, and land degradation also contributed to the soil carbon loss. Forest and shrubland carbon stocks in 2010 was 6% lower than in 2001 due to a number of large wildfires that occurred during the 2001-2010 period. (Future inventory editions will capture the impacts of large fire events seen in recent years.) Woody crops and urban forest both gained carbon, as these trees are generally well maintained due to their economic and aesthetic values. Part of the carbon gain seen in urban forests came from expansion of the urban footprint over this period of time. Movement of carbon among land types and carbon pools is a dynamic process. Carbon gain in one land type may be a result of carbon loss in another land type, and vice versa.

- Although carbon that leaves the land base is counted as a carbon stock loss in the NWL Inventory, not all carbon stock loss becomes emissions released into the atmosphere. Some of the carbon leaving the land base continue to retain carbon as durable wood products (e.g., furniture and building materials).

- Disturbances in Forest and Other Natural Lands
  Geospatially explicit carbon stock change information can be related to the different types of disturbance on land. During the 2001-2014 period, wildfire accounted for 74% and prescribed fire accounted for 3% of the areas that experienced disturbance. The impact of wildfire can be seen throughout the State, in both rural areas and urbanized areas near shrublands and forest. Harvest and clearcut accounted for 11%, and fuel reduction activities (thinning, mechanical, and mastication) accounted for 14% of the disturbed area.

- Uncertainty of the Inventory Estimates The science, method, and technique for accounting of ecosystem carbon are relatively new and still rapidly advancing. Although significant progress has been made in the inventory development, more work still needs to be done. The parts of the NWL Inventory that have been in development for more years generally have a reasonably constrained uncertainty (between 15% and 40%), but other parts of the inventory that CARB started to develop more recently contain significant uncertainties.

AB 1504 California Forest Ecosystem and Harvested Wood Product Carbon Inventory
(Christensen, Gray, Kuegler, Tase, & M, 2021)

Summary: California forests vastly exceed the 5MMT CO2e target, by a factor of over 5 times, even when taking into account losses from fire, drought and timberland conversion. Forests remain a net sink of carbon, even accounting for losses from wildfire and drought.

- Overall California forests are exceeding the 5 MMT CO2e target rate of annual sequestration established by AB 1504, sequestering 26.8 ± 4.2 MMT CO2e per year (excludes confidence interval for HWP C net change; Table 7.1). This value includes changes in forest ecosystem pools (26.0 MMT CO2e per year), harvested wood product pools (0.8 MMT CO2e per year), non-CO2 emissions from wildfires (-0.6 MMT CO2e per year), and forest land conversions (-1.0 MMT CO2e per year).
- Based on plots initially measured between 2001-2009 and re-measured between 2011-2019, the average statewide rate of forest carbon sequestration is 26.0 ± 4.1 MMT CO2e per year, excluding net CO2e contributions from other sources such as, harvested wood products, forest land conversions and non-CO2 GHG emissions from wildfire (Table 4.1,4.3).
- Based on the 2019 measurement period, after accounting for these other CO2 and greenhouse gas sources the statewide rate of carbon sequestration on all forest land is 24.5 ± 4.0 MMT CO2e per year (Table 4.2a), down from the 2018 re-calculated reporting period estimate of 26.4 ± 4.3 MMT CO2e. This value cannot be directly compared to previous report values from the 2015 reporting period (32.8 ± 5.5 MMT CO2e per year), the 2016 reporting period (30.7 ± 5.3 MMT CO2e per year), or the 2017 reporting period (27.0 ± 5.5 MMT CO2e per year) due to improved methods over time and the re- stratification that occurred in 2019. However, data suggest that the net annual sequestration rate is decreasing over time. This value excludes contributions from HWP pools.

THP-Specific Assessment

CEQA requires that individual projects estimate the associated GHG emissions from a proposed project and make a determination of significance. The plan submitter provided a site-specific analysis on pages 175 through 188. The specific calculations used for the assessment are from the CAL FIRE Greenhouse Gas calculator located on pages 181 through 188 and estimate the THP is capable of releasing a total of 1,175 tonnes of CO_2e. As described in the analysis, many of these releases will occur slowly over time, and are provided in the THP as a conservative, worst case emission estimate. These emissions are estimated to be recouped by trees in the THP area within 10-26 years. Over the next 100 years, these stands are expected to sequester a total of 46,107 tonnes of CO_2e.

The THP concluded that these emissions would not be significant, when combined with other past, present and reasonably foreseeable future projects.

The Department has reviewed the estimates of emissions associated with the pools evaluated by the Plan as part of the project specific analysis and has determined that the calculations have reasonably accounted for emissions from biologic and production elements of the project and that the sequestration estimates incorporate approaches for estimating carbon sequestration that are consistent with current science.

When this THP is considered within its own context, taking into account the state and national assessments discussed previously, CAL FIRE believes that it meets the requirements of CEQA and is consistent with the broader goals established by AB32 in providing for long-term carbon sequestration while providing for the market needs for forest products.

Fire Hazard Risk and Assessment

> From the appointment of the first State Board of Forestry in 1885, to the creation of the first State Forester position in 1905, and the organization of the original California Division of Forestry in 1927, the Department of Forestry and Fire Protection (CAL FIRE) has protected the people, property, and natural resources of California. The Department's diverse programs work together to plan protection strategies for over 31 million acres of privately-owned wildlands, and to provide emergency services of all kinds throughout California.
>
> -CAL FIRE 2019 Strategic Plan

As an agency, CAL FIRE fulfills many roles to protect both the public and natural resources of our state. When it comes to operations that can impact both the natural environment and the public, CAL FIRE must review these proposals with an eye towards these two responsibilities. When it comes to a decision of whether to approve a plan, CAL FIRE must exercise professional discretion:

> 14 CCR § 897 Implementation of Act Intent

(d) Due to the variety of individual circumstances of timber harvesting in California and the subsequent inability to adopt site-specific standards and regulations, these Rules use judgmental terms in describing the standards that will apply in certain situations. By necessity, the RPF shall exercise professional judgment in applying these judgmental terms and in determining which of a range of feasible (see definition 14 CCR 895.1) silvicultural systems, operating methods and procedures contained in the Rules shall be proposed in the plan to substantially lessen significant adverse Impacts in the environment from timber harvesting. The Director also shall exercise professional judgment in applying these judgmental terms in determining whether a particular plan complies with the Rules adopted by the Board and, accordingly, whether he or she should approve or disapprove a plan. The Director shall use these Rules to identify the nature of and the limits to the professional judgment to be exercised by him or her in administering these Rules.

Requirements of Evaluation included in the Rules

The Forest Practice Rules recognize that Timber Operations have the potential to cause and contribute to the severity of fires. The need to protect property and natural resources from fire goes back to the founding of the original Board of Forestry in 1885. Fire prevention laws were the first regulations governing forestry in our state.

Current Forest Practice Laws contain significant detail on how operations are to be conducted to reduce or eliminate the chance that logging will cause a fire. Article 7 of the Rules cover the various methods of reducing fire risk and hazard, collectively called “Hazard Reduction”:

- 917, 937, 957 Hazard Reduction
  - 917.2, 937.2, 957.2 Treatment of *[Logging]* Slash to Reduce Fire Hazard
  - 917.3 Prescribed Broadcast Burning of Slash [Coast]
  - 937.3 Prescribed Broadcast Burning of Slash [Northern]
  - 957.3 Prescribed Broadcast Burning of Slash [Southern]
  - 917.4 Treatment of Logging Slash in the Southern Subdistrict
  - 957.4 Treatment of Logging Slash in the High Use Subdistrict
  - 917.5, 937.5, 957.5 Burning of Piles and Concentrations of Slash
  - 917.6, 937.6, 957.6 Notification of Burning
  - 917.7, 937.7, 957.7 Protection of Residual Trees
  - 917.9, 937.9, 957.9 Prevention Practices

A primary concern addressed in the Hazard Reduction Rules deals with logging debris left over after trees are harvested. Branches, leaves, and other materials not taken to a sawmill (called “slash”) must be treated in such a way that an increase in fire hazard does not occur, and to prevent the spread of forest-based insects and diseases. For example, the following standard practices shall be followed within the THP area to treat slash:

917.2, 937.2, 957.2 Treatment of Slash to Reduce Fire Hazard [All Districts]
Except in the [High-Use Subdistrict of the Southern Forest District,] Southern Subdistrict of the Coast Forest District and Coastal Commission Special Treatment Areas of the Coast Forest District, the following standards shall apply to the treatment of Slash created by Timber Operations within the plan area and on roads adjacent to the plan area. Lopping for fire hazard reduction is defined in 14 CCR 895.1.

(a) Slash to be treated by piling and burning shall be treated as follows:
    (1) Piles created prior to September 1 shall be treated not later than April 1 of the year following its creation, or within 30 days following climatic access after April 1 of the year following its creation.
    (2) Piles created on or after September 1 shall be treated not later than April 1 of the second year following its creation, or within 30 days following climatic access after April 1 of the second year following its creation.
(b) Within 100 feet of the edge of the traveled surface of public roads, … and seasonal] private roads open for public use where permission to pass is not required, Slash created and trees knocked down by road construction or Timber Operations shall be treated by lopping for fire hazard reduction, piling and burning, chipping, burying or removal from the zone.
(c) All woody debris created by Timber Operations greater than one inch but less than eight inches in diameter within 100 feet of permanently located structures maintained for human habitation shall be removed or piled and burned; all Slash created between 100-200 feet of permanently located structures maintained for human habitation shall be lopped for fire hazard reduction, removed, chipped or piled and burned

This plan has one public road (Fish Rock Road) that runs adjacent to a portion of plan. As required, a 100 foot hazard reduction zone is designated for this area. This is described on page 62 and shown on map page 84.

This proposal was reviewed by CAL FIRE and determined to be appropriate and in conformance with the Rules. For this plan, there are no structures requiring hazard reduction near the plan area,

No matter where Timber Operations are located, every Licensed Timber Operator is required to submit to CAL FIRE a Fire Suppression Resource Inventory that contains emergency contact information for each Licensed Timber Operator along with the number of personnel and types of equipment that can be used to suppress any fire. These operators can be called upon to assist CAL FIRE with emergency fire suppression in the area where they are operating, further adding to the resources that can be used during a fire.

In addition to the hazard reduction rules, operations proposed in this plan have additional benefits expected to reduce fire danger.

- Road brushing and maintenance: As part of the Timber Operations, existing roads will receive maintenance to allow for access for logging equipment. These operations ensure that roads used for operations are free of obstruction and can be used during the operations and in the future in the event they are required for fire suppression:

  > 923.1, 943.1, 963.1 Planning for Logging Roads and Landings. [All Districts]
  > Logging Roads and Landings shall be planned and located within the context of a systematic layout pattern that considers 14 CCR § 923(b), uses existing Logging Roads and Landings where feasible and appropriate, and provides access for fire and resource protection activities.

  Additionally, any time that burning permits are required (e.g. during the declared fire season), all roads and landings within the harvest plan area must be passable for use during an emergency:

  > 923.6, 943.6, 963.6 (d) When burning permits are required pursuant to PRC § 4423, Logging Roads and Landings that are in use shall be kept in passable condition for fire trucks.

- New road construction: In addition to the existing roads within the plan area, new seasonal roads are proposed to assist with harvesting. These roads will allow for additional access if necessary for fire suppression.

Maintaining access within the harvest plan area is consistent with the Mendocino Unit Strategic Fire Plan to allow for rapid extinguishment of fires within CAL FIRE responsibility areas.

When it comes to evaluating the potential for the proposed plan to negatively impact wildfire risk and hazard, the Rules contain the following guidelines:

> Excerpt from Technical Rule Addendum #2:
> WILDFIRE RISK AND HAZARD
> Cumulative increase in wildfire risk and hazard can occur when the Effects of two or more activities from one or more Projects combine to produce a significant increase in forest fuel loading in the vicinity of residential dwellings and communities.

> The following elements may be considered in the assessment of potential Cumulative Impacts:
>
> 1. Fire hazard severity zoning.
> 2. Existing and probable future fuel conditions including vertical and horizontal continuity of live and dead fuels.
> 3. Location of known existing public and private Fuelbreaks and fuel hazard reduction activities.
> 4. Road access for fire suppression resources.

The Rules specify that an RPF must evaluate potential impacts that could be caused by the project. Timber harvesting is not required to lower wildfire risk and hazard, although this is common from properly designed and implemented operations.

The complete assessment is located on page 189-190 and correctly discloses that the area is designated as being within a High Fire Hazard Severity Zone. This designation was made by CAL FIRE as part of a statewide assessment. Additional detail and information can be found on the CAL FIRE website[7]

> *The Fire Hazard Severity Zone maps are developed using a science-based and field-tested model that assigns a hazard score based on the factors that influence fire likelihood and fire behavior. Many factors are considered such as fire history, existing and potential fuel (natural vegetation), predicted flame length, blowing embers, terrain, and typical fire weather for the area. There are three levels of hazard in the State Responsibility Areas: moderate, high and very high. Urban and wildland areas are treated differently in the model, but the model does recognize the influence of burning embers traveling into urban areas, which is a major cause of fire spread.*

For Mendocino County, most lands are classified as being within the “High” category.

Percent of Responsibility Area with Hazard Severity Level				
Hazard Rating	Federal Responsible Lands	Local Agency Responsible Lands	CAL FIRE Responsible Lands	Percent of County Per Rating
Very High	0%	0%	20%	10%
High	0%	0%	70%	60%
Moderate	0%	0%	10%	10%
(blank)	90%	100%	0%	20%
Grand Total	100%	100%	100%	100%

[7] https://osfm.fire.ca.gov/divisions/wildfire-planning-engineering/wildfire-prevention-engineering/fire-hazard-severity-zones

CAL FIRE has determined that the assessment of potential hazards is reasonable based upon the characteristics of the assessment area and the proposed operations. In light of the available information contained within the record, CAL FIRE concurs with the RPFs conclusion that the plan will not have a significant adverse effect on Wildfire Risk and Hazard.

CEQA Thresholds of Concern (TOC) and Quantitative Versus Qualitative Assessments

The Board's rules do not require a specific method of cumulative impacts assessment, because the Board determined that no single, available procedure adequately addresses the wide range of site conditions and THP activities found in California. Technical Rule Addendum No. 2 provides the framework of what should be considered and what to look for with respect to conditions that may be at or near some level of concern. As stated in the Addendum, "The watershed impacts of past upstream and on-site projects are often reflected in the condition of stream channels on the project area." This is a critical element as it guides the RPF to focus on areas where cumulative watershed effects are known to accumulate. The Addendum then describes factors that can be used to evaluate the potential project impacts. Such factors include gravel embeddedness, pool filling, stream aggrading, bank cutting, bank mass wasting, downcutting, scouring, organic debris, stream-side vegetation, and recent floods. Taken together, they help inform the RPF about the status of the Environmental Setting (14 CCR §15125[8]) with respect to the impacts of past projects, and will form the basis of a determination on the impacts of the proposed project.

[8] **15125. ENVIRONMENTAL SETTING**
(a) An EIR must include a description of the physical environmental conditions in the vicinity of the project. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant. The description of the environmental setting shall be no longer than is necessary to provide an understanding of the significant effects of the proposed project and its alternatives. The purpose of this requirement is to give the public and decision makers the most accurate and understandable picture practically possible of the project's likely near-term and long-term impacts.
(1) Generally, the lead agency should describe physical environmental conditions as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. Where existing conditions change or fluctuate over time, and where necessary to provide the most accurate picture practically possible of the project's impacts, a lead agency may define existing conditions by referencing historic conditions, or conditions expected when the project becomes operational, or both, that are supported with substantial evidence. In addition, a lead agency may also use baselines consisting of both existing conditions and projected future conditions that are supported by reliable projections based on substantial evidence in the record.
(2) A lead agency may use projected future conditions (beyond the date of project operations) baseline as the sole baseline for analysis o.nly if it demonstrates with substantial evidence that use of existing conditions would be either misleading or without informative value to decision-makers and the public. Use of projected future conditions as the only baseline must be supported by reliable projections based on substantial evidence in the record.
(3) An existing conditions baseline shall not include hypothetical conditions, such as those that might be allowed, but have never actually occurred, under existing permits or plans, as the baseline.
(b) When preparing an EIR for a plan for the reuse of a military base, lead agencies should refer to the special application of the principle of baseline conditions for determining significant impacts contained in Section 15229.
(c) Knowledge of the regional setting is critical to the assessment of environmental impacts. Special emphasis should be placed on environmental resources that are rare or unique to that region and would be affected by the project. The EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated and discussed and it must permit the significant effects of the project to be considered in the full environmental context.
(d) The EIR shall discuss any inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans. Such regional plans include, but are not limited to, the applicable air quality attainment or maintenance plan or State Implementation Plan, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, regional blueprint plans, plans for the reduction of greenhouse gas emissions, habitat conservation plans, natural community conservation plans and regional land use plans for the protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains.
(e) Where a proposed project is compared with an adopted plan, the analysis shall examine the existing physical conditions at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced as well as the potential future conditions discussed in the plan.

Comment writers take exception to the assessment produced by the Registered Professional Foresters claiming it to be subjective and not sufficient upon which to make determinations on potential plan impacts. Additionally, commenters propose alternative methods that quantify impacts based upon the expected change to vegetation. Attempts to codify statewide, quantitative standards for determining thresholds of concern for impacts have consistently proved problematic due to the wide variety of conditions found in California.

Faced with similar comments, the Board of Forestry addressed this issue during the rulemaking for Technical Rule Addendum #2 in 1991:

> Final Statement of Reasons (FSOR) for Technical Rule Addendum #2 (1/18/91)
>
> Pages 56-57 (In response to concerns on the need for Quantitative Data for establishing baselines):
>
> Response - The Board reviewed several drafts of regulations before noticing the proposed language. One of the drafts offered to the Board by the Department contained a set of required measurements which could be reproduced as suggested.
>
> Public comment received by the Board from the agencies and public convinced the Board that there is not a set of quantitative values which can withstand peer review in all areas which are affected by cumulative effects. The breadth of this expertise ranges from geologists, hydrologists, soils scientists, and various biologists.
>
> Given this, the Board relied upon the experience of others in the field of cumulative effects and decided that a qualitative method would be most reliable for the decision maker. Most other agencies currently use the qualitative method which means that an independent analysis is conducted on each project. In this method available data is collected and evaluated to determine that defined topic and issue areas (i.e. stream bank or bed condition) are considered and a condition identified. There then are certain conditions which can be identified. One example is a lack of certain stream biota which indicate the threshold of significant cumulative effects has been reached.
>
> To date, the quantitative methods identified by the Board rely upon numbers which are assigned on the basis of professional judgment. This means that it is only a modified qualitative analysis at best. An example of this is the Chatoian Method of Equivalent Roaded Acres being developed for use by the United States Forest Service. Recent field evaluations have shown that there is little relationship between Equivalent Roaded Acres and the conditions of the water quality in a watershed.
>
> For these reasons the Board did not believe it could require a standardized set of data measurements in the THP regulations.

Further, the data collected would have to be entered into a common data base if any analytical value is to be gained. This would be a costly proposition for the State. The Board believes that such a data base will ultimately be developed and will be invaluable but it should be sought at this time in a nonregulatory manner.

Proceeding with the development of a data base in this manner will allow the necessary data to be identified, the analysis process to be developed, the funding to be identified, and most of all the necessary peer acceptance of such a system to be nurtured.

Also page 70

Response - Refer to response No. 1 in the letter dated August 1, 1990 by Mr. Benjamin Kor, Northcoast Regional Water Quality Control Board. Further, the Board conducted an extensive review of cumulative effects methodologies during 1988 and 1989 most recently and has had at least two previous reports prepared on the topic. The Board in developing this proposal released several draft cumulative effects methodologies for peer review. These methods were originally quantitative to the extent numerical values were assigned to professional judgments. Those values were then totaled and used to estimate whether a cumulative effects threshold had been crossed. The peer review always resulted in criticism of the time required to develop determinations which still relied upon best professional judgment. In response the Board chose to pursue development of the adopted proposal which relies on an independent analysis which provides guidance on what measures must be considered when judging if a cumulative impact will occur. This method as is now currently used by most planning departments and other lead agencies. Use of this method requires information of sufficient detail to support a record of decision.

Even recognizing the limitations that go with these and other quantitative methods,

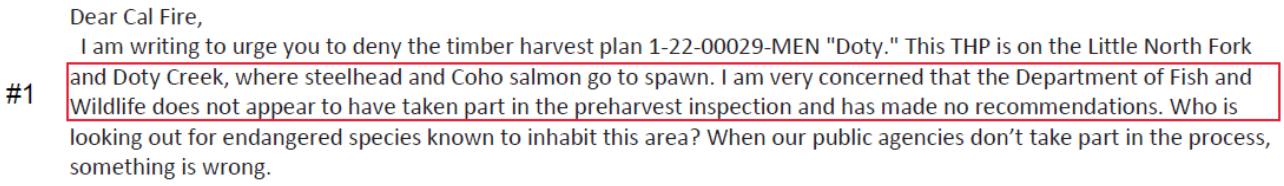
The CEQA Guidelines encourage agencies to develop specific Thresholds of Concern that can be applied to environmental review, but this is not required (14 CCR §15064.7(b)). For CAL FIRE, the establishment of Thresholds of Concern rest with the Board of Forestry and they will make the final determination on if, when and where these thresholds should be applied.

What is (and is not) Answered in an Official Response

In its simplest form, the Official Response (OR) is an apologia, which is latin for "speaking in defense." This involves CAL FIRE providing an explanation for why the plan was approved within the context of the comments received. Usually, this is why the plan was approved over comments that it should be denied or modified. The OR is limited to only substantial environmental concerns (PRC §21080.5(d)(2)(D)[9], 14 CCR §1037.8[10], §1090.22[11], §1094.21[11]) and does not address issues that are outside of CAL FIRE jurisdiction, involve points of law, or policy.

Public Comment

Public comment for this plan came in the form of several letters and emails. These have been included in Appendix A along with a reference to where they are specifically responded to in the document. The discussion preceding this section provides responses to broader questions received through public comment, and information below provides specific responses to individual questions responded to separately. The brackets around the snapshot below show that this is considered specific Concern #1, of which a corresponding Response #1 is provided.



Response #1: (CDFW Did Not Participate in Review)

The California Department of Fish and Wildlife (CDFW) is a member of the interagency review team by statute, but they are not required to participate in the review process. In this case, however, CDFW did participate in First Review and provided questions for the RPF. Based upon the initial review of the plan, CDFW indicated that they only needed to be notified of the PHI date and time. The CAL FIRE inspector notified CDFW of the PHI date and time and they did not elect to send anyone to the field inspection. At the Second Review meeting, CDFW again participated in the review and had no additional questions for the plan.

Response #2: (41 Acre Clearcut)

Several comments mentioned concerns that a 41 acre clearcut would be included in the proposed harvest. This concern appears to be based on the total acres proposed for Clearcut specified on page 10 under Item #14. In actuality the 41 acres of Clearcut are spread over 4

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[9] (d) To qualify for certification pursuant to this section, a regulatory program shall require the utilization of an interdisciplinary approach that will ensure the integrated use of the natural and social sciences in decision making and that shall meet all of the following criteria:… 2) The rules and regulations adopted by the administering agency for the regulatory program do all of the following: … (D) Require that final action on the proposed activity include the written responses of the issuing authority to significant environmental points raised during the evaluation process.

[10] At the time the Director notifies the plan submitter that the plan has been found in conformance, as described in 14 CCR 1037.7, the Director shall transmit a notice thereof to the agencies and persons referred to in 14 CCR 1037.3, and for posting at the places named in 14 CCR 1037.1. A copy of the notice shall be filed with the Secretary for Resources. The notice of conformance shall include a written response of the Director to significant environmental issues raised during the evaluation process.

[11] §1090.22 and §1094.21 contain the same language related to the Official Response as §1037.8

different units. The other general concerns noted in the first letter are addressed elsewhere in this response.

Response #3: (Sediment Impacts and "cbec report")

CAL FIRE recognizes that a disagreement exists between parties and that information that reaches potentially conflicting conclusions exists in the record. As described above in the section titled "CEQA Analysis", such disagreements do not mean the analysis is faulty. CAL FIRE and the Plan Submitter have used professional discretion and the evidence collected by site-specific observations to reach a conclusion that is very different from the cbec report, which was conducted using remote sensing information only.

CAL FIRE notes that these reports have been submitted in previous harvest plans. In THP 1-18-095-MEN, CEG Matthew O'connor provides a response to the methodology used in the cbec reports. This assessment has been included as Appendix B for reference.

Other recent THPs in this vicinity have been the subject cbec reports. One of which was 1-20-00150-MEN "Far North". In response to comments on that plan, a report from Mr. Danny Hagans, Principal Earth Scientist from Pacific Watershed Associates was provided to respond to the cbec report and provide additional background on the work conducted within the assessment area. This report is included in its entirety as Appendix C with a few relevant portions included below:

Per page 4 of the memorandum, Mr. Hagans is the author of the document that is referenced by Mr. Kamman in his analysis. Page 5 of the memorandum from Mr. Hagans states that:

> Making desktop assumptions about the percentage of the road that is hydrologically connected (e.g., 100% or 50% as was done by Kamman) is potentially fraught with error and will lead to erroneous estimates of sediment delivery from the road network being discussed, especially where those road systems have already been effectively treated with state grant funding for hydrological disconnection.
>
> In fact, the above described 45-mile 2002 road erosion and connectivity assessment within the LNFGR watershed only identified 17 miles of road (or 38%) as being hydrologically connected, based on direct field observations and measurements. That means the other 62% of the road network was not hydrologically connected or delivering eroded fine sediment to the stream system on an annual basis even before the roads were treated with CDFG monies…
>
> Finally, Kamman (paragraph 2 on page 1 in each of their three November 20, 2020 reports submitted to CAL FIRE in response to the 3 GRT THP's (Far North, Little and Elk)) suggests there are many other unquantified potential

> sediment sources, such as gullying, landslides and stream crossing failures that will contribute to additional sediment cumulative effects in the Planning Watershed. This conclusion is inaccurate and unrealistic as the 2003 CDFG grant funded and approved watershed restoration and erosion prevention work resulted in over 150 stream crossings that were: 1) reconstructed with properly sized culverts or armored fills designed to accommodate the 100-year return runoff event, installed at grade with stable fillslopes and critical dips to prevent stream diversion and gully formation; or 2) the stream crossings were properly decommissioned per the guidelines provided in the Handbook for Forest, Ranch and Rural Roads (Weaver, Weppner and Hagans, 2015). In addition, the 2003 watershed-wide storm-proofing work included the excavation and preventive stabilization of a minimum of 51 potential road-related unstable fillslopes that PWA had identified as exhibiting a potential for failure and sediment delivery to nearby streams.

In Mr. Hagans conclusion, he states the following (page 5 of the memorandum):

> The conditions and assumptions included in the Kamman reports are not consistent with those found on the ground in these areas.

As it relates to the specific estimates of sediment production, CAL FIRE does not agree with the assessment provided in the cbec report. Additionally, representatives from Water Quality did not indicate such deficiencies with the THP and the included Erosion Control Plan. CAL FIRE has determined that the plan as approved adequately mitigates the potential for sediment to be generated to below the level of significance.

Response #4 (Past Harvesting and Equivalent Clearcut Acres [ECA])

When it comes to the evaluation of potential cumulative effects of a project, 14 CCR §898 specifies “Cumulative Impacts shall be assessed based upon the methodology described in Board Technical Rule Addendum Number 2, Forest Practice Cumulative Impacts Assessment Process and shall be guided by standards of practicality and reasonableness.” With respect to the discussion of past projects, Technical Rule Addendum #2 specifies:

> *D. Past Projects and Reasonably Foreseeable Probable Future Projects*
> *Past Projects and Reasonably Foreseeable Probable Future Projects included in the Cumulative Impacts assessment shall be described as follows:*
> *1. Identify and briefly describe the location of Past Projects and Reasonably Foreseeable Probable Future Projects within*

assessment areas. Include a map or maps and associated legend(s) clearly depicting the following information:
a. Township and Range numbers and Section lines.
b. Boundary of the planning watershed(s) which the Plan area is located along with the CALWATER 2.2 Planning Watershed number(s).
c. Location and boundaries of Past Projects and Reasonably Foreseeable Probable Future Projects on land owned or controlled by the Timberland Owner (of the proposed timber harvest) within the planning watershed(s) depicted in provision (b) above. For purposes of this provision, Past Projects shall be limited to those Projects submitted within ten years prior to submission of the Plan.

For this plan, these are included on pages 112-117 and 134-137. The information tabulated by the comment writer uses the metric of "Equivalent Clearcut Acres" (ECA) to express concern over the impacts of cumulative timber harvesting. This method is one way of estimating changed in impacts due to management actions:

"Equivalent Clearcut Acres (ECA) – ECA is used as an indicator of change in water yield or peak flows resulting from reductions in forest canopy (thinning and harvest-related activities). The ECA analysis takes into account the initial percentage of crown removal and the recovery through vegetative regrowth since the initial disturbance. Existing roads are considered permanent openings in ECA estimates. The analysis takes a simple snapshot in time, with the assumption that all Clear Creek project activities would be implemented in 1 year. ECA predictions are used to compare alternatives and are not viewed as absolutes. This water yield indicator serves only as a red flag that suggests a potential for decreased stability due to sustained increased energy in the stream channel. ECA is used in combination with other indicators such as channel stability and channel type to determine hydrologic risk. The ECA method was developed to address concerns about water yield increases and potential effects on channel morphology. In the 1970s and 1980s, channel changes (primarily scouring) were often observed following timber harvest, and these changes were thought to be caused by water yield increases."

- Biological Assessment for snake river fall chinook, salmon, Snake river steelheao trout, Columbia river bull trout, Spring chinook salmon, Westslope cutthroat trout, Interior redband trout, Pacific lamprey,Western pearlshell musse. USDA Nez Perce-Clearwater National Forests.

Introduction from (Ager & Clifton, 2005)

Understanding and modeling the cumulative watershed effects of management and natural disturbance is a significant

challenge for land managers (U.S. Council on Environmental Quality 1997). Cumulative watershed effects can result from minor actions taking place over a period of time that collectively are thought to alter hydrologic response (FEMAT 1993). A wide variety of qualitative and quantitative methods for analyzing cumulative watershed effects have been developed over the past 25 to 30 years (Berg et al. 1996, Reid 1993). One of the earliest quantitative approaches used by the Forest Service was the equivalent clearcut area (ECA) method, which accounts for past and future effects of different types of disturbances by standardizing the effects and modeling the recovery over time. It was originally developed for use in northern Idaho and Montana (King 1989, USDA FS 1974) where it was used to measure the potential impacts of alternative timber harvesting schedules. A more encompassing model, equivalent roaded area (ERA), was later developed in the Pacific Southwest Region by using the same framework, and was extensively used in the Sierra Nevada Ecosystem Project (Menning et al. 1997).

Both models assume a direct linkage between vegetation disturbance and hydrologic response (i.e., peak flows and water yield) (Bosch and Hewlett 1982, Stednick 1996). Despite conficting literature on the existence of these linkages and other limitations (Beschta et al. 2000, Menning et al. 1997), the model is still required for consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries Department and the U.S. Fish and Wildlife Service (USDC NMFS 1995, USDI FWS 1998) for all proposed management actions in the Blue Mountains national forests and elsewhere within the range covered by PACFISH (USDA USDI 1995a) and INFISH (USDA USDI 1995b) policies. An ECA analysis is typically applied at the subwatershed scale (10,000 to 40,000 acres) as part of analyzing alternative management actions developed in the National Environmental Policy Act (NEPA) project analysis. Equivalent clearcut area measures are also relevant to standards and guidelines for many of the current national forest plans that specify maximum treatment acreages on a subwatershed basis over time. For the Umatilla National Forest, there is no explicit ECA standard in the forest plan, but an ECA of 15 percent is used as a surrogate for a forest plan standard that allows a maximum of 30 percent of the forested area in a subwatershed to be in the 0 to 10-year age class.

The ECA model uses one set of coefficients to describe the proportion of the total basal area removed for different disturbance types, including harvest prescriptions,

> wildfire, prescribed fire, roads, and insect mortality. A second set determines how fast the treated acres recover to 100 percent of potential leaf area or canopy closure, at which point the acre is assumed to have hydrologic function the same as an untreated acre. The physical model behind ECA as a cumulative-effects measure is that vegetation removal changes water yield characteristics (peak flow, timing, total yield) in rough proportion to leaf area, or basal area removed from a site. Several studies have shown that timber harvest affects water yield by reducing water loss associated with interception and evapotranspiration, or by changing snow distribution and melt rates (Hicks et al. 1991, Scherer 2001, Stednick 1996). The hydrologic changes may lead to destabilized stream channels and other adverse ecological effects (Reid 1993). The ECA statistic (percentage of area in equivalent clearcut condition) is typically used in conjunction with climatic data to evaluate the cumulative effects of vegetative removal on water yields and peak flows. The ECA statistic also may be used as a general guide to overall watershed condition when coupled with site-specific evaluations.
>
> Calculation of the ECA statistic can be a time-consuming process for watersheds that have received multiple disturbances over time. Calculations are complicated by the consideration of multiple treatment alternatives and revision of treatment intensities in the process of project development. This paper describes the program Equivalent Treatment Area Calculator (ETAC) that vastly simplifies calculation of the ECA statistic. The ETAC program is intended to provide a consistent approach to measuring harvest and other impacts to forest vegetation. This paper describes the most recent version of the program, methods for preparing data, considerations for use of the model, and includes an example analysis.

While ECA and other methods such as ERA can be used to analyze past projects and their expected interactions with proposed actions, their use is not required. This is discussed in greater detail in the General Discussion above. CAL FIRE reviewed the past projects assessment and concluded that it was consistent with the requirements of TRA2.

Response #5 (Thresholds of Concern):

This concern is addressed above in the section titled CEQA Thresholds of Concern (TOC) and Quantitative Versus Qualitative Assessments.

Response #6 (CAL FIRE not Complying with Regulations):

Although several sections of code and case law are referenced, no specific deficiency with the plan that correlates to the concern is provided making a response impossible.

Response #7 (CAL FIRE Deferred Mitigation/Mitigation as an Alternative to Analysis and Deficiencies with CAL FIRE Review):

CAL FIRE believes that deferred mitigation is not appropriate, although CEQA case law shows a more mixed opinion of the practice (see below). It is reasonable to conclude that impacts from a proposed project cannot be reasonably assessed unless the mitigation measures to apply are specified before approval. The potential always exists that a more appropriate mitigation could be developed after plan approval, but such changes would need to be considered as an amendment to the plan, providing the Lead Agency with the decision of how to proceed with making that change to the plan (i.e. minor or substantial deviation)

Deferred Mitigation

Deferred mitigation refers to the practice of putting off the precise determination of whether an impact is significant, or precisely defining required mitigation measures, until a future date. Over the years, the courts have addressed the issue of deferred mitigation numerous times to the point where patterns of appropriate and inappropriate CEQA behavior have emerged. Such certainty is not possible if the details of enforceable mitigation measures to avoid the impacts are deferred.

Deferral should only be considered when there is a legitimate reason why the agency cannot develop a specific mitigation measure at the time of the project environmental review. As discussed below, deferring mitigation does not mean deferring the inclusion of a mitigation measure in the environmental document or the implementation of that measure. It refers to deferring to a future time for the refinement or full definition of the adopted mitigation measure.
The essential rule for proper deferral of the specifics of mitigation was established in Sacramento Old City Assoc. v. City Council of Sacramento (1991) 229 Cal. App. 3d 1011. This case held that the City of Sacramento had correctly deferred the selection of specific mitigation measures to reduce the parking impacts from the expansion of its convention center. Under the reasoning established in this case and cited in many decisions since, in order to meet CEQA's requirements a mitigation measure must meet one of the following basic Conditions:

- The agency must commit itself to the mitigation by

identifying and adopting one or more mitigation measures for the identified significant effect. The mitigation measure must also set out clear performance standards for what the future mitigation must achieve.

- Alternatively, the agency must provide a menu of feasible mitigation options from which the applicant or agency staffs can choose in order to achieve the stated performance standards.

The courts have opined on deferred mitigation in reported cases many times since the Sacramento Old City decision, and three points stand out. First, each case is fact-specific. So, keeping a clear administrative record that contains substantial evidence supporting the deferred approach is crucial. Second, performance standards must be included in the mitigation measure; specific performance standards are needed in order to show that the final mitigation measure will be effective. Third, the lead agency must ensure that the future mitigation will be implemented— oftentimes done through a condition of approval for obtaining a development permit. Inherent in the commitment to mitigation and adoption of performance standards is a responsibility to ensure that the final mitigation is effective and is actually implemented.

> "'[W]hen a public agency has evaluated the potentially significant impacts of a project and has identified measures that will mitigate those impacts,' and has committed to mitigating those impacts, the agency may defer precisely how mitigation will be achieved under the identified measures pending further study." (Oakland Heritage Alliance v. City of Oakland (2011) 195 Cal.App.4th 884, citing California Native Plant Society v. City of Rancho Cordova (2010) 172 Cal.App.4th 603.)
>
> "CEQA Portal Topic Paper - Mitigation Measures" Association of Environmental Professionals. Updated 2/10/20[12]

It is important for CAL FIRE to clarify, without vagueness, that a determination of significance has been made for this plan upon approval. All operational measures included in this plan have been determined to avoid significant adverse effects. No determination on significance or appropriate operational measures has been deferred.

[12] https://ceqaportal.org/tp/CEQA%20Mitigation%202020.pdf

With respect to any mitigation measures adopted, CAL FIRE agrees that they should be accompanied by Substantial Evidence to support their effectiveness. It is important to point out, however, that the application of the Rules (including ASP Rules) are not considered mitigation measures in and of themselves.

The Rules were designed as a set of generic measures to avoid significant impacts, but they do not presume that significant impacts would occur if they were not applied. Since every project is unique in both the physical setting and proposed operations, such one-size-fits-all measures cannot be presumed to always avoid impacts, nor does their application imply that a significant impact would occur with some lesser measure. If the Rules were in fact definitive as mitigation measures for a THP, field review would never be required since it would be entirely redundant.

While the Rule development underwent its own CEQA process, site-specific evaluations of impacts and of potential cumulative effects is still required on all THPs.

In the CEQA Guidelines, the following definition of mitigation is provided:

> 15370. MITIGATION
> "Mitigation" includes:
> (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
> (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
> (c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.
> (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
> (e) Compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements.

Since regular CEQA projects (e.g. EIR, Mitigated Negative Declaration, Negative Declaration) do not have a set of standards or best management practices to draw from in regulation, they must independently evaluate potential impacts and develop custom mitigation measures when a significant adverse effect is anticipated.

Important to remember in the CEQA process, there are no "standard" rules for how a project can mitigate potential risks. Under a Certified Regulatory Program, this is different. The Board has promulgated Rules designed to reduce potential impacts from Timber Operations to below the level of significance. Although this is the purpose of the Rules, as described above, it does not eliminate the requirement to evaluate them for a specific project. Interagency (Interdisciplinary) review is a required component of a Certified Regulatory Program and is part of the decision making process that CAL FIRE uses to evaluate proposed plans.

With respect to the deficiencies with review of cumulative impacts, CAL FIRE watershed protection staff provided a robust and appropriate response to the “Dunne” report in 2003. It is evident from reading both the Dunne report and the CDF response that the Dunne authors did not make a good faith attempt to understand the fundamentals of the issue. The report concluded that CDF had no staff with adequate training in CWEs, yet never interviewed any of the employees who actually do this work. The response is so substantive and germane that it has been included in its entirety as Appendix D.

Response #8 (Using Watersheds for Evaluation of Cumulative Effects)
The general discussions of “Watersheds as the Focal Point for Cumulative Impacts Evaluation” and “Greenhouse Gas Sequestration” provide an extensive discussion on the use of watersheds for evaluation. Put simply, there is substantial evidence to support the use of watersheds for the basis of evaluating cumulative effects.

Response #9 (Reasonable Thresholds of Concern Already Exist [e.g. Burkhardt])
CAL FIRE reviewed the report from Burkhardt titled “Maximizing Forest Productivity” and found it to be a competent and compelling argument for re-establishing the productive capacity of cutover or depleted forestlands in Mendocino County.

Burkhardt uses known facts relative to mensuration, growth & yield and forest economics to construct a methodology for sustainable harvesting across multiple forest types. This methodology, while rather conservative with respect to potential tree growth, is nonetheless well constructed, researched and described in his report. While it is one approach that can be taken to dealing with harvesting over large areas, it is not the only method that could be employed or applicable to harvesting applications. California law and regulations provide foresters with a range of methods to achieve sustainable harvests and professional discretion to make decisions about management actions to achieve landowner goals.

The Burkhardt paper and its conclusions are very appropriate for the time when it was written. Before current MSP rules (i.e. 1994), the late 80s and 90s were a time when forest liquidation was accelerating. Companies, investors and financial predators saw the massive financial reserves that timberlands held and devised ways to turn that into cash. Forest investments are radically different than others and rely on the owner placing more assets at risk of loss than other businesses. This is what makes forestry so special and yet vulnerable to exploitation. The Burkhardt paper is one way of dealing with this temptation to liquidate what some see as merely excess capital reserves.

But it is not the only way for plans to demonstrate compliance with the MSP rules. For landowners with less than 50,000 acres, MSP can be demonstrated as specified in 14 CCR 913.11(c):

> (c) In a THP, NTMP, or WFMP, MSP is achieved by:
> (1) For evenage management, meeting the minimum stand age standards of 14 CCR § 913.1(a)(1), meeting minimum stocking and basal area standards for the selected silvicultural methods as contained in these Rules only with group A species, and protecting the soil, air, fish and wildlife, water resources and

other public trust resources through the application of these Rules; or
(2) For unevenaged management, complying with the seed tree retention standards pursuant to 14 CCR § 913.1(c)(1)(A) [933.1(c)(1)(A), 953.1(c)(1)(A)] or 913.2(b)(6) [933.2(b)(6), 953.2(b)(6)], meeting minimum stocking and basal area standards for the selected silvicultural methods as contained in these Rules only with group A species, and protecting the soil, air, fish and wildlife, water resources and other public trust resources through the application of these Rules.
(3) For intermediate treatments and special prescriptions, complying with the stocking requirements of the individual treatment or prescription.

For this plan, each silvicultural method proposed complies, at minimum, with the retention standards specified by 14 CCR §913.1(c).

Response #10 (Watershed Biomass not Accumulating)
The concern states that a model was used to determine changes in volume for the Doty Creek watershed and that biomass has not accumulated since 2015. It is difficult to provide any response to this concern for the following reasons:

1. The model used for this process was not specified.
2. The specific inputs used were not specified, along with how the data was obtained.
3. There is no requirement under the rules to increase biomass over time.

Overall, it was impossible to determine, without speculation, what this concern was trying to convey or what specific negative impacts were expected to occur as a result.

Response #11 (Plan Fails to Address the Water Cycle):
Timber harvesting plans are not required to evaluate the water cycle as part of the cumulative effects analysis, and it is difficult to understand how a THP could alter patterns of the water cycle on a regional or global scale.

The concern makes a series of generalized and generic conclusions about timber harvesting that can be generally responded to:

- The concern equates timber harvesting with “land degradation” which cannot be supported based upon the Record. One of the definitions used by the International Panel on Climate Change (IPCC) is “*a negative trend in land condition, caused by direct or indirect human-induced processes including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity or value to humans.”* (IPCC, 2019)*.* The report “Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegatation of Other Vegetation Types” (IPCC-NGGIP, 2003) notes that there were over 50 definitions of “degradation” in the literature they reviewed.

- The concern equates timber harvesting with increased fire danger, ignoring the requirements found within the Rules for hazard reduction, the requirement to evaluate fire hazard and risk in the Cumulative Impacts Discussion.
- The concern assumes increased erosion, despite mitigation measures included in the Rules and the plan to assess erosion potential (e.g. EHR) and reduce erosion to below the level of significance.
- The concern assumes that harvesting will result in loss of soil fertility without providing evidence to support the concern.

The concern states that nothing has been done at the local, regional or state level to address the effects on the water cycle, yet it is unclear what could be done at the THP level to address this. Further, requiring mitigation on an individual THP when the ability for forest management to affect the local water cycle is entirely speculative cannot be supported by the Record.

While impacts on the water cycle are not addressed specifically, the impact that the plan could have on the release and sequestration of Greenhouse Gasses (GHG) has been evaluated on pages 175-188 and is also extensively discussed in the General Discussion. Additionally, the long-term trends in expected changes in temperature and rainfall have also been discussed in the General Discussion and taken into consideration when making a determination on this plan.

CAL FIRE reviewed the Lukovic study (Sekulić, 2021) which reviewed rainfall data for the last 60 years and identified a statistically significant decrease in precipitation in the autumn, extending the dry period in California. This research was conducted in order to inform future modeling of precipitation trends.

CAL FIRE reviewed the Porkony study (Pokorný, 2018) compared temperatures collected and released on different surfaces such as forest, meadows and concrete. Not surprisingly, forested landscapes moderated temperatures much more effectively than areas not covered with vegetation such as concrete. Concerns are noted over conversion of forests into non-forested or urban landscapes. This is not proposed under this plan and a new forest will be planted after harvesting within the evenage units.

CAL FIRE reviewed the Ellison work (Ellison, 2017) and found it to be primarily an opinion piece intended to influence public policy to achieve social justice goals. A variety of topics are discussed in this piece, and it is worth noting, however, that the authors conclusions on the value of biodiversity and native species in plantations meshes very well with current practices in California.

> Forest-driven water and energy cycles are poorly integrated into regional, national, continental and global decision-making on climate change adaptation, mitigation, land use and water management. This constrains humanity's ability to protect our planet's climate and life-sustaining functions. The substantial body of research we review reveals that forest, water and energy interactions provide the foundations for carbon storage, for cooling terrestrial surfaces and for distributing water resources. Forests and trees must be recognized as prime regulators within the water, energy

and carbon cycles. If these functions are ignored, planners will be unable to assess, adapt to or mitigate the impacts of changing land cover and climate. Our call to action targets a reversal of paradigms, from a carbon-centric model to one that treats the hydrologic and climate-cooling effects of trees and forests as the first order of priority. For reasons of sustainability, carbon storage must remain a secondary, though valuable, by-product. The effects of tree cover on climate at local, regional and continental scales offer benefits that demand wider recognition. The forest- and tree-centered research insights we review and analyze provide a knowledge-base for improving plans, policies and actions. Our understanding of how trees and forests influence water, energy and carbon cycles has important implications, both for the structure of planning, management and governance institutions, as well as for how trees and forests might be used to improve sustainability, adaptation and mitigation efforts.

Billions of people suffer the effects of inadequate access to water (Mekonnen and Hoekstra, 2016) and extreme heat events (Fischer and Knutti, 2015; Herring et al., 2015). Climate change can exacerbate water shortages and threaten food security, triggering mass migrations and increasing social and political conflict (Kelley et al., 2015). Strategies for mitigating and adapting to such outcomes are urgently needed. For large populations to remain where they are located without experiencing the extreme disruptions that can cause migrations, reliable access to water and tolerable atmospheric temperatures must be recognized as stable ingredients of life. As we explain, the maintenance of healthy forests is a necessary pre-condition of this globally- preferential state.

The published work we review suggests forests play important roles in producing and regulating the world's temperatures and fresh water flows. Well recognized as stores of carbon, forests also provide a broad range of less recognized benefits that are equally, if not more, important. Indeed, carbon sequestration can, and perhaps should, be viewed as one co-benefit of reforestation strategies designed to protect and intensify the hydrologic cycle and associated cooling. Organized and conceived in this way, reduced deforestation, forest landscape restoration and forest preservation strategies offer essential ingredients for adaptation, mitigation and sustainable development.

Deforestation and anthropogenic land-use transformations have important implications for climate, ecosystems, the

> sustain- ability of livelihoods and the survival of species, raising concerns about long-term damage to natural Earth system functions (Steffen et al., 2015). Mean warming due to land cover change may explain as much as 18% of current global warming trends (Alkama and Cescatti, 2016). Deforestation exerts an influence on warming at the local scale and alters rainfall and water availability, not to mention the emission of greenhouse gases.
>
> Biodiversity enhances many ecosystem functions like water uptake, tree growth and pest resistance (Sullivan and O'Keeffe, 2011; Vaughn, 2010). The perverse effects of current land management strategies require closer scrutiny. For example, the practice of plantation forestry can negatively impact species richness and related ecosystem services (Ordonez et al., 2014; Verheyen et al., 2015).
> Mixed species forests may lead to healthier, more productive forests, more resilient ecosystems and more reliable water related services, and often appear to perform better than monocultures regarding drought resistance and tree growth (Ordonez et al., 2014; Paquette and Messier, 2011; Pretzsch et al., 2014 Pretzsch et al., 2014). Through variation in rooting depth, strength and pattern, different species may aid each other through water uptake, water infiltration and erosion control (Reubens et al., 2007).
> Species richness – particularly native species – may be an essential driver in land management policies. Forest rehabilitation offers opportunities to restore water-related ecosystem services (Muys et al., 2014). Future research should identify the required species richness for optimal water ecosystem services. The effects of biodiversity on aerosols, volatile organic compounds, ice nucleation and other rainfall related processes require further research.

The long-term maintenance and perpetuation of forested ecosystems is of primary importance in achieving both regulatory and strategic objectives for mitigating the anticipated negative effects of climate change. This is discussed in great detail in the General Discussion along with the role that forests and forestry play in achieving these goals.

When studies are referring to deforestation, there does not seem to be a unified definition. Some refer to the conversion of forests to non-forest uses to be deforestation while others would consider a native forest replaced by an exotic tree species to meet the definition. The United Nations Food and Agriculture Organization has the following definition for "deforestation": (UNFAO, 2021)

> Deforestation is:

Decision 11/CP.7 (UNFCCC, 2001): the direct human-induced conversion of forested land to non-forested land.

FAO 2001: The conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 percent threshold.

Explanatory note:
1. Deforestation implies the long-term or permanent loss of forest cover and implies transformation into another land use. Such a loss can only be caused and maintained by a continued human-induced or natural perturbation.
2. It includes areas of forest converted to agriculture, pasture, water reservoirs and urban areas.
3. The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures. Unless logging is followed by the clearing of the remaining logged-over forest for the introduction of alternative land uses, or the maintenance of the clearings through continued disturbance, forests commonly regenerate, although often to a different, secondary condition. In areas of shifting agriculture, forest, forest fallow and agricultural lands appear in a dynamic pattern where deforestation and the return of forest occur frequently in small patches. To simplify reporting of such areas, the net change over a larger area is typically used.
4. Deforestation also includes areas where, for example, the impact of disturbance, over-utilization or changing environmental conditions affects the forest to an extent that it cannot sustain a tree cover above the 10 percent threshold.

Using the definitions established by the UN, nothing short of timberland conversion would meet this definition, and no conversion is proposed in this THP. Restrictions on the size of evenage harvest units and age limits on adjacent harvesting provide more variety in stand ages and composition across the landscape. When it comes to plantation establishment in California, native species specific to the seed zone where the THP occurs are required to be planted.

Response #12 (THP Impacts on the Ability for Forest to Product Fog Drip):

Fog drip, or the condensation of water vapor onto vegetation, is not only a well-documented phenomenon but can represent a significant portion of available moisture in an ecosystem (Harr, 1982). The degree to which an individual THP can influence fog drip is highly speculative, however, and an in depth analysis on the part of the Plan is not required in this instance. For example, here is the discussion of fog drip included in this THP:

> (THP Page 132.4-132.5)
>
> Fog Drip: 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 under-story 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 would necessarily reduce the amount of fog interception and therefore reduce fog drip (at least temporally until the canopy closes). 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).
>
> Findings: Since this THP is close to the coast, vegetation receives a significant amount of moisture from fog drip, according to these studies. Any reduction in timber growth from reduced fog drip will likely be more than made up for by the decrease in evapotranspiration of the residual stand. No significant effects on fog drip and stream flows either positive or negative would be expected from this harvest.

For issues that are determined to be non-significant, the CEQA Guidelines state that a lead agency need not consider an effect significant if the project's incremental effect is not cumulatively considerable. (Ref 14 CCR § 15130(a))[13] The concern did not explain how the project's incremental effect might be cumulatively considerable. The concern contains ambiguous references to large areas of canopy loss and extended droughts, but it is unclear

[13] 15130. DISCUSSION OF CUMULATIVE IMPACTS

(a) An EIR shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable, as defined in section 15065(a)(3). Where a lead agency is examining a project with an incremental effect that is not "cumulatively considerable," a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.

how this relates to the proposed plan. This THP will not result in permanent canopy loss and the harvesting of trees in and of itself does not cause drought.

The proposed plan includes four different silvicultural prescriptions: Clearcutting, Shelterwood Removal, Selection and Transition. Of these, only the Clearcutting silviculture is designed to remove all of the trees within the harvest area. The other harvest areas will maintain a trees onsite immediately after harvesting and the Clearcut areas must be replanted within 5 years. This short time period over such a small area is unlikely to have any significant effect on the ability for vegetation to intercept fog from the atmosphere.

The remainder of the area outside of the proposed harvest area will remain in a forested condition and will continue to facilitate fog drip. Any decrease in moisture from fog drip would be offset by a very minor positive effect on summer base flows created by a short-term reduction of evapotranspiration (Hicks, Beschta, & Harr, 1991); (Sendek, Rice, & Thomas, 1988). Large trees consume large amounts of water during the summer period. This water is removed from the soil by the tree's roots, transported up the stem to the leaves where it is released to the atmosphere in the process of photosynthesis and transpiration. Research on the effects of logging on streamflows by (Evans & Patric, 1983) (Hess, 1984), (Hicks, Beschta, & Harr, 1991), (Rice, Tilley, & Datzman, 1979), (Rothacher, 1973), (Sendek, Rice, & Thomas, 1988), (Wright, Rice, Sendek, & Thomas, 1990), and (Ziemer, 1981) have shown that in rain-dominated hydrologic environments (including those with fog drip contributing to seasonal precipitation), logging or forest road construction is unlikely to adversely change the flow regime of a stream. Groundwater availability is not expected to decrease. Harvest of trees will reduce transpiration and potentially slightly increase the amount of groundwater available for stream recharge, especially in the critical summer months. See also (Aravena, Suzuki, & Pollastri, 1989), (Morgan & Azvedo, 1974), (Byers, 1953), (Cameron, Murray, Fahey, Jackson, & Et. al., 1997), (Cannon, 1901),
(Cavelier & Goldstein, Mist and fog interception in elfin cloud forests in Colombia and Venezuela, 1989), (Cavelier, Solis, & Jaramillo, Fog interception in montane forest across the central cordillera of Panama, 1996), (Cooper, 1917), (Dawson, 1996), (Del Moral & Muller, 1969), (Eckern, 1964), (Freeman, 1971), (Gardiner, 1977), (Goodman J. , 1982), (Goodman J. , 1985), (Gurnell, 1976), (Harr, 1982), (Harris, 1987), (Hutley, Doley, Yates, & Boonsaner, 1997), (Ice, 1987), (Ingram & Matthews, Fog drip as a source of groundwater recharge in northern Kenya, 1988), (Ingram & Matthews, The importance of fog drip water to vegetation - Point Reyes peninsula, California, 1995), (Jagels, 1991), (Keppler, 2004), (Kummerow, 1962), (Lerner, 1991), (Loewe, 1960), (Marloth, Results of experiments on Table Mountain for ascertaining the amount of moisture deposited from the S. E. clouds, 1903), (Marloth, Results of further experiments for ascertaining the amount of moisture deposited from the S. E. clouds, 1905), (Nagel, Fog precipitation on Table Mountain, 1956), (Nagel, Fog precipitation measurements on Africa's southwest coast., 1962), (Nicholson, 1936), (Oberlander, 1956), (Parsons, 1960), (Rubner, Fog precipitation and its measurement, 1932), (Rubner, Fog precipitation in forests and its measurement. II., 1935), (Schemenauer, 1992), (Simon, 1976), (Twomey, 1957), (Vermeulen, Wyers, Romer FG, & Vanleeuwen, 1997), (Vogelmann, SIccama, Ovitte, & Ovitte, 1968), (Walmsley, Schemenauer, & Bridgman, 1996), (Went, 1955), (Yin & Arp, 1994)

Response #13 (Impacts Downstream Users and Anadromous Salmonids):

While the ability for the THP to negatively impact downstream water supplies was not specified, it could be inferred that these impacts could occur from water drafting to support the logging operations.

The potential for water drafting to negatively impact the environment is well understood and the reason why the Rules contain requirements to quantify the anticipated drafting volumes and examine potential impacts from these operations on biological and non-biological resources.

Water is a common way of minimizing dust on unpaved roads during Timber Operations, however, it is not the only way to prevent the loss of road surface:

> *14 CCR § 923.7(c) During Timber Operations, road running surfaces in the logging area shall be treated as necessary to prevent excessive loss of road surface materials by methods including, but not limited to, rocking, watering, paving, chemically treating, or installing commercial erosion control devices to manufacturer's specifications.*

Several options are available to accomplish this goal, but the RPF has elected to use water only. Water is to be sourced from 5 different sources as specified on page 76 of the plan:

Water Drafting Sites				
WD1	Spring	N/A		
WD2	Spring	N/A		
WD3	Class I; off channel sump	South Fork Gualala		Gualala River
WD4	Class I; off channel sump	North Fork Gualala		Gualala River
WD5	Class I; off channel sump	North Fork Gualala		Gualala River

Additionally, the timing of operations can also be modified to take advantage of times of the year when road surfaces are moist due to precipitation.

For watersheds that have anadromous salmonids (ASP), the information required to be disclosed for water drafting is very specific, unless the plan submitter has had their drafting plan reviewed and approved by CDFW as part of a "1600 agreement":

> *923.7(l) In watersheds with listed anadromous salmonids, water drafting for Timber Operations shall:*
>
> *(1) Comply with Fish and Game Code Section 1600, et seq. Timber Operations conducted under a Fish and Game Code Section 1600 Master Agreement for Timber Operations that includes water drafting may provide proof of such coverage for compliance with 14 CCR § 923.7(l).*

A plan with an approved “1600 Agreement” is deemed to be in compliance with the water drafting regulations for watersheds with Anadromous Salmonids (ASP). The ASP Rules are designed to avoid impacts to salmonids that would result in Take of the species.

This plan was submitted proposing re use of existing water drafting sites and includes a new 1600 notification for the proposed operations. This notice is found on pages 76-80. Once approved by CDFW, this permit shall be active for operations under the plan.

These measures, when combined with the standard rules for the protection of watercourses and watersheds with Anadromous Salmonids are designed to avoid take of the species. Furthermore, the drafting restrictions, along with the requirements to maintain minimum flows, will ensure that adequate water is available for downstream users, specifically including the town of Gualala. Finally, it is important to note that water drafting is contingent on their being sufficient water at the drafting site to support operations without violating the restriction of the Plan, the Rules and the conditions of the CDFW permit. If minimum conditions for drafting do not exist, no drafting can occur.

CAL FIRE has determined that the plan adequately evaluates the proposed water drafting operations and that, as proposed, they avoid take of listed species, ensure adequate downstream flows and avoid significant adverse impacts to watershed resources.

CAL FIRE believes that the plan as proposed, including limitations on the use of drafting based upon stream conditions at the time of operations, is sufficient to avoid take of listed species and protect downstream users of water.

Response #14: (Reduction in Biomass Linked to Decline in Flow)

As described in Response #10 above, without knowing any of the specifics related to the modeling of standing volume within the watershed, there is no way to validate the results that show declining biomass. The observed declines in streamflow match the statewide reduction in precipitation rates for the last several years. It is inappropriate, however, to conclude that two metrics trending in the same direction prove direct causality. In many forested landscapes, increased harvesting of vegetation leads to short term increases in flows, not decreases. Again, it is difficult to provide additional comment on this concern without speculating.

Response #15 (Plan does not Address Wild and Scenic Rivers Act):

The THP is not required to comply with the Wild and Scenic Rivers Act because the designated section of this river starts at the confluence of the North and South Forks of the Gualala and runs to the Pacific Ocean.

Response #16 (Unconscious Bias):

CAL FIRE understands the concern expressed by the comment writer but notes that the assumption that CAL FIRE would automatically side with a plan submitter on any issue raises

concerns that the comment writer may also have an unconscious bias. In reality, the professional foresters at CAL FIRE serve the people of California no matter their position. A CAL FIRE forester has regular contact with people possessing a wide range of beliefs related to timber harvesting. What appears to be at the heart of the concern is that of trust in a public servants ability to maintain objectivity and for the public to know decisions were made fairly.

Public trust is considered an essential, but elusive, element in public service. Government agencies and their personnel are entrusted to carry out specific duties, so that other members of society don't need to do it themselves. When conducted properly and in good faith, all members of society can be assured that common goals and ideals are being preserved to the benefit of all.

But trust can be an elusive thing. Fragile. Hard to earn and quick to lose. Once lost, it can take a long time to rebuild, if ever.

Disagreement and mistrust do not have to be synonymous. When interested parties feel as if important information is being hidden or withheld, mistrust grows.

It is tempting for the public servant to be angered by the suggestion, whether covert or overt, that they are untrustworthy. That there is some malicious motive or agenda that government officials are serving contrary to the benefit to the public. This is understandable, as many life experiences testify to the misdeeds of humanity, especially when power is involved. Individuals in power are tempted, and often succumb to the pressure to use their authority to achieve their own ends, or the ends that they prefer.

The issue of trust is important to this response. The information relied upon by CAL FIRE, and the thinking behind the decision-making process, should be available to anyone who wishes to see it. The ultimate hope is that, even if people disagree with the conclusions or results of the review, it can be acknowledged that the process was conducted fairly.

Trustless Decision-making

The process by which decisions are made should be as transparent as possible. In a perfect system, all information could be reviewed and audited by any interested party to ensure that proper consideration was provided by the plan submitter. By law, certain elements are confidential and must be restricted from public view (e.g. archaeological resources). Agencies should strive to be as open as possible about the process to build or maintain public confidence in the system.

That being said, there have been improvements in the transparency of the review process. CalTrees[14], for example, has been a significant improvement allowing the public to track every step of the review process, and have quick access to the information used as part of the decision-making process.

The process used to review and evaluate proposed projects is complex, but explainable. We don't just "trust the experts" when they provide input to the process. We require additional proof to back up their opinion. One place this is embodied in CEQA is in the definition of Substantial

[14] https://www.fire.ca.gov/programs/resource-management/forest-practice/caltrees/

Evidence[15] in the CEQA Guidelines. This term is a cornerstone element of CEQA and exists at the center of every defensible agency determination. When conducted correctly, the outside observer should be able to follow the trail of logic that the Lead Agency used to make their decision.

This does not mean that an independent reviewer will reach the same conclusion as the Lead Agency, but an objective assessment would admit that the conclusion reached had "Substantial Evidence" to support it. See also the discussion of "CEQA Analysis" above for a discussion on how experts can disagree on conclusions.

A Post-Trust World

Ideally, the public would not have to trust that public servants are upholding their responsibilities. Below are some ways that future decision making can be improved to enhance public confidence:

- **Enhance transparent review:**
  CalTrees is an improvement in the review process, but perhaps there are more effective systems. Emerging technologies using distributed ledgers, cryptography and smart contracts could be utilized to provide independent and immutable proof that the process was followed.

- **Replace mistrust with skepticism:**
  Mistrust is counterproductive to effective management and decision making. It is based upon the assumption that one party is acting in bad faith. Skepticism, on the other hand, is suspending judgement on the merits until it is demonstrated to be either worthy or unworthy. A skeptic should be able to examine the record of a decision before making a conclusion about whether or not the process is valid. Skeptics are important to a process; being open to many different conclusions based upon the evidence.

- **Create independent oversight channels:**
  Developing an independent body that has oversight and some form of corrective power could be used to ensure that Agency personnel are fulfilling their obligations under the law. It is unclear if such a body would be able to effect positive change or would become another barrier to good governance. Such decisions are beyond the scope of this discussion.

Response #17 (Impacts to Water Quality from Increased Sediment):

The potential for timber operations to generate sediment that could move offsite into watercourses is well understood. Many of the Forest Practice Rules are intended to minimize the potential for sediment to leave the logging area in amounts deleterious to the beneficial

[15] 15384. SUBSTANTIAL EVIDENCE
(a) "Substantial evidence" as used in these guidelines means enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached. Whether a fair argument can be made that the project may have a significant effect on the environment is to be determined by examining the whole record before the lead agency. Argument, speculation, unsubstantiated opinion or narrative, evidence which is clearly erroneous or inaccurate, or evidence of social or economic impacts which do not contribute to or are not caused by physical impacts on the environment does not constitute substantial evidence. (b) Substantial evidence shall include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts.

uses of water. In addition, site specific modifications to these measures can be prescribed by either the RPF or required by the Interagency Review Team in order to reduce sediment production to below the level of significance. See also Response #3.

As it relates to the verbiage in the CGS report, this is common language used by CGS to substantiate the need to attend the PHI and is not indicative of a specifically identified impact.

The declarations were reviewed but they were specific to another plan that is not involved in this review. Responses for this OR were limited to concerns enumerated for this plan.

Response #18 (Impacts to Chinook and Steelhead from Increased Stream Temperature):

While the James 2003 study was referenced, it was not the only work cited. What the James studies examined was the impacts of different streamside buffers on instream temperatures. Varying WLPZ buffers were measures until the entire buffer was removed. While this experiment has value for understanding the relationship between canopy and stream temperatures, the Judd Creek watershed is very different from the Doty Creek Watershed. Most importantly, is that the Judd Creek watershed is fed primarily by deep seated springs that provide cool water to the watercourse along portions of its length. This is more common of streams in the interior than those found on the coast. A recent study on this topic (Wissler, Segura, & Bladon, 2022) noted distinct differences in temperature regimes between the Coast Range and the Cascade Range:

> Thermal regimes in headwater streams are critical for freshwater ecological condition and habitat resilience to disturbance, and to inform sustainable forest management. However, stream temperatures vary depending on characteristics of the stream, catchment, or region. To improve our knowledge of stream thermal regimes, we collected stream and air temperature data along eight headwater streams in two regions in Northern California. Five streams were in the Coast Range, which is characterized by permeable sandstone lithology, rain dominated precipitation regime, and dense coast redwood forests. Three streams were in the Cascade Range, which is characterized by fractured and resistant basalt lithology, snow dominated precipitation, and low to moderate density pine forests. We instrumented each stream with 12 stream temperature and four air temperature sensors during summer 2018. We compared stream thermal regimes and thermal sensitivity—slope of the linear regression between daily stream and air temperature—within and between study regions. Mean daily stream temperatures were ~4.7°C warmer in the Coast Range but were less variable (SD = 0.7°C) compared to the Cascade Range (SD = 2.3°C). Median thermal sensitivity was $0.33°C°C^{-1}$ in the Coast Range and $0.23°C°C^{-1}$ in the Cascade Range. We posit that the volcanic lithology underlying the Cascade streams likely supported discrete groundwater discharge locations of cold snowmelt water, which dampened thermal sensitivity. At locations of apparent groundwater discharge in

> these streams, median stream temperatures rapidly decreased by 2.0–7.0°C relative to locations 70–90 m upstream. In contrast, thin friable soils in the Coast Range likely contributed warmer, rain dominated baseflow from shallow subsurface sources, which strongly co-varied with air temperature and generally warmed downstream (up to 2.1°C km^{-1}). Our study revealed distinct longitudinal thermal regimes in streams with contrasting lithology, precipitation regimes, and stand densities suggesting that streams in these different regions may respond differentially to forest disturbances or climate change.

Closer to the conditions found within the region where the THP is located would be (Ridgeway & Surfleet, 2021):

> Forest harvesting has been shown to effect water quantity and water quality parameters, highlighting the need for comprehensive forest practice rules. Being able to understand and predict these impacts on stream temperature is especially critical where federally threatened or endangered fish species are located. The goal of this research was to predict responses in stream temperature to potential riparian and forest harvest treatments in a maritime, mountainous environment. The Distributed Hydrology Soil Vegetation Model (DHSVM) and River Basin Model (RBM) were calibrated to measured streamflow and stream temperatures in the South Fork of the Caspar Creek Experimental Watersheds during critical summer periods when temperatures are highest and flows are low for hydrologic years 2010–2016. The modeling scenarios evaluated were (1) varying percentages of stream buffer canopy cover, (2) a harvest plan involving incrementally reduced stand densities in gauged sub-watersheds, and (3) an experimental design converting dominant riparian vegetation along set reaches. The model predicted a noticeable rise in stream temperatures beginning when stream buffer canopy cover was reduced to 25 and 0% retention levels. Larger increases in Maximum Weekly Maximum Temperatures (MWMT), compared to Maximum Weekly Average Temperatures (MWAT),occurred across all scenarios. There was essentially no difference in MWAT or MWMT between altering buffers along only fish bearing (Class I) watercourses and altering buffers along all watercourses. For the scenario with stream buffers at 0% retention, MWMTs consistently rose above recommended thermal limits for coho salmon (Oncorhynchus kisutch). Predictions when clearcutting the entire watershed showed less of an effect than simulations with 0% buffer retention, suggesting groundwater inflows mitigate stream temperature rises in the South Fork. The harvest simulation showed a small but consistent increase in MWATs (avg. 0.11◦C), and more varied increases in MWMTs (avg. 0.32◦C). Sensitivity analyses suggest potentially unrealistic tracking of downstream temperatures, making the vegetation conversion simulations inconclusive. Additional sensitivity

> analyses suggest tree height and monthly extinction coefficient (a function of leaf area index) were most influential on temperatures in the South Fork, which was consistent with other modeling studies suggesting management focus on tall, dense buffers compared to wider buffer widths.

It is worth noting that the 50% canopy retention standards precede any of the more recent studied, including those by James.

Another paper on this topic (Moore, 2005) provides additional background for consideration:

> ABSTRACT: Forest harvesting can increase solar radiation in the riparian zone as well as wind speed and exposure to air advected from clearings, typically causing increases in summertime air, soil, and stream temperatures and decreases in relative humidity. Stream temperature increases following forest harvesting are primarily controlled by changes in insolation but also depend on stream hydrology and channel morphology. Stream temperatures recovered to pre-harvest levels within 10 years in many studies but took longer in others. Leaving riparian buffers can decrease the magnitude of stream temperature increases and changes to riparian microclimate, but substantial warming has been observed for streams within both unthinned and partial retention buffers. A range of studies has demonstrated that streams may or may not cool after flowing from clearings into shaded environments, and further research is required in relation to the factors controlling downstream cooling. Further research is also required on riparian microclimate and its responses to harvesting, the influences of surface/subsurface water exchange on stream and bed temperature regimes, biological implications of temperature changes in headwater streams (both on site and downstream), and methods for quantifying shade and its influence on radiation inputs to streams and riparian zones.
>
> Despite decades of research on stream temperature response to forest harvesting, there are still vigorous debates in the Pacific Northwest about the thermal impacts of forestry and how to manage them (e.g., Larson and Larson, 1996; Beschta, 1997; Ice et al., 2004; Johnson, 2004). The conventional approach to minimizing the effects of forest harvesting on streams and their riparian zones is to retain a forested buffer strip along the stream. Most jurisdictions in the Pacific Northwest require buffer strips to be left along larger (usually fish bearing) streams (Young, 2000). However, less protection is afforded to smaller, non- fishbearing streams.

The Moore paper evaluates the differing views on the results of management on stream temperature; and the different considerations taken in the prediction of results from differing management. Obviously, local factors have a great deal of influence over the results that one

could expect from harvesting. Not only can the physical characteristics influence potential outcomes (e.g. Climate, topography, elevation, soils etc.) but the political constraints also undoubtedly have an effect (i.e. local forest practice laws and regulations). These differences cannot be ignored.

Not surprisingly, clearcut harvesting adjacent to stream zones with no buffer did show an increase in temperature, although not in every situation. Also, the dominant source of streamflow also appears to have a great deal of impact on results. As discussed above, Coast Range streams tend to receive more baseflow from rain resulting in higher temperatures than those found in the Cascade Range.

The breakdown of study results in Table 1 of the study provides a wide range of results for the studies examined, and it is worth noting that none of the study areas are in California so the impacts of the Forest Practice Rules cannot be seen in relation to the other works. It must also be considered that half of the studies used no buffers at all and that the allowable harvesting size for the study areas are significantly larger than what is allowed in California:

- British Columbia: 111 acres until 1989 when it was reduced to 70 acres. (B.C. Ministry of Forests, Mines and Lands, 2010)
- Oregon: 120 acres (Oregon Forest Resources Institute, 2018)
- Washington: 240 acres (Washington Administrative Code Title 222 Chapter 30 Section 025)
- California: 20 acres for tractor yarding & 30 acres for cable with allowances for oversized units (14 CCR913.1(a)(2))

CAL FIRE does not agree with the comment writer that the THP failed to evaluate potential changes to stream temperatures as a result of the proposed harvest. There was no evidence provided to dispute the plan in its conclusions that the measures applied to the plan area, including those increased retention standards found in the ASP Rules, would result in a significant increase in stream temperature. Pages 132.1 through 132.3 contain an evaluation of the plans potential to impact stream temperatures and CAL FIRE has found this discussion to be adequate to address the issue.

Response #19 (Herbicide Application):

The plan discloses the speculative but likely need for herbicides to be applied as part of the project. As a result, a cumulative impacts discussion on herbicide use and potential impacts is required.

Some specifics related to worker safety, concentrations of applied materials etc. fall outside of the jurisdiction of CAL FIRE and are not necessary to include in a THP. Below is a summary of the Herbicide references in the plan:

- Pages 13-14 disclose the potential for herbicide use.
- Page 62, under Item #30a notes that any trees treated with herbicide in the Hazard Reduction Zone shall not be left standing.
- Page 71 specifies herbicide application restrictions in the vicinity of California Red Legged Frog habitat.
- Pages 123-131 contain the cumulative effects analysis of potential herbicide use.

Response #20 (Increased Fire Hazard from THP):

CAL FIRE understands the concern that timber operations could ignite a fire, and that the presence of high hazard ratings and low water availability could cause fires that are difficult to control. Most of the concerns related to this are addressed in the section titled “Fire Hazard Risk and Assessment” above. As described above, hardwood trees treated with herbicide in the Hazard Reduction Zone shall not be left standing.

As described previously, the Rules are designed to reduce the potential for fires to occur, and the myriad planning documents, including the Mendocino Unit Fire Plan, are designed to reduce fire starts and promptly respond to and extinguish any fires that occur.

Response #21 (THP Failed to Assess Impacts of Harvesting on Carbon Sequestration)

CAL FIRE simply does not agree with the concern. The discussion above titled “Greenhouse Gas Sequestration” goes into substantial detail on how the plans potential impact on Greenhouse gass was analyzed.

Although not clear, the concern could be that the plan does not maximize the carbon sequestration potential of the lands under the plan. If so, it should be noted that maximizing carbon sequestration is not the preeminent consideration for management of these timberlands and the landowner is not required to choose the management style that would maximize sequestration.

Response #22 (THP Failed to Assess Impacts of Harvesting on Specific Plant and Animal Species)

As with other concerns, the comment writer states that the THP did not assess or consider impacts to specific plant and animal species. Again, CAL FIRE must disagree and will point to where these are addressed in the plan, or if such consideration was not warranted:

- Franklin’s bumblebee: The THP is far outside of the known range for this species and analysis was not warranted.
- Grand fir Alliance: This species association has no special status and does not require consideration in the THP.
- Sonoma Tree Vole: This species, also known as the Red Tree Vole is not a listed species but is a CDFW Species of Special Concern. This designation does not have the force of law that a fully listed species pursuant to CESA or ESA would have. Nevertheless, the THP provides protection measures on page 68 and assessments on pages 133.1 and 153.
- California Red Legged Frog: This species has protection measures on pages 70-71 and an assessment on pages 146-147. The concerns over the adequacy of the protection measures in the plan are noted but these measures are consistent with those provided by the US Fish and Wildlife Service to avoid Take.

SUMMARY AND CONCLUSIONS

The Department recognizes its responsibility under the Forest Practice Act (FPA) and CEQA to determine whether environmental impacts will be significant and adverse. In the case of the management regime which is part of the THP, significant adverse impacts associated with the proposed application are not anticipated.

CAL FIRE has reviewed the potential impacts from the harvest and reviewed concerns from the public and finds that there will be no expected significant adverse environmental impacts from timber harvesting as described in the Official Response above. Mitigation measures contained in the plan and in the Forest Practice Rules adequately address potential significant adverse environmental effects.

CAL FIRE has considered all pertinent evidence and has determined that no significant adverse cumulative impacts are likely to result from implementing this THP. Pertinent evidence includes, but is not limited to the assessment done by the plan submitter in the watershed and biological assessment area and the knowledge that CAL FIRE has regarding activities that have occurred in the assessment area and surrounding areas where activities could potentially combine to create a significant cumulative impact. This determination is based on the framework provided by the FPA, CCR's, and additional mitigation measures specific to this THP.

CAL FIRE has supplemented the information contained in this THP in conformance with Title 14 CCR § 898, by considering and making known the data and reports which have been submitted from other agencies that reviewed the plan; by considering pertinent information from other timber harvesting documents including THP's, emergency notices, exemption notices, management plans, etc. and including project review documents from other non-CAL FIRE state, local and federal agencies where appropriate; by considering information from aerial photos and GIS databases and by considering information from the CAL FIRE maintained timber harvesting database; by technical knowledge of unit foresters who have reviewed numerous other timber harvesting operations; by reviewing technical publications and participating in research gathering efforts, and participating in training related to the effects of timber harvesting on forest values; by considering and making available to the RPF who prepares THP's, information submitted by the public.

CAL FIRE further finds that all pertinent issues and substantial questions raised by the public and submitted in writing are addressed in this Official Response. Copies of this response are mailed to those who submitted comments in writing with a return address.

ALL CONCERNS RAISED WERE REVIEWED AND ADDRESSED. ALONG WITH THE FRAMEWORK PROVIDED BY THE FOREST PRACTICE ACT AND THE RULES OF THE BOARD OF FORESTRY, AND THE ADDITION OF THE MITIGATION MEASURES SPECIFIC TO THIS THP, THE DEPARTMENT HAS DETERMINED THAT THERE WILL BE NO SIGNIFICANT ADVERSE IMPACTS RESULTING FROM THE IMPLEMENTATION OF THIS THP.

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APPENDIX A

UNIT, ER, RPF, CalT 1-22-00029-MEN 22PC-000000060

PC3

From: Jeanne Jackson <jackson2@mcn.org>
Sent: Thursday, May 12, 2022 12:31 PM
To: Santa Rosa Public Comment@CALFIRE
Subject: 1-22-00029-MEN "Doty"

Dear Cal Fire,

I am writing to urge you to deny the timber harvest plan 1-22-00029-MEN "Doty." This THP is on the Little North Fork and Doty Creek, where steelhead and Coho salmon go to spawn. I am very concerned that the Department of Fish and Wildlife does not appear to have taken part in the preharvest inspection and has made no recommendations. Who is looking out for endangered species known to inhabit this area? When our public agencies don't take part in the process, something is wrong. #1

I am also against the clearcutting planned in this THP. A forty-one-acre clearcut in this sensitive area is anathema. When is this assault on the impaired Gualala River going to stop? From increased fire danger due to logging, to more sediment allowed to further impair the river, to water drafting in the river when the town of Gualala is on a water moratorium, to the taking of redwood trees in a time of climate crisis, to the lack of cumulative impacts, to harm done to endangered species, this THP has them all. #2

Do the right thing here and deny this terrible THP.

Jeanne Jackson
Anchor Bay

To: Cal Fire THP Review Team
Submitted via emal to: SantaRosaPublicComment@fire.ca.gov
Attn: Dominik Schwab

From: Friends of Gualala River
Lynn Walton
P.O. Box 1543
Gualala, CA. 95445
info@gualalariver.org

May 12, 2022

Re: Public comment letter and Kamman Report for THP 1-22-00029-MEN (Doty)

This comment letter and attachment (Kamman report) is submitted for the public record on behalf of Friends of Gualala River (FoGR) and raises significant environmental concerns regarding the discharge of excessive sediment into the already impaired Gualala River which is listed under the EPA's Clean Water Act 303(d) due to sediment and high temperature. These comments and attached report indicate why the Doty THP should not be approved.

#3 The Gualala River Watershed is home to endangered CCC Coho and threatened NC steelhead and California red-legged frogs whose habitat will be further degraded, thereby harming and/or killing these species, by the sediment discharge that will occur if the Doty THP is approved.

To demonstrate this position, FoGR retained the services of Greg Kamman, PG, CHG, a principal hydrologist with Cbec Eco Engineering. Mr. Kamman analyzed the Doty THP and estimated the sediment yield from surface erosion of roadways and skid trains within and appurtenant to the Doty THP that drain to the Little North Fork Gualala River and its tributaries Doty and Log Cabin Creeks. The attached report from Mr. Kamman presents the approach, methods and results of the road and skid trail surface erosion analysis.

Mr. Kamman's report presents calculations of total sediment yield for hydrologically disconnected roads and skid trails with the Doty THP boundary at five distinct delivery rates (100, 50, 20, 5 and 1%). These rates, even at 1%, would exceed the established TMDL for the Gualala River and water quality standards.

Furthermore, the Doty THP erosion control plan is inadequate and fails to demonstrate how it will effectively prevent excessive sediment from being discharged into watercourses.

Attachments: Estimated Roadway and Skid Trail Sediment Yields, Doty THP (Kamman Report – 8 pages)

cbec eco engineering

Hydrology | Hydraulics | Geomorphology | Design | Field Services

March 31, 2022

Ms. Lynn Walton
Friends of Gualala River
PO Box 1543
Gualala, CA 95445

Subject:Estimated Roadway and Skid Trail Sediment Yields,
Doty THP: 1-22-00029-MEN, Mendocino County, California

Dear Ms. Walton:

I have been retained by Friends of the Gualala River to estimate the sediment yield from surface erosion of roadways and skid trails within and appurtenant to the Doty THP and lying within the Little North Fork Gualala River watershed. This letter presents the approach, methods and results of the road and skid trail surface erosion analysis.

#3 It is important to note that other sources of erosion and sediment yield from road related gullying, road related landslides and road-stream crossing failures were not estimated in this analysis due to the lack of available information. Including these processes and sediment yields could significantly increase the sediment yield values presented herein.

1.0 Approach and Methods

Estimating road surface erosion volumes followed the "Measuring and Estimating Future Erosion Volumes" (page X-34) approach and methods presented in Part X (Upslope Erosion Inventory and Sediment Control Guidance) of the California Salmonid Stream Habitat Restoration Manual (March 2006)[1]. Specific variables and assumptions used in this analysis include the following.

- Road and skid trail types and lengths were determined and measured from the Doty THP Yarding Methods and Appurtenant Road Maps (see Figures 1 through 3)[2].

[1] Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B., 2006, California Salmonid Stream Habitat Restoration Manual, Fourth Edition. California Department of Fish and Game, Wildlife and Fisheries Division.
[2] The scales on THP maps represented here in Figures 2 and 3 were incorrect and required adjustment to complete accurate distance and area measurements as part of this analysis. Note that THP maps represented in Figures 1-3 were reduced in size for presentation purposes and scales indicated only apply to original maps in the THP.

2544 Industrial Blvd., West Sacramento, CA 95691 USA
T 916.231.6052 F 916.669.8886 info@cbecoeng.com
www.cbecoeng.com

- This analysis included only roads draining to the Little North Fork Gualala River and its tributaries Doty and Log Cabin Creeks. The cumulative THP area (i.e., cumulative area within the Unit 1 through Unit 5 THP boundaries) is 150 acres (0.23 square miles) as measured from Figure 1.

- The road and cut bank width are assumed to be 25 feet, a common assumption presented in California North Coast THP Erosion Control Plans such as the Elk THP (1-19-098-MEN) and Little THP (1-18-095-MEN). The width of the skid trails is assumed to be 12-feet.

- Road surface lowering (erosion rates in feet/year[ft/yr]) from the Habitat Restoration Manual were applied as follows:
  - native surfaced (unimproved, dirt) roads and adjacent cutbanks and continually bare soil areas - 0.03 ft/yr; and
  - rock surfaced roads and adjacent cutbanks and continually bare soil areas - 0.02 ft/yr.

- Skid trails were treated as unimproved, dirt roads.

#3

- To convert sediment volume to weight, a bulk density of 1.40 grams per cubic centimeter (g/cc) (87.40 pounds per cubic foot [lbs/ft^3]) was applied. This composite bulk density is representative of the range of bulk densities (1.35 – 1.45 g/cc) for the Dehaven-Hotel complex, Irmulco-Tramway complex, and Ornbaun-Zeni complex soil, which underlie the majority of the THP and appurtenant roadways. The site soil map and bulk density value was obtained from the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Web Soil Survey site[3].

2.0 Results

Table 1 presents the total length, area, and eroded sediment yield of THP roads and skid trails within the THP. A road surface erosion rate of 0.02 ft/yr was applied to permanent road types, while an erosion rate of 0.03 ft/yr was applied to all other road types (seasonal) and skid trails. The total sediment yield to Little North Fork River and tributaries from THP road and skid trail surface erosion is 499.9 cubic yards per year (yd^3/yr).

Table 2 presents the conversion of sediment yield from yd^3/yr (Row 1) to tons/yr (Row 5). Dividing the sediment yield of 589.9 tons/yr by the THP drainage area to the Little North Fork Gualala River (0.23 square miles) yields a maximum annual sediment yield of 2,516 tons/mi^2/yr. This value assumes 100% of road surface erosion is delivered to the receiving waterways.

In addition to roads within the THP boundary, the appurtenant haul routes experience surface erosion that yields sediment to the river. Table 3 presents the total length, area, and sediment yield from the appurtenant roadways. These appurtenant roads would contribute an additional 811.1 yd^3/yr (975tons/yr) of sediment to the river assuming 100% of appurtenant roadway erosion is delivered to the river (see Tables 3 and 4).

[3] https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

3.0 Discussion of Results

Because the Doty THP is proposed on private lands and roads, I was not able to conduct a site inspection of the THP area to estimate the degree to which roads and skid trails are or would be hydrologically connected or disconnected from receiving waters. It is unrealistic to assume 100% of roads and skid trails will be hydrologically connected to the river and creeks. There are some THPs that present estimates where "typically 50 percent" of roads had been hydrologically disconnected (e.g., THP No. 1-19-00098 MEN [Elk], sec. 5, p. 261 and THP No. 1-18-095 MEN [Little], sec. 5, p. 100.2 & 240).

Assuming that 50% of the roads and skid trails within the THP boundary are hydrologically disconnected from the creek results in 1,258 tons/mi^2/yr of road and skid trail sediment (Table 2) delivery to the Little North Fork Gualala River. Tables 2 also presents annual sediment delivery rates for roads and skid trails that are 20%, 5% and 1% hydrologically connected to the river as examples where a greater percentage of roads and skid trails are hydrologically disconnected from the river. In addition to the THP road and skid trail sediment sources, contributions from THP appurtenant roads outside the THP boundaries further contribute sediment to the river to varying degrees depending on the percentage of hydrologic connection or these roads (see Table 4). #3

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Gregory R. Kamman

Gregory Kamman, PG, CHG
Principal Hydrologist

TABLE 1: Lengths, surface areas, and sediment yield estimates for roads and skid trails within Doty THP

	Doty THP Road Types			
	Permanent	Seasonal	Skid Trail	
total road lengths (ft)	1,989	15,071	3,335	
road width (ft)	25	25	12	
road area (ft^2)	49,725	376,775	40,020	
erosion rate (ft/yr)[1]	0.02	0.03	0.03	
sediment yield (ft^3/yr)	995	11,303	1,201	
sediment yield (yd^3/yr)	36.8	418.6	44.5	**499.9** yd^3/yr

#3

Notes

1) Erosion rates: a) native surface (unimproved, dirt) roads = 0.03 ft/yr; rock surfaced roads=0.02 ft/yr) (Source: Upslope Erosion Inventory and Sediment Control Guidance, Part X, California Salmonid Stream Habitat

TABLE 2: Calculation of total sediment yield for disconnected roads and skid trails within the Doty THP boundary

Row	Calculations	Notes
1	499.94 yd^3/yr	sed yield: assumes 100% delivery
2	87.40 lbs/ft^3	density from NRCS soil survey
3	2359.78 lbs/yd^3	
4	1.18 tons/yd^3	
5	589.87 tons/yr	sed yield: assumes 100% of erosion delivered to creek
6	0.23 mi^2	total drainage area
7	**2,516 tons/mi^2/yr**	**sed yield: assumes 100% delivery**
8	**1,258 tons/mi^2/yr**	**sed yield: assumes 50% delivery**
9	**503 tons/mi^2/yr**	**sed yield: assumes 20% delivery**
10	**126 tons/mi^2/yr**	**sed yield: assumes 5% delivery**
11	**25 tons/mi^2/yr**	**sed yield: assumes 1% delivery**

TABLE 3: Lengths, surface areas, and sediment yield estimates for appurtenant roads outside the Doty THP boundary

	Doty THP Appurtenant Roads and Skid Trails		
	Permanent	Seasonal	
total road lengths (ft)	37,647	8,545	
road width (ft)	25	12	
road area (ft^2)	941,175	102,540	
erosion rate (ft/yr)[1]	0.02	0.03	
sediment yield (ft^3/yr)	18,824	3,076	
sediment yield (yd^3/yr)	697	114	**811.1** yd^3/yr

#3

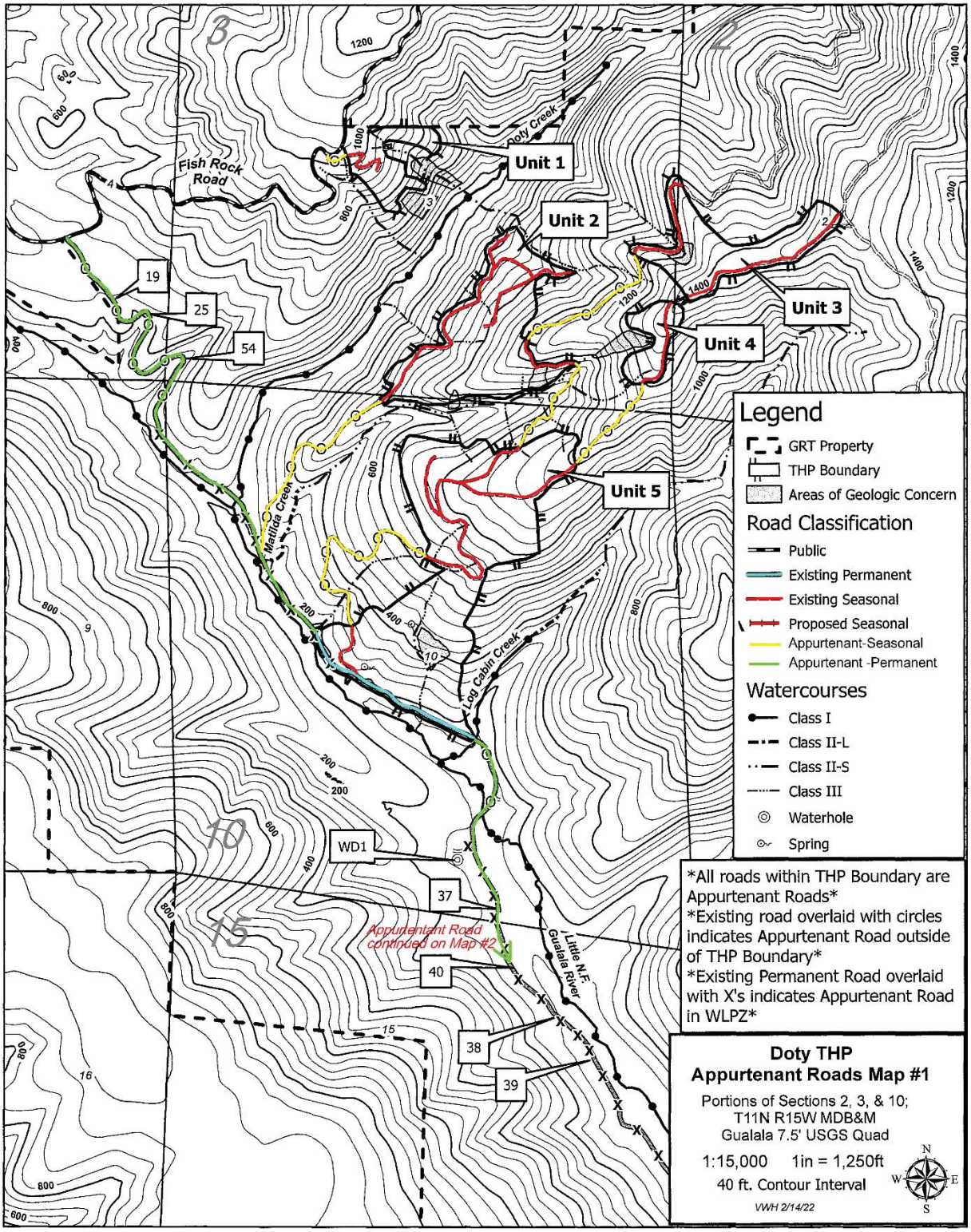
Notes

1) Erosion rates: a) native surface (unimproved, dirt) roads = 0.03 ft/yr; rock surfaced roads=0.02 ft/yr) (Source: Upslope Erosion Inventory and Sediment Control Guidance, Part X, California Salmonid Stream Habitat Restoration Manual, 2006)

TABLE 4: Calculation of total sediment yield from appurtenant roads outside the Doty THP boundary

Calculations	Notes
811.1 yd^3/yr	sed yield: assumes 100% delivery
87.40 lbs/ft^3	density from NRCS soil survey
2,359.78 lbs/yd^3	
1.18 tons/yd^3	
957 tons/yr	**sed yield: assumes 100% delivery**
479 tons/yr	**sed yield: assumes 50% delivery**
191 tons/yr	**sed yield: assumes 20% delivery**
47.9 tons/yr	**sed yield: assumes 5% delivery**
9.6 tons/yr	**sed yield: assumes 1% delivery**

#3



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Notes: Modified from Doty THP. For presentation purposes only – figure not to scale.	cbec eco engineering	*Estimated Roadway and Skid Trial Sediment Yield, Doty THP (#1-22-00029-Men)* **Appurtenant Roads Map #1**		
		Project No. 22-1012	Created By: GK	**Figure 1**

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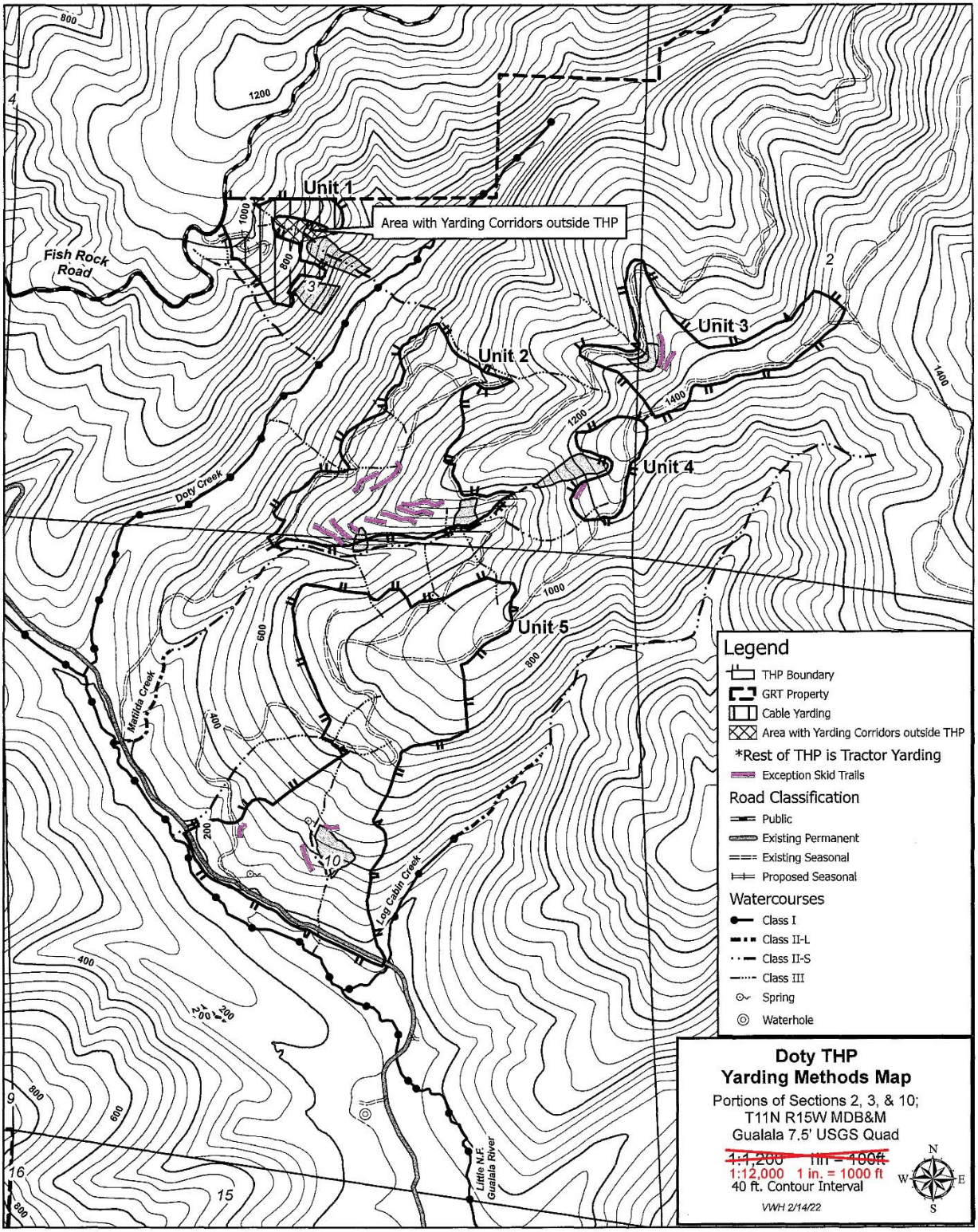
3/31/2022

APPENDIX A

#3



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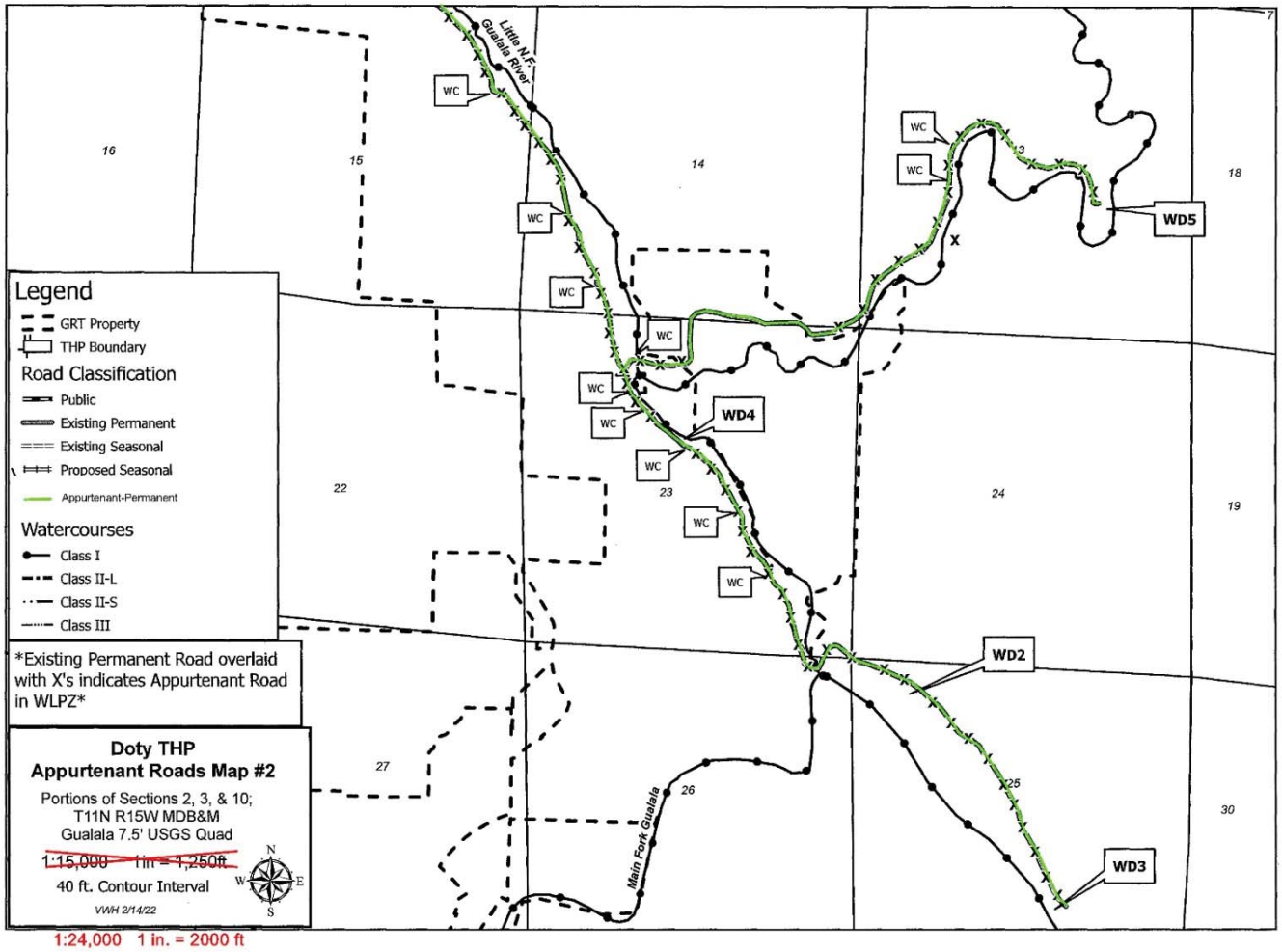
Notes: Modified from Doty THP. For presentation purposes only – figure not to scale.	cbec eco engineering	*Estimated Roadway and Skid Trial Sediment Yield, Doty THP (#1-22-00029-Men)* **Location of Skid Trails**		
		Project No. 22-1012	Created By: GK	**Figure 2**

E:\000 cbec\cbec-Projects\22-1012_Doty-THP\Reporting\Graphics\Figure 2.docx
3/31/2022



Notes: Modified from Doty THP. For presentation purposes only – figure not to scale.	cbec eco engineering	*Estimated Roadway and Skid Trial Sediment Yield, Doty THP (#1-22-00029-Men)* **Appurtenant Roads Map #2**	
		Project No. 22-1012	Created By: GK	**Figure 3**

E:\000 cbec\cbec-Projects\22-1012_Doty-THP\Reporting\Graphics\Figure-3.docx
3/31/2022

APPENDIX A

PC1

Public Comment ID: 22PC-000000054
Comment Received Date: 5/12/2022
Comment for Plan Number: 1-22-00029-MEN
County: Mendocino
Closest City: Point Arena
Email to Notify for Official Response: llynnwalton@gmail.com

Comment:
Letter from Friends of Gualala River and 8 page sediment analysis report from G. Kamman submitted as attachments.

Submitted through CalTREES 05/12/2022

RECEIVED

MAY 12 2022

COAST AREA OFFICE
RESOURCE MANAGEMENT

To: Cal Fire THP Review Team
Submitted via emal to: SantaRosaPublicComment@fire.ca.gov
Attn: Dominik Schwab

From: Friends of Gualala River
Lynn Walton
P.O. Box 1543
Gualala, CA. 95445
info@gualalariver.org

Submitted through CalTREES 05/12/2022

May 12, 2022

Re: Public comment letter and Kamman Report for THP 1-22-00029-MEN (Doty)

This comment letter and attachment (Kamman report) is submitted for the public record on behalf of Friends of Gualala River (FoGR) and raises significant environmental concerns regarding the discharge of excessive sediment into the already impaired Gualala River which is listed under the EPA's Clean Water Act 303(d) due to sediment and high temperature. These comments and attached report indicate why the Doty THP should not be approved.

The Gualala River Watershed is home to endangered CCC Coho and threatened NC steelhead and California red-legged frogs whose habitat will be further degraded, thereby harming and/or killing these species, by the sediment discharge that will occur if the Doty THP is approved.

To demonstrate this position, FoGR retained the services of Greg Kamman, PG, CHG, a principal hydrologist with Cbec Eco Engineering. Mr. Kamman analyzed the Doty THP and estimated the sediment yield from surface erosion of roadways and skid trains within and appurtenant to the Doty THP that drain to the Little North Fork Gualala River and its tributaries Doty and Log Cabin Creeks. The attached report from Mr. Kamman presents the approach, methods and results of the road and skid trail surface erosion analysis.

Mr. Kamman's report presents calculations of total sediment yield for hydrologically disconnected roads and skid trails with the Doty THP boundary at five distinct delivery rates (100, 50, 20, 5 and 1%). These rates, even at 1%, would exceed the established TMDL for the Gualala River and water quality standards.

Furthermore, the Doty THP erosion control plan is inadequate and fails to demonstrate how it will effectively prevent excessive sediment from being discharged into watercourses.

Attachments: Estimated Roadway and Skid Trail Sediment Yields, Doty THP (Kamman Report – 8 pages)

APPENDIX A

UNIT, ER, RPF, CalT 1-22-00029-MEN 22PC-000000061

PC4

From: Friends of the South Fork Gualala <info@fosfg.org>
Sent: Friday, May 13, 2022 11:49 AM
To: Santa Rosa Public Comment@CALFIRE
Cc: Ethan Arutunian
Subject: public comment 1-22-00029-MEN "Doty" THP
Attachments: public_comment-1-22-00029-MEN-Doty-compressed.pdf; CEQA Portal Topic Paper_Thresholds of Signifcance_2020 Update.pdf; Dawson1998_Article_FogInTheCaliforniaRedwoodFores.pdf; 151130 _UpElkRvrInitialStudy.pdf; EstimatingSIteProductivity2014.pdf; Predicting Aboveground Biomass.pdf; Discovering the Climate Change Resilience of Coast Redwood Forests _ Save the Redwoods League.pdf; Metcalf-et-others-good-data-compressed.pdf; DunneReport46.pdf; OBrien_Position_Letter_Forest_Protection.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Warning: this message is from an external user and should be treated with caution.

Review team,

Please include the attached Significant Environmental Concerns as public comment for THP #1-22-00029 "Doty".

Please note: I also tried uploading this comment and all of it's attachments directly to CalTrees but it failed. I wanted to spare you the trouble of having to deal with all of the attachments, and the large email it has generated.

Thank you,

-Ethan Arutunian

APPENDIX A

Significant Environmental Concerns regarding THP #1-22-00029-MEN "Doty Creek"

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Table of Figures

To: CDF THP Review Team
SantaRosaPublicComment@fire.ca.gov
Attn: Dominik Schwab, RPF #2823, Director of Santa Rosa Office
Attn: Jon Woessner, RPF #2571, Second Review Chair, Redding Office

May 12, 2022

Significant Environmental Concerns regarding THP #1-22-00029-MEN "Doty"

I. Introduction

This comment is submitted to the California Dept of Forestry's (CDF) Timber Harvest Review Team regarding plan number 1-22-00029-MEN named Doty THP. This plan is inside the same Doty Creek watershed planning area as both the recently submitted "Doty Creek" THP, 1-22-00024-MEN, as well as the strongly-contested and non-compliant "Elk" THP, 1-19-00098-MEN. All of the problems that the public wrote about regarding that plan are still present or exacerbated here.

This additional plan continues the ongoing practice of providing no factual, valid cumulative impacts analysis, continues to ignore the downstream cumulative effects which were documented and raised in public comments to CDF previously, and does not provide the equivalent of an EIR. The THP fails to 'include sufficient detail to enable those who did not participate in its preparation to understand and to consider meaningfully the issues the proposed project raises, as CEQA requires' Sierra Club v. Fresno (2018) 6 Cal.5th 502, 510. An approval of this plan by CDF will fail to uphold the environmental protection requirements of the California Environmental Quality Act (CEQA) and may trigger a legal challenge.

The following comments are submitted on behalf of Friends of the South Fork Gualala (FSFG).

Please consider these comments as Significant Environmental Concerns raised during the review team process.

These comments and substantive evidence show that the material submitted by the RPF:

1. is largely not relevant to the logging plan, the watershed area affected by the plan, or plan-related adverse cumulative watershed effects;
2. fails entirely to address the significant environmental concerns raised here;
3. is based on subjective, unsupported conclusions and speculation;
4. does not provide a substantial, factual, evidentiary basis for CDF to determine that this logging plan is in conformance with the Forest Practice Act and Rules and will not add to significant cumulative impacts which already exist. In light of the full record, approval of this plan would be an abuse of discretion. A full list of additional information and materials being submitted as part of these comments is at the end of this document.

II. Friends of the South Fork Gualala Background

Friends of the South Fork Gualala (FSFG) is an unincorporated association whose mission is to conserve, protect, and restore the South Fork Gualala River watershed and neighboring watersheds. Its members promote science and evidence-based solutions to limiting the effects of climate change on the coastal river watersheds and endangered wildlife. The group is actively engaged in many aspects of conservation, including establishing a historical record of logging in the entire Gualala River basin, conducting data collection and public outreach, and advocating before state and local agencies.

III. Doty Creek Planning Watershed; Cumulative Harvested Acres

At only 4,628 acres, the Doty Creek watershed planning area [calwater 1113.810003] is the third smallest planning watershed area in the entire Gualala River basin. Ironically, Doty Creek is also #3 in terms of equivalent clearcut acres (ECA), with over 15% of the watershed harvested for timber in just the past 10 years.

Table 1. Gualala River Basin planning watersheds and 10-year harvested acreage totals

#4

Planning Watershed	Name	Watershed Acres	THP Acres	ECA	Cumulative ECA %	Cumulative Acres %
1113.85	Mouth of Gualala River	5305.35	1044.15	728.56	13.7	19.7
1113.85	Middle South Fork Gualala River	7910.29	1837.6	969.03	12.3	23.2
1113.81	**Doty Creek**	**4628.21**	**715.82**	**565.17**	**12.2**	**15.5**
1113.85	Stewarts Point	4946.65	787.97	524.07	10.6	15.9
1113.82	Lower Rockpile Creek	2946.81	316.54	300.1	10.2	10.7
1113.85	Big Pepperwood Creek	6531.54	678.49	512.63	7.8	10.4
1113.81	Robinson Creek	8793.06	887.84	649.33	7.4	10.1
1113.84	Annapolis	7580.04	381.65	305.05	4	5
1113.83	Grasshopper Creek	5766.82	330.91	198.62	3.4	5.7
1113.85	Black Point	4621.39	159.13	153.38	3.3	3.4
1113.81	Billings Creek	10651.3	315.45	236.59	2.2	3
1113.84	Tobacco Creek	8061.58	226.2	169.65	2.1	2.8
1113.81	Stewart Creek	6585.38	196.53	139.42	2.1	3
1113.85	Kolmer Gulch	5769.82	158.42	93.37	1.6	2.7
1113.83	Little Creek	5869.02	108.27	67.55	1.2	1.8
1113.85	Upper South Fork Gualala River	8403.28	182.61	91.44	1.1	2.2

1113.82	Middle Rockpile Creek	8165.85	97.72	73.29	0.9	1.2
1113.84	Haupt Creek	6043.85	93.62	46.81	0.8	1.5

Sadly, this tiny Doty Creek planning watershed has also been hammered by relentless timber harvest plans (THPs). With 3 THPs currently proposed in the watershed, 7 plans completed or in progress over the past 10 years, and 15 additional plans completed in the 15 years preceding that, Doty Creek has seen over 36% of its forestland laid waste by tractors, skidders, and cable yarders in the very recent past.

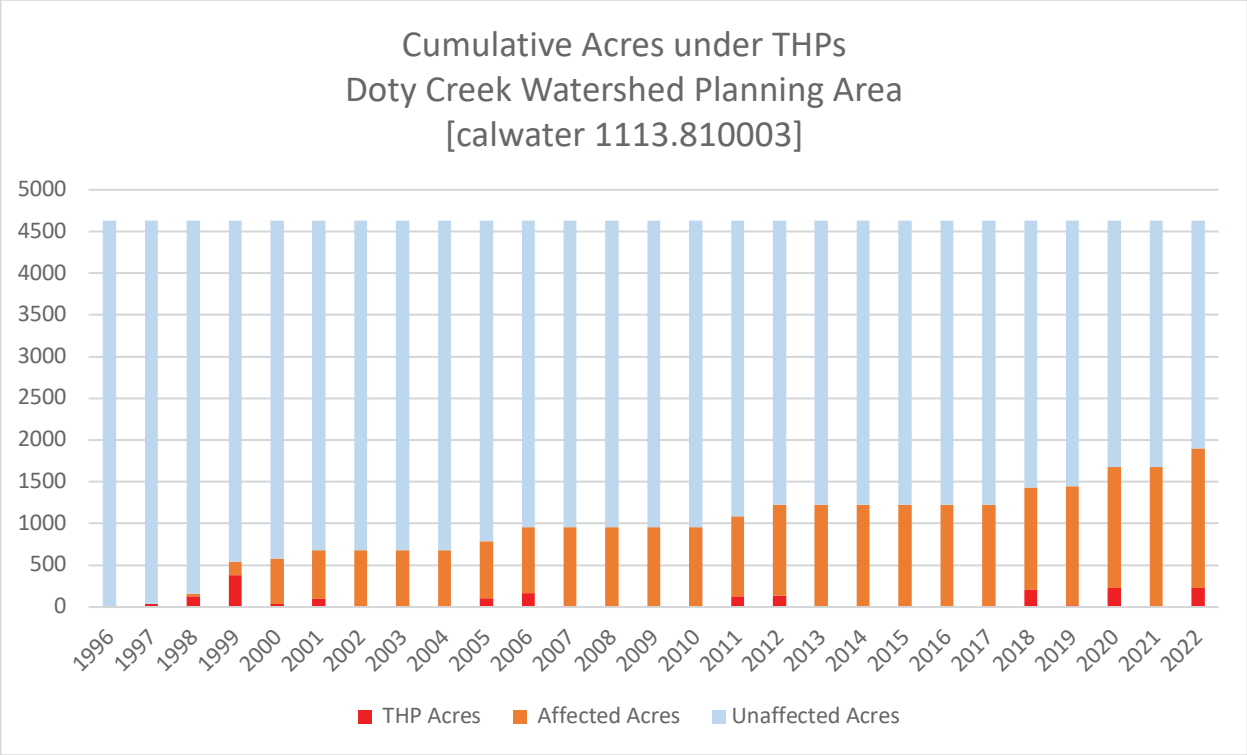
Table 2. Proposed and Past THPs in Doty Creek planning watershed, 1997-present

	THP Year	THP Acres	ECA	% Watershed	% ECA Watershed
2022 PROPOSED THPs					
1-19-00098-MEN	2022	22.14	11.24	0.50%	0.20%
1-22-00024-MEN	2022	43.28	32.46	0.90%	0.70%
1-22-00029-MEN	2022	161.93	122.7	3.50%	2.70%
SUBTOTAL PROPOSED		**227.35**	**166.4**	**4.90%**	**3.60%**
THPs 2012-2022					
1-20-00150-MEN	2020	224.91	203.1	4.90%	4.40%
1-19-00048-MEN	2019	12.3	9.23	0.30%	0.20%
1-19-00191-MEN	2019	6.1	6.1	0.10%	0.10%
1-18-095-MEN	2018	206.35	103.18	4.50%	2.20%
1-16-094-MEN	2016	0.21	0.11	0.00%	0.00%
1-12-029-MEN	2012	128.65	128.65	2.80%	2.80%
1-12-078-MEN	2012	5.82	5.52	0.10%	0.10%
SUBTOTAL 2012-2022		**584.34**	**455.87**	**12.60%**	**9.80%**
THPs pre-2012					
1-11-105-MEN	2011	131.48	109.3	2.80%	2.40%
1-06-163-MEN	2006	8.22	8.22	0.20%	0.20%
1-06-186-MEN	2006	161.36	153.89	3.50%	3.30%
1-05-023-MEN	2005	108.4	95.93	2.30%	2.10%
1-01-059-MEN	2001	101.41	101.41	2.20%	2.20%
1-01-240-MEN	2001	0.04	0.04	0.00%	0.00%
1-00-263-MEN	2000	36.75	18.38	0.80%	0.40%
1-99-149-MEN	1999	71.15	71.15	1.50%	1.50%
1-99-186-MEN	1999	219.33	214.03	4.70%	4.60%
1-99-341-MEN	1999	13.98	10.05	0.30%	0.20%
1-99-348-MEN	1999	74.91	71.46	1.60%	1.50%

#4

1-99-460-MEN	1999	1.81	1.81	0.00%	0.00%
1-98-147-MEN	1998	125.59	125.59	2.70%	2.70%
1-97-211-MEN	1997	27.14	27.14	0.60%	0.60%
1-97-213-MEN	1997	7.65	7.65	0.20%	0.20%
SUBTOTAL pre-2012		**1089.22**	**1016.03**	**23.50%**	**22.00%**
Total Harvested Acres		**2485.25**			

Chart 1. Cumulation of harvested acres in Doty Creek in the past 25 years.



#4

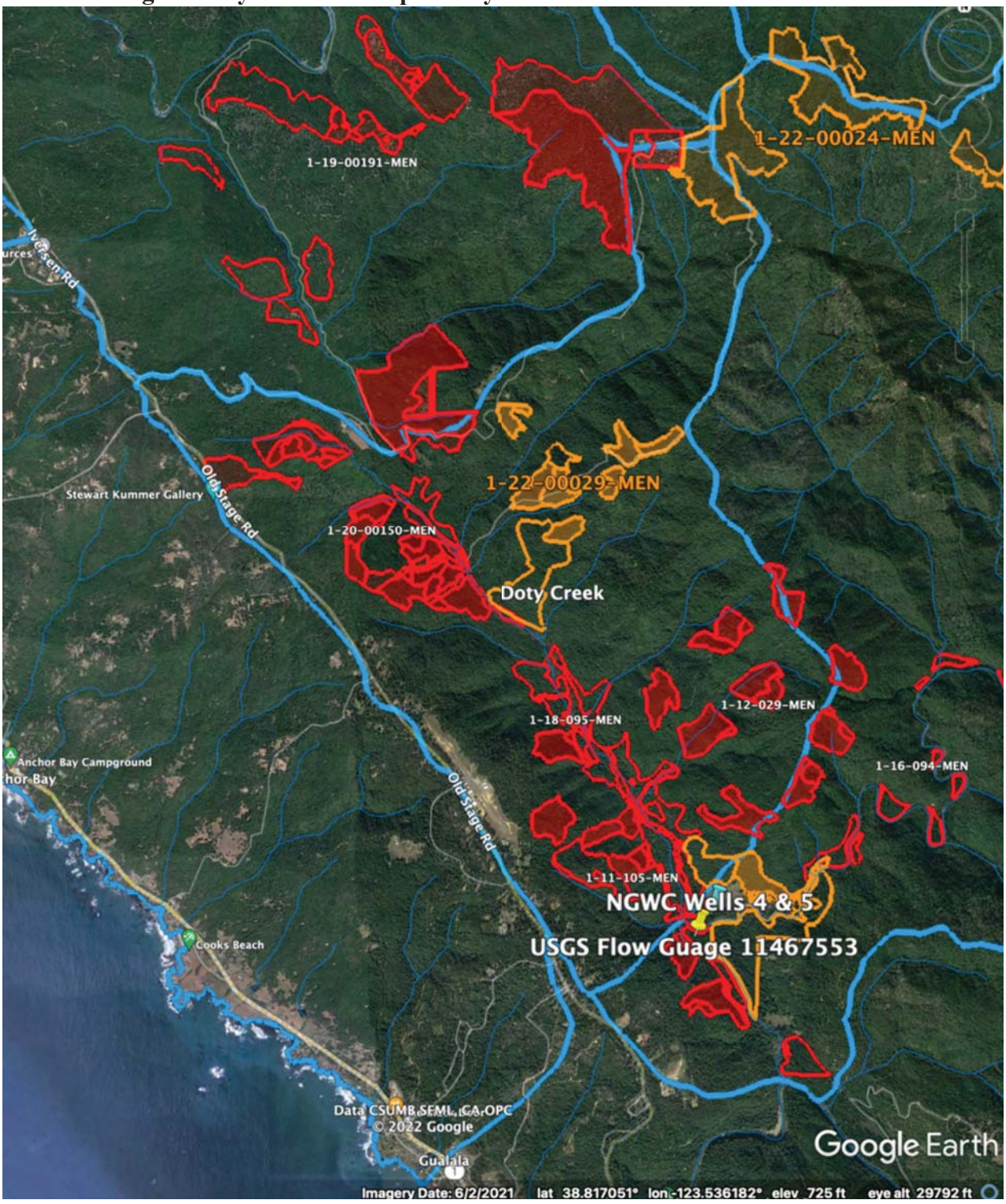
Satellite Imagery

The following satellite imagery shows THP boundaries in the Doty Creek planning watershed.

Orange = Proposed THP boundaries
Red = Active or completed THPs
Blue = Planning watershed boundary, rivers and tributaries.
Shading inside THP boundaries indicates the type of Silviculture used:
Clearcuts: dark shading
Group Selection: light shading
Selection: no shading

#4

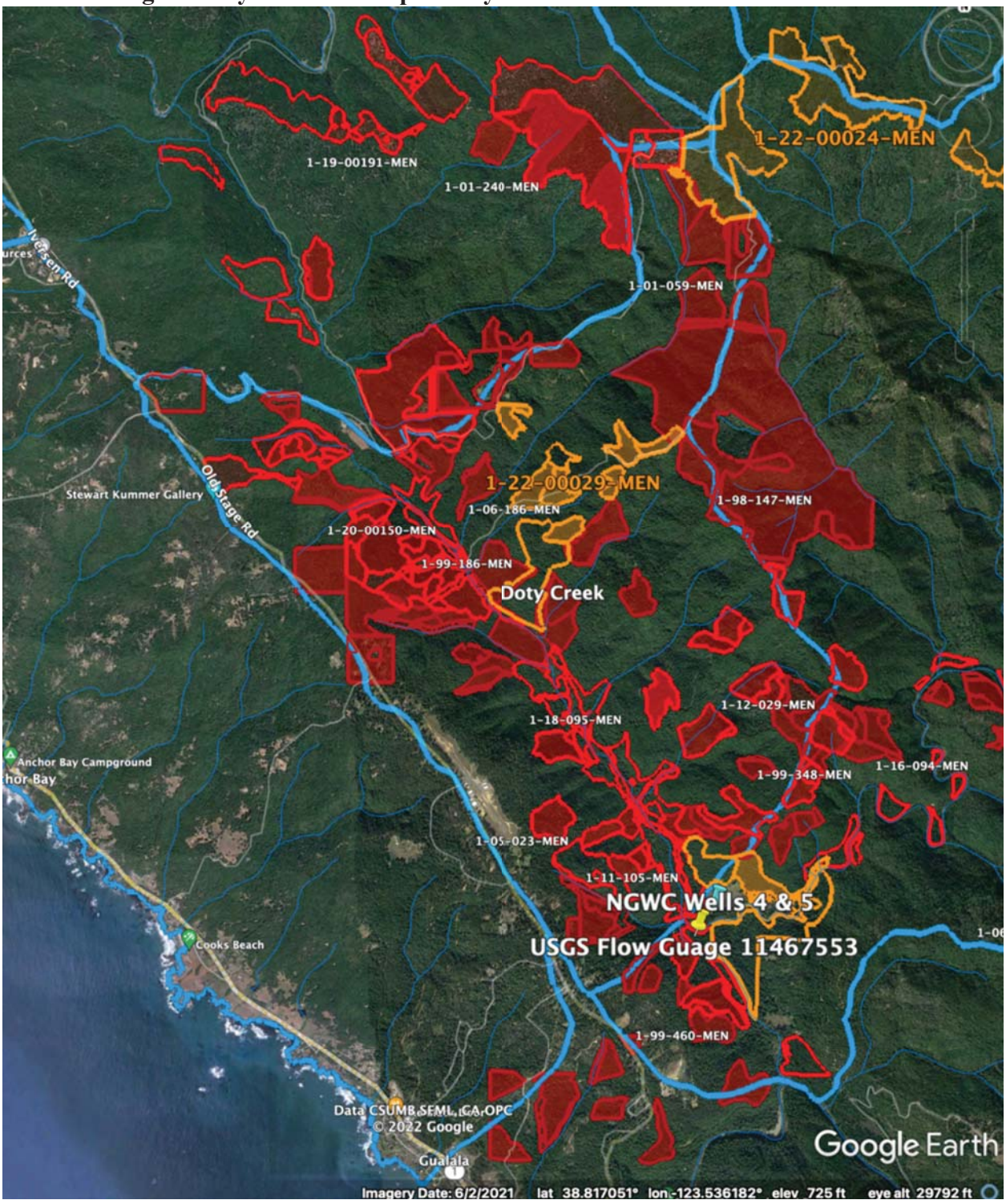
Satellite Image 1. Doty Creek THPs past 10 years



APPENDIX A

#4

Satellite Image 2. Doty Creek THPs past 25 years



IV. CDF practices do not require, gather or disperse information needed by their agency and the public to make informed decisions.

The California Association of Environmental Professionals (AEP) is a non-profit association of public and private sector professionals with a common interest in serving the principles underlying the California Environmental Quality Act (CEQA). These professionals have summarized the 2020 CEQA Statute and Guidelines regarding the obligations of Lead Agencies such as CDF in establishing Thresholds of Significance as follows:

> CEQA requires a Lead Agency to determine the significance of all environmental impacts (California Public Resources Code [PRC] § 21082.2; 14 CCR [State CEQA Guidelines] § 150641). A threshold of significance for a given environmental impact defines the level of effect above which the Lead Agency will normally consider impacts to be significant, and below which it will normally consider impacts to be less than significant (See State CEQA Guidelines § 15064.7(a)). Thresholds of significance may be defined either as quantitative or qualitative standards, or sets of criteria, whichever is most applicable to each specific type of environmental impact.
>
> Lead Agencies have discretion to formulate their own significance thresholds (See State CEQA Guidelines § 15064.7(b)). Setting thresholds requires the Lead Agency to make a policy judgment about how to distinguish significant impacts from less-than-significant impacts.
>
> Lead Agencies can set thresholds on a project-by-project basis, or they can adopt thresholds to be consistently applied to all projects. For the Lead Agency, having clearly established thresholds promotes predictability and consistency (over time and across reviewers) in the environmental review process, can bolster the defensibility of significance determinations in the agency's CEQA documents, and can focus the analysis on impacts expected to be significant rather than impacts that are simply controversial. However, CEQA does not require that a Lead Agency use the same significance threshold for different CEQA documents.
>
> Lead Agencies are responsible for establishing the thresholds of significance for all documents they prepare. They can rely on several sources, including: Appendix G of the State CEQA Guidelines; CEQA's mandatory findings of significance (State CEQA Guidelines § 15065); thresholds established by regulatory agencies; thresholds provided in General Plans or other local planning documents; or thresholds established by other agencies. For example, many jurisdictions rely on thresholds established by a local or regional air district when analyzing air quality impacts.
>
> Thresholds of significance are key elements of any CEQA document, as the level at which thresholds are established can determine whether the impacts of a project are deemed significant (thus requiring mitigation) or less than significant (thus not requiring mitigation). Further, if significant project impacts are identified that cannot be reduced below the threshold of significance through mitigation, the Lead Agency is obligated to prepare an EIR rather than a Negative Declaration or Mitigated Negative Declaration (PRC § 21082.2(d); State CEQA Guidelines § 15064(a)(1)).

#5

#5 The development and use of thresholds of significance are not required by CEQA. However, ***it is good and accepted practice to do so in both Initial Studies and EIRs because it allows readers to more easily understand the chain of facts and logic that led the Lead Agency to their significance conclusions.***

CDF is repeatedly ignoring the California Code of Regulations

The California Code of Regulations addresses logging plans (THPs):

> **14 CCR 897** The information in [THPs] shall also be ***sufficiently clear and detailed to permit adequate and effective review by responsible agencies and input by the public***. . .
>
> **14 CCR 898.2** The Director shall disapprove a plan as not conforming to the rules of the Board if ... there is evidence that the information contained in the plan is incorrect, incomplete or misleading in a material way, ***or is insufficient to evaluate significant environmental effects***.

#6 CDF is violating both of these regulations by not collecting or providing sufficient information needed by the public to effectively review the plan or CDF's process. Withholding this information also does not provide the public with sufficient information to ascertain whether CDF has adequately evaluated significant environmental effects. This practice is part of CDF's ongoing pattern of dismissing the public and refusing to answer questions the public asks.

Many CEQA lawsuits have provided a clear foundation of the expectations by both CEQA and the court as to CDF's responsibilities towards cumulative impacts analyses:

1. "The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects." *Golden Door Props., LLC v. Cty. of San Diego*, 50 Cal. App. 5th 467, 527 (2020), quoting CEQA Guidelines § 15355, subd. (b).
2. An EIR must discuss cumulative impacts when they are significant and the project's incremental contribution is "cumulatively considerable." 14 Cal Code Regs §15130(a).
3. A project's incremental contribution is cumulatively considerable if the incremental effects of the project are significant "when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." 14 Cal Code Regs §15065(a)(3).
4. "'[C]onsideration of the effects of a project or projects as if no others existed would encourage the piecemeal approval of several projects that, taken together, could overwhelm the natural environment . . . . This would effectively defeat CEQA's mandate to review the actual effect of the projects upon the environment.' The agency must interpret this requirement to 'afford the fullest possible protection of the environment.'" *Id.*, quoting *Las Virgenes Homeowners Fed'n v. Cty. of L.A.*, 177 Cal. App. 3d 300, 306 (1986); *Friends of the Eel River v. Sonoma Cty. Water Agency*, 108 Cal. App. 4th 859, 868 (2003).
5. Further, "[t]he greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as

significant." *Cmtys. for a Better Env't v. Cal. Res. Agency*, 103 Cal. App. 4th 98, 120 (2002).

6. "The total absence of consideration of the existing environmental problems . . . is a legal failure that is potentially prejudicial to the FEIS/R's analysis." *AquAlliance, et al.* v. U.S. Bureau of Reclamation, et al., 287 F. Supp. 3d 969, 1037 (E.D. Cal. 2018).
7. "[I]t is vitally important that an EIR avoid minimizing . . . cumulative impacts." (*San Franciscans for Reasonable Growth v. San Francisco* (1984) 151 Cal.App.3d 61, 79.) "One of the most important environmental lessons evident from past experience is that environmental damage often occurs incrementally from a variety of small sources. These sources appear insignificant, assuming threatening dimensions only when considered in light of the other sources with which they interact." (*Kings County, supra,* 221 Cal.App.3d at p. 720.)

#6

<u>CDF has an established Pattern and Practice of deferring obligations under CEQA</u>

For decades, professional hydrologists have made observations such as: "Examination of recently approved THPs and SYPs indicates that plans are being approved that do not contain technically valid cumulative impact assessments." (Reid 1999, see also Dunne et al. 2001)

CDF has a historical pattern and practice of accepting the same type of factually-void logging plans throughout the entire greater Gualala watershed, never providing the public or other decision makers with the information necessary to knowledgably assess the cumulative environmental impacts of each logging plan. While decisions concerning whether or not to ultimately approve a plan are matters left to the judgment of CDF, CDF does not have discretion to take short cuts through the environmental review process, compromise its core obligations under CEQA, and approve a plan with significant impacts that have not been fully analyzed.

#7

Although the Forest Practice Rules contain a number of generic best management practices (BMPs) or mitigation measures to reduce the environmental impacts of logging, experts have understood for decades that the measures are not sufficient to prevent cumulative watershed effects (CWEs) from occurring. CEQA does not permit mitigation measures to be used to avoid assessing whether a project's cumulative impacts will be significant (San Joaquin Raptor Rescue Center v. County of Merced (2007) 149 Cal.App.4th 645, 663). Merely the inclusion of mitigation measures in the plan description does not make any potential impacts automatically less than significant (Lotus v. Dept. of Transp. (2014) 223 Cal.App.4th 645, 656).

"Formulation of mitigation measures shall not be deferred until some future time," and the identification of the specific details of mitigation measures cannot be postponed unless CDF (1) commits itself to mitigation (2) adopts specific performance standards that the mitigation will achieve and (3) identifies the potential actions that could feasibly achieve the identified performance standard. CEQA Guidelines section 15126.4(a)(1)(B). Here, contrary to CEQA, CDF does not identify any such specific performance standards, nor does it identify how to feasibly attain those nonexistent standards.

In a report titled, “A Scientific Basis for the Prediction of Cumulative Watershed Effects” (Dunne et al. 2001, "CWE Report") a blue ribbon panel of experts on the University of California Committee on Cumulative Watershed Effects comprehensively reviewed the Forest Practice Rules, dozens of logging plans, and ongoing water quality impacts. The CWE Report explains the inadequacy of CDF‘s application of the Rules to avoid cumulative watershed effects. The CWE Report pointed to three reasons why CWEs are occurring, despite CDF‘s application of the Forest Practice Rules.

The first problem is that CDF does not require that plans contain sufficient data to allow the agency and the public to assess existing and expected impacts. (“Information provided in individual THPs that we examined was often incomplete or too subjective to assess current resource conditions, lingering cumulative effects, or the potential for additional impacts.”)

#7

The second problem, the CWE Report explains, is that CDF operates under the premise that, even if a logging plan may have adverse impacts, “it can be mitigated out of existence by application of a Best Management Practice” found in the Forest Practice Rules.

The third problem is that CDF never looks at the watershed as a whole in assessing cumulative impacts. Having reviewed dozens of logging plans, the CWE Report records the damage caused to watersheds when CDF allows the “postage stamp” approach, looking only at a small fraction of the watershed in which the logging plan is located. This “postage-stamp”, or "parcel-by-parcel", approach, in which only the immediate project area of a single, small timber harvest is ever reviewed ... does not capture the cumulative influence of multiple harvests over a long period of time in a larger watershed.

Ultimately, the CWE Report concluded that a process – indistinguishable from the review relied on in all of the Gualala River watershed logging plans – “contains no method for recognizing damage across entire ecosystems or watersheds” and “needs to be replaced with a true, watershed-scale assessment.” While the CWE Report was written nearly 20 years ago, each of these problems remains, and can be seen once again in the Doty Creek plan at issue here.

The public is still waiting for enough concrete information and specific data to enable them to understand the project's cumulative impacts, CDF is still acting under the unsupported and unsupportable assumption that mitigation measures render a cumulative impact analysis superfluous, and CDF continues to studiously avoid looking at the impacts of timber harvesting on the watershed as a whole.

V. Limiting the Assessment Area in the Doty Plan is an Attempt to Avoid the Required Cumulative Impact Analysis of the Downstream Watershed.

For unknown reasons, CDF uses the calwater 2.2 planning watershed as its basis for the entire area subject to any cumulative effect. The calwater system was first developed in 1996.

#8

According to this USGS link online,

> "This digital data set was created to provide a context for developing a statewide, comprehensive ground-water monitoring and assessment program as per the requirements

of the California State Assembly bill AB599. The development of this data set facilitated analysis and identification of the priority basins and areas outside basins.

This data set was developed from previously developed digital data sets of ground-water basins (California Department of Water Resources, 2002) and watersheds (California Department of Forestry and Fire Protection, 1999)."
[https://water.usgs.gov/GIS/metadata/usgswrd/XML/ca_provinces.xml]

AB599 was filed in 2001.

"AB 599, Liu. Groundwater contamination: quality monitoring program.

Existing law declares that groundwater is a valuable natural resource in the state and should be managed to ensure its safe production and its quality. Existing law authorizes specified local agencies to adopt and implement groundwater management plans.

This bill would require the State Water Resources Control Board to integrate existing monitoring programs and design new program elements, as necessary, for the purpose of establishing a comprehensive monitoring program capable of assessing each groundwater basin in the state through direct and other statistically reliable sampling approaches, and to create an interagency task force to identify actions necessary to establish the monitoring program and to identify measures that would increase coordination among state and federal agencies that collect groundwater contamination information. The bill would require the state board to convene a described advisory committee to the task force. The bill would require the state board, in consultation with other specified agencies, to submit to the Governor and the Legislature, on or before March 1, 2003, a report that includes a description of a comprehensive groundwater quality monitoring program for the state."
[http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=200120020AB599&search_keywords=groundwater]

#8

CDF has chosen to confine their assessments to the small planning watersheds for many years and has approved thousands of plans in California using this faulty assessment system. In past plans and approvals within the greater Gualala watershed, neither the NCRWQCB nor CDF have ever provided adequate justification, supported by substantial evidence, as to why they refuse to look for water quality impacts downstream of the individual plans beyond the planning watershed boundaries. As a result, both the past logging plans and this current one fail to inform the public and decision makers of the true environmental consequences which are occurring.

Although the Rules permit “planning watersheds” to be used as a starting point for cumulative watershed assessments, CDF is required to look beyond the planning watershed to ensure all relevant information is considered (such as the greater watershed and fluvial system). 14 CCR § 898; see also East Bay Mun. Utility Dist. v. Cal Dept. of Forestry & Fire Prot. (1996) 43 Cal.App.4th 1113, 1133 (“duty to require supplementations is entirely consistent with the agency‘s duty under CEQA to use its best efforts to find out and disclose all that is reasonably can”).

The small geographic scope used by the RPF in this logging plan is exactly the type of inadequate analysis that the cumulative impact assessment is intended to prevent (EPIC v. Cal Dept. of Forestry & Fire Prot. (2008) 44 Cal.4th 459, 525). CEQA requires the scale of the cumulative impact assessment area to be based on the nature of the impacted resource, not the scale of the project (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692, 722-723).

#8

The practice of the misuse of the planning watershed delineations has prevented any meaningful cumulative impact analyses and allowed many of California's important watersheds to be over-cut. There is no excuse for this and it must stop. CDF's approvals are not upholding the laws nor the intent of the laws, and are not preventing or repairing the well-known significant adverse effects that are detailed in public comments and throughout many scientific studies.

VI. Reasonable Scientifically-based Thresholds for Sustainability Already Exist

Hans Burkhardt provides a rational, thorough, and thoughtful, scientific-based approach to answering this question of cumulative assessment in his publication "Maximizing Forest Productivity".

> "A healthy forest economy must be sustainable, that is, able to be carried on in perpetuity; any forest economy which is not sustainable cannot last, and is, therefore, not healthy.
>
> The way to achieve sustainability and a healthy economy is to live in balance with a region's ecology.
>
> If harvests exceed forest growth, inventory and productivity gradually ***decline to the point where both the economic and ecological system simultaneously collapse***. If, on the other hand, harvest rates are below the rate of forest growth, inventory and productivity will steadily increase until the forest's full productive capacity is reached."

#9

Burkhardt goes on to show that the optimal sustainable rates of harvest for this type of mixed redwood/conifer forest is between 1-2% yield of forestland per year; based on ***regrowth rates***, depending on conditions. (Burkhardt, H. J. 1994. Maximizing Forest Productivity, pgs. 3-7).

Research has shown that coastal redwoods grow faster in wetter areas and slower in dryer areas. Redwoods grow when minimum soil moisture ranges from 18 to 86%, but they grow best when soil moisture does not go below 60 %. Redwood has no taproot but its roots spread out over large areas. [Univ. of California, Agriculture and Natural Resources, Forest Research and Outreach]

Burkhardt's research was based on redwood/conifer forests that were not subjected to historic drought conditions. It can be reasonably assumed that growth rates today are not as high as they were in 1994, when Burkhardt published his research (Therefore it should be in the low end of the range). As such, safe thresholds for cumulative effects should be considered even lower, inevitably in the 1.0-1.2% range to ensure recoverability and overall watershed health.

James Burke, lead reviewer on this THP representing the North Coast Regional Water Quality Control Board (NCRWQB) authored his own study of the North and South Fork Eel River in neighboring Humboldt County. Burke's study establishes thresholds for harvest rates based on controlling *sedimentation* (not regrowth or recoverability).

According to Burke, in the Elk River, "***Watershed-wide average annual harvest rates required under the Order equate to less than 1.5% equivalent clearcut acres.*** These rates are lower than required under the 2006 WWDRs, which allowed annual harvest rates of 1.9% in the North Fork and 1.8% and upwards in the South Fork... In addition, the Order requires that the rate of harvest in any subwatershed not exceed 2% equivalent clearcut acres per year averaged over any 10 year period. This is to ensure that proposed harvest rates are generally below a threshold that would cause concern for contributing to ongoing cumulative impacts on water quality and contribute towards control of sediment and improvement of impaired beneficial uses of water."

#9

[Note: Equivalent clearcut area (ECA) is a widely used methodology developed by the United States Forest Service (USFS) to account for the relative impacts of different types of silvicultural treatment. It assigns a weighting factor of one to clearcutting and a value less than one for partial harvesting silvicultural treatments. The weighting factor for a silvicultural treatment is multiplied by total area treated under each silviculture to arrive at a normalized disturbance calculation. Therefore, 100 acres of Selection harvest, which is typically assigned a ECA factor of 0.5, would be counted as 50 equivalent clearcut acres.]

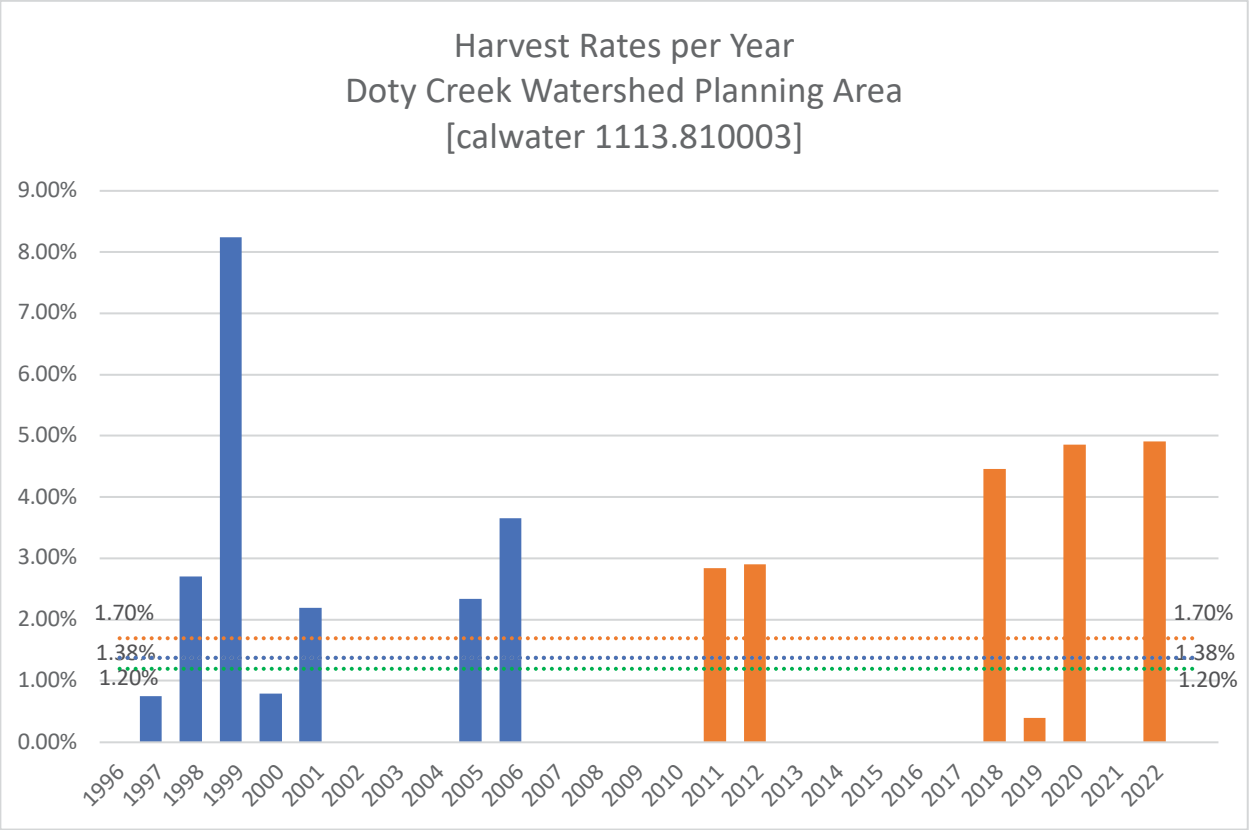
Both Burkhardt's and Burke's research show inarguably that it is possible to formulaically calculate cumulative effects and harvest rates, contrary to CDF's repeated refusal to do so. The studies both indicate that a reasonable rate of harvest for sustainability in these watersheds is less than 1.5% ECA, or less than 3% Selective silviculture per year.

Additionally, research has shown that coastal redwoods grow faster in wetter areas and slower in dryer areas. According to E. Burns, "comparison of historically wet and dry forests reveals that redwoods produce biomass at highly variable rates as climate changes. For example, forests exhibited different responses to the severe drought of 2012-2015 with redwoods in wetter forests maintaining high productivity through the drought, and those in old-growth forests producing the most wood by far."

The second and third-growth Doty Creek watershed has seen severe drought conditions for the past 5 years. It is not reasonable to assume that the trees have been growing here at their maximal rate during this time. Neither study takes into consideration historic drought conditions. ***During these conditions of low water flow and lower growth rates, establishing and enforcing a conservative harvest threshold between 1.0-1.2% ECA is absolutely critical to the recovery of these watersheds.***

The Doty THP, which includes clearcuts, puts the cumulative harvest rate in 10 years at over 1.7% in the planning watershed. Additionally, if this THP is approved, harvests of well over 4% ECA will have been approved and executed every-other-year 3 times in a row since 2018!

Chart 2. Harvested acres by year and thresholds in Doty Creek, past 25 years.



#9

VII. Watershed Biomass has not Accumulated since 2015

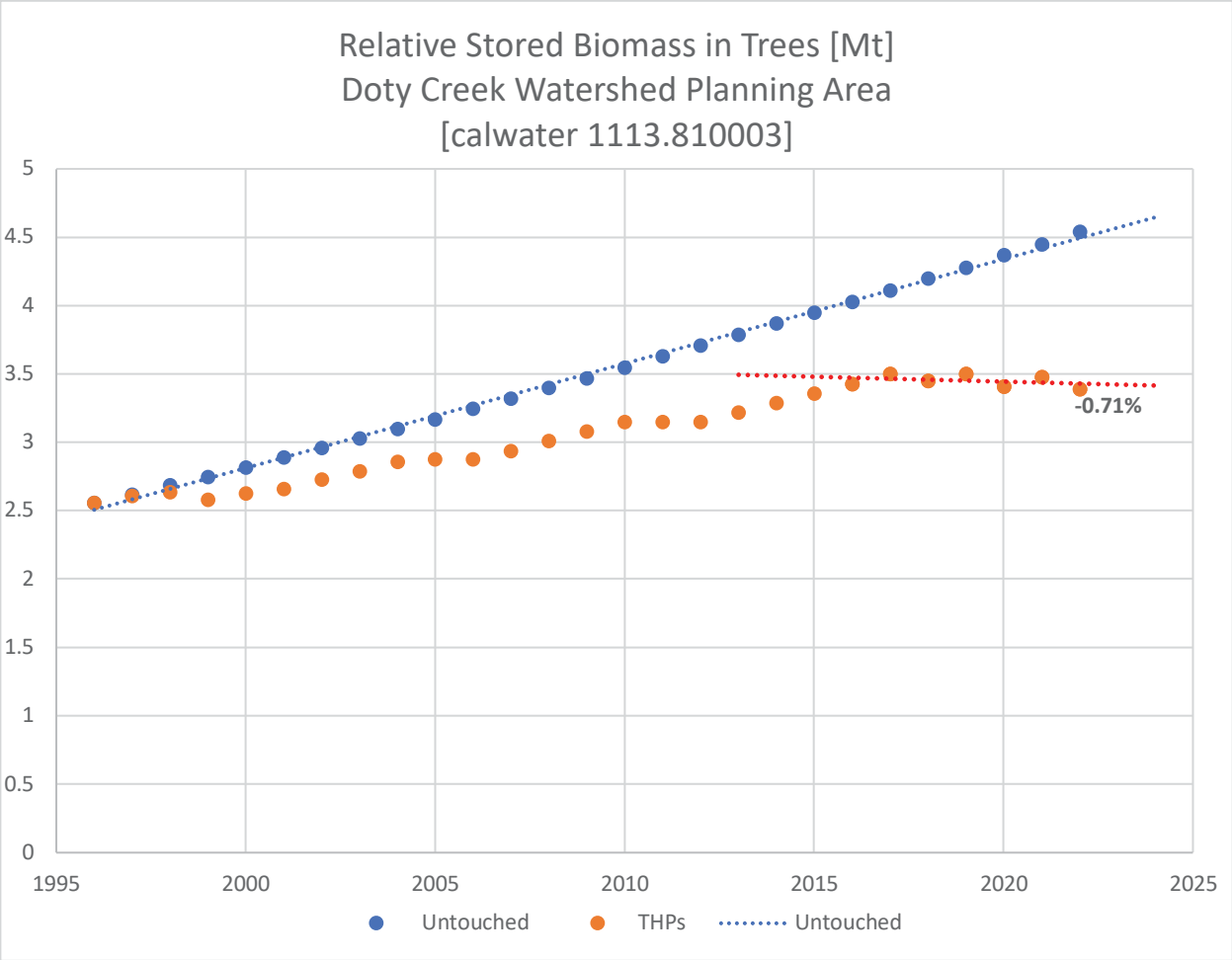
I have modelled the second growth Doty Creek watershed using a watershed modelling software application.

#10

This application takes as input a basic configuration of existing stands in the watershed. It then uses scientifically published formulae of growth rates in these mixed conifer forests, as well as formulae for tree volumes as a function of basal diameter, to calculate a yearly estimated overall biomass in the watershed (in million-metric tons). The application also analyzes each timber harvest that has occurred in the watershed over time, accounting for the number of acres harvested and type of silviculture used, and assumes restocking occurs as required in those harvested areas.

The following graph represents the estimated accumulation and loss of stored carbon in the Doty Creek planning watershed since 1997. In this graph it is clearly visible that rates of harvesting until 2017 were in-line with sustainable and restorative practices, and the watershed was accumulating carbon each year. After 2017 however, the cumulative impacts of the current rates of harvesting become very apparent.

Chart 3. Estimated relative stored biomass in trees in Doty Creek (million-metric-ton)



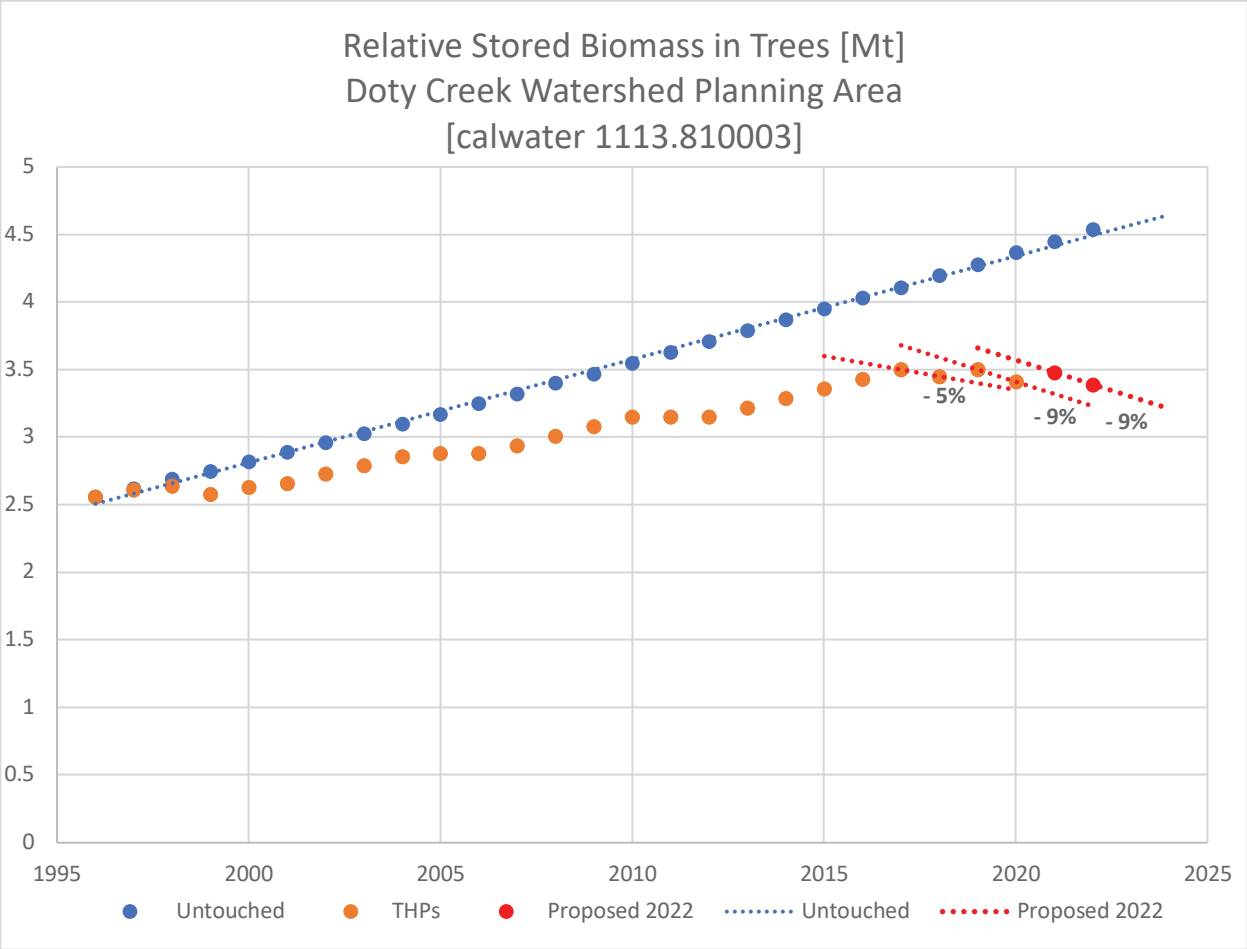
#10

Additionally, as shown on the second graph below, the back-to-back harvests in 2018 and 2020 from THP's 1-18-095-MEN and 1-20-00150-MEN caused biomass to decline by 5% and 9% (respectively). The proposed 2022 THPs will cause an additional 9% loss in biomass in this small planning watershed.

We already know, from Hans Burkhardt above, ***"If harvests exceed forest growth, inventory and productivity gradually decline to the point where both the economic and ecological system simultaneously collapse."***

Burkhardt's conclusion is very evident here, where harvests have clearly exceeded growth, inventory is on the decline and we are on the brink of ecological collapse. The watershed has turned the corner for the worst, and this THP will only increase the rate of ecological demise.

Chart 4. Estimated relative stored biomass in trees in Doty Creek (million-metric-ton)



#10

Biomass and Stored Water

Healthy conifers contain on-average 50% water and redwoods have been measured at 60% water by volume. "Biomass", by definition, is the "dry weight" of that tree volume, which is all of the mass with the water removed. Given that healthy trees contain 50% water, we know that each tree stores an equivalent amount of water as biomass.

Simply put, using 50% water by volume:

1 metric ton of biomass = 1,000 liters of stored water (1 kg water = 1 liter water)

Redwoods and all trees participate in "evapotranspiration", where they actually transpire 5-10x the amount of water they store into the air through the year. Transpiration cools trees and every organism around it. A large oak can transpire 150,000 liters of water every year, a redwood possibly more!

Plan Fails to Assess Cumulative Effects on the Water Cycle

The very foundation of a watershed's ecosystem health is the water cycle, yet there is no discussion in the plan of the cumulative effects that the vast changes to the landscape are producing.

Removing forest cover opens the land to more solar radiation, producing land degradation effects by drying out the soil more quickly, and increasing groundwater temperatures. Removal of larger trees significantly reduces evapotranspiration and greatly affects the local microclimate. Logging leaves combustible slash about while drying out the cutover and surrounding areas.

The fact is this plan will continue to contribute to climate change, produce land degradation, and impact the water cycle by:

- **Increasing soil and air temperature**
  impacts: less rain and humidity→ increased fire danger → fire leads to more loss of forest cover → dryer landscape
- **Increasing erosion**
  impacts: soil loss → water pollution from point- and non-point sources → degradation of aquatic habitat → population loss in aquatic species
- **Causing loss of soil fertility from loss of nutrients and organic matter**
  impacts: less vegetation growth → less evapotranspiration → less atmospheric moisture transport → higher, drier air and soil temperatures → more vegetation death and increased fire probability

#11

As far as I am aware, there has been no attempt at the local, regional, or state level to prevent or constrain these effects, or to collect factual evidence to determine what effects are occurring. There is no general or site-specific evidence provided in this plan regarding water cycle and climate change cumulative effects from logging, nor has there been in the multitude of past plans CDF has approved.

Lukovic et al. (2021) observes: "Californian hydroclimate is strongly seasonal and prone to severe water shortages. Recent changes in climate trends have induced shifts in seasonality, thus exacerbating droughts, wildfires, and adverse water shortage effects on the environment and economy... We discover that the onset of the rainy season has been progressively delayed since the 1960s, and as a result the precipitation season has become shorter and sharper in California."

Ellison et al. 2017: "Effects of forests on water and climate at local, regional and continental scales through change in water and energy cycles. (1) Precipitation is recycled by forests and other forms of vegetation and transported across terrestrial surfaces to the other end of continents. (2) Upward fluxes of moisture, volatile organic compounds and microbes from plant surfaces (yellow dots) create precipitation triggers. (3) Forest-driven air pressure patterns may transport atmospheric moisture toward continental interiors. (4) Water fluxes cool temperatures and produce clouds that deflect additional radiation from terrestrial surfaces. (5) Fog and cloud interception by trees draws additional moisture out of the atmosphere. (6) Infiltration and

groundwater recharge can be facilitated by trees. (7) All of the above processes naturally disperse water, thereby moderating floods."

Ellison further explains: "By evapotranspiring, trees recharge atmospheric moisture, contributing to rainfall locally and in distant locations. Cooling is explicitly embedded in the capacity of trees to capture and redistribute the sun's energy (Pokorný et al., 2010). Further, trees' microbial flora and biogenic volatile organic compounds can directly promote rainfall. Trees enhance soil infiltration and, under suitable conditions, improve groundwater recharge. Precipitation filtered through forested catchments delivers purified ground and surface water (Calder, 2005; Neary et al., 2009)."

Pokorny et al. (2010) wrote: "Ecosystems use solar energy for self-organisation and cool themselves by exporting entropy to the atmosphere as heat. These energy transformations are achieved through evapotranspiration, with plants as 'heat valves'... While global warming is commonly attributed to atmospheric CO2, the research shows water vapour has a concentration two orders of magnitude higher than other greenhouse gases. It is critical that landscape management protects the hydrological cycle with its capacity for dissipation of incoming solar energy."

#11

This plan fails to provide any assessment or mitigation for these ongoing cumulative impacts that affect lives locally, regionally, nationally, and internationally. Barnosky et al. wrote of these problems: "Localized ecological systems are known to shift abruptly and irreversibly from one state to another when they are forced across critical thresholds. Here we review evidence that the global ecosystem as a whole can react in the same way and is approaching a planetary-scale critical transition as a result of human influence. The plausibility of a planetary-scale 'tipping point' highlights the need to improve biological forecasting by detecting early warning signs of critical transitions on global as well as local scales, and by detecting feedbacks that promote such transitions. It is also necessary to address root causes of how humans are forcing biological changes."

There are many studies available throughout science that pertain to these effects. The availability of science that documents well-understood processes within the water cycle makes the absence of any discussion or consideration of the cumulative effects that this plan increases even more disturbing.

This THP should be revised to discuss this issue and recirculated.

<u>Importance of Fog; Reduction of Fog; Reduction of water intake in water cycle</u>

#12

The redwood's range seems to be determined more by the distribution of summer fog than the actual amount of rainfall. Fog actually condenses on tree crowns and drips down to water the roots of the tree and into the watershed during the dry summer months. The humidity of fog also decreases trees' water loss from evaporation and transpiration. Redwoods can even generate their own fog, from the up to 2000 liters of water a large tree may transpire into the air per day.

The disruption from ongoing climate change, coupled with the loss of thousands to millions of acres of canopy cover, has produced lengthier hot and dry seasons and fire seasons both here and in California in general, as documented in Williams et al. 2019, and Williams et al. 2020. Droughts and low water years have been more frequent and extreme in the first 20 years of the 21st century, yet there is no mention in this plan, or past plans, of how intricately linked forests are with the water cycle (Fischer et al. 2014, EPA 2017, Vose et al. 2017, Cook 2018).

Previous public comments on past THPs in this watershed and other nearby watersheds have underscored the importance of fog in this coastal redwood ecosystem.

#12 According to a 1998 study by T.E. Dawson on the effects of fog in the California redwood forest entitled "Fog in the California redwood forest: ecosystem inputs and use by plants":

> "During the [3-year] study period, 34%, on average, of the annual hydrologic input [by plants inhabiting the heavily fog inundated coastal redwood forests of Northern California] was from fog drip off the redwood trees themselves (interception input). When trees were absent, the average annual input from fog was only 17%, demonstrating that the trees significantly influence the magnitude of fog water input to the ecosystem."
>
> … In summer, when fog was most frequent, ~19% of the water within *S.sempervirens* [coastal redwood], and ~66% of the water within the understory plants came from fog after it had dripped from tree foliage into the soil; for *S.sempervirens*, this fog water input comprised 13–45% of its annual transpiration. For all plants, there was a significant reliance on fog as a water [input] source, especially in summer when rainfall was absent."

Clearly, this plan will cause an additional loss of hydrologic input into the watershed by eliminating fog trip that would normally occur in the harvest areas.

VIII. Doty Plan Will Affect Downstream Areas

Running down the center of the Doty Creek planning watershed from north to south is the Little North Fork Gualala River. The Little North Fork joins the North Fork Gualala River where it exits the Doty Creek planning area to the South.

#13 Just downstream of this juncture, a few hundred feet south of the Doty Creek watershed boundary, is USGS Flow Gauge #11467553.

Just upstream of this juncture on the North Fork, also a few hundred feet south of the Doty Creek watershed boundary in Elk Prairie, are North Gualala Water Company's (NGWC) Wells #4 &#5. These two wells, each capable of pumping 250 gpm, are the main source of water for the entire town of Gualala, and are the only sources available to the water company during the summer months.

In past years, low summer flows have put a serious strain on the ability of the water company to meet the needs of the town. The water company has been fined for over-drafting and is blocked from making any new service connections.

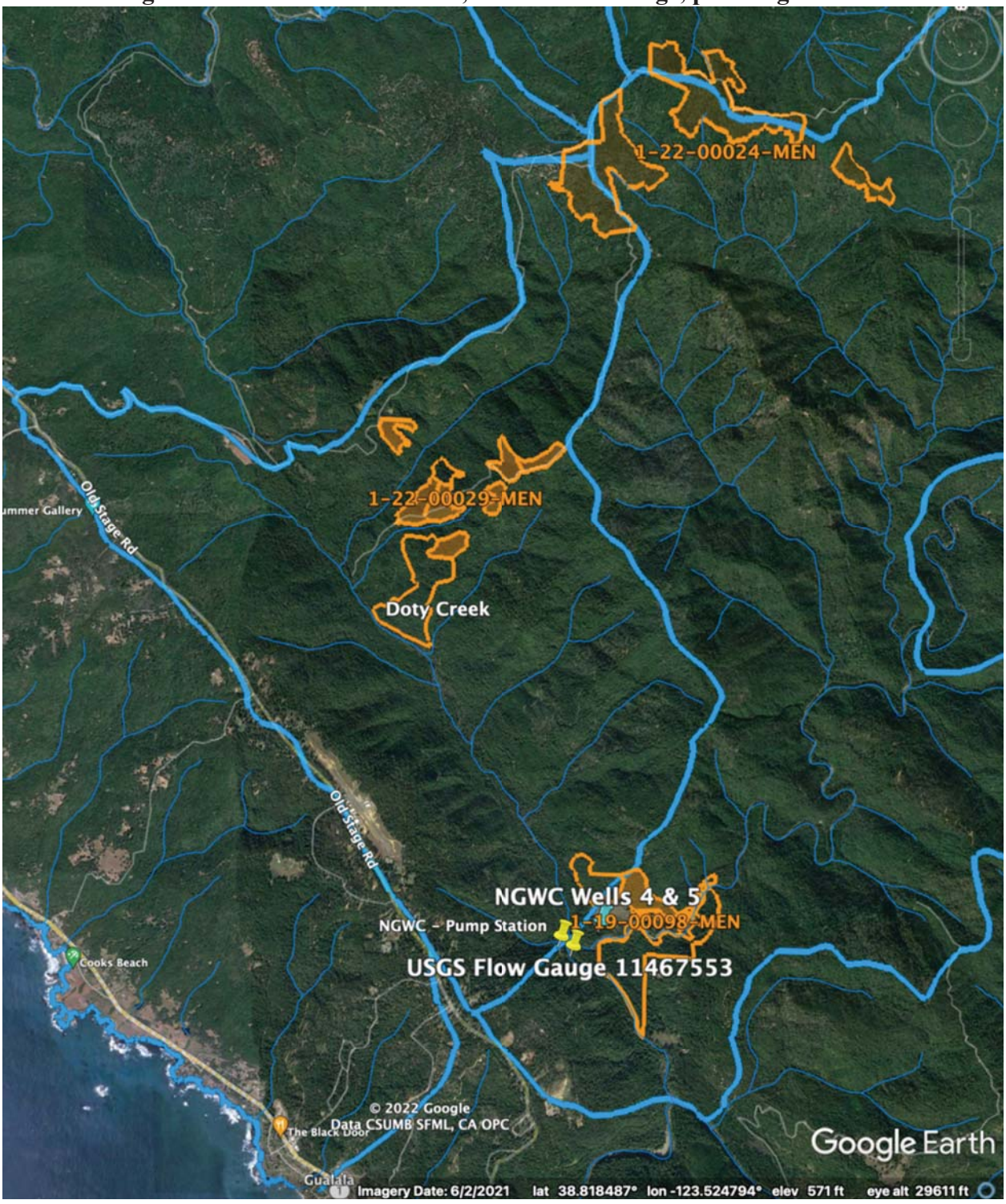
The North Fork Gualala River has been designated by the National Marine Fisheries Service as critical habitat for coho salmon and steelhead, both listed as threatened under the federal Endangered Species Act. NGWC's unauthorized diversions may have reduced the amount of flow in the North Fork and may also have reduced the available habitat for the listed species.

Satellite Image 3. Locations NGWC Wells, USGS Flow Gauge, planning watershed

#13

APPENDIX A

Satellite Image 4. Locations NGWC Wells, USGS Flow Gauge, planning watershed



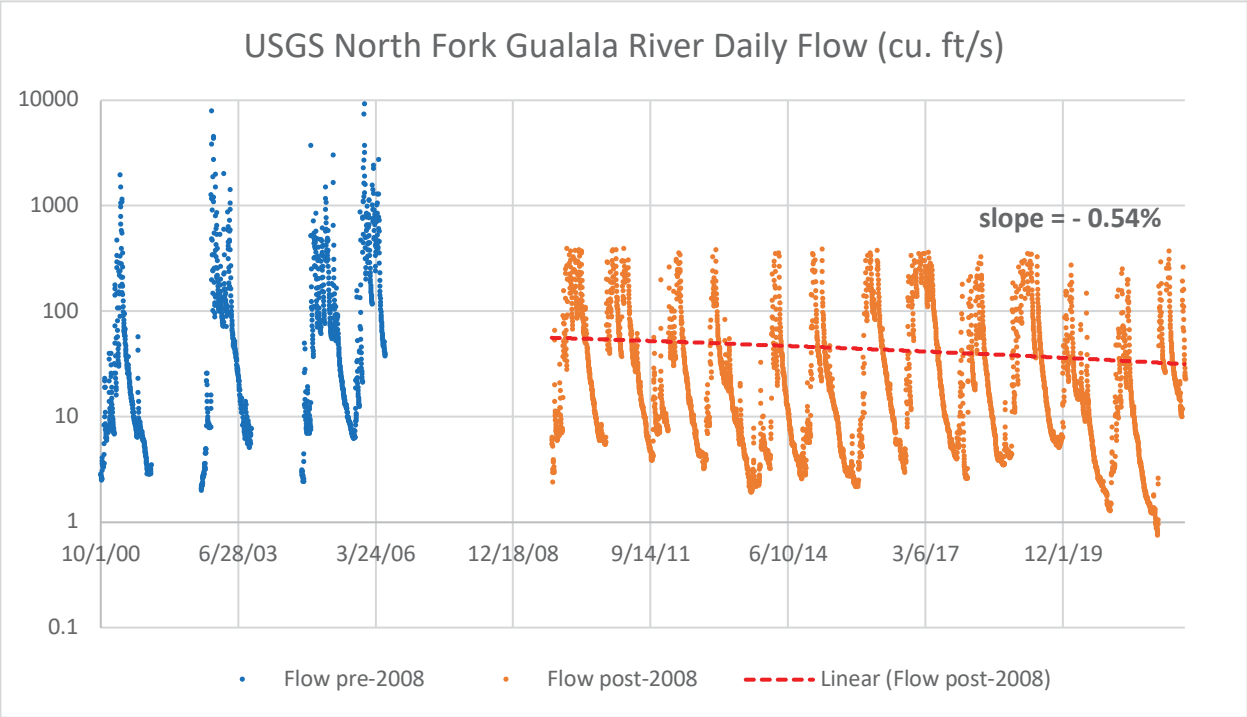
#13

#14

Historically Low Flow Rates in North Fork

On top of the illegal diversions, historically low flow rates have been measured at the USGS Flow Gauge, just downstream of the watershed. These flow rates have been declining at an average annual rate of 0.54% per year for the past 13 years, with the lowest flow rate ever recorded on the North Fork happening just last year!

Chart 5. Flow rates for North Fork Gualala River (cu ft/sec), Source: USGS



Loss of Biomass Corresponds to Decline in Annual Flow

From this data we can see, not surprisingly, that the decline in average annual flow in the North Fork/Little North Fork corresponds closely with the loss of biomass estimated over the past 8 years.

Biomass accumulation: -0.71% / year
Average annual flow: -0.54% / year

Given all of the data provided herein, one can only conclude that approval of this THP will negatively impact both biomass accumulation and flow rates in the North Fork Gualala. This will inevitably put an even greater strain on the NGWC and its customers, the people of Gualala.

Please investigate whether this decrease in biomass as a result of this THP will result in a decrease in annual flow. This investigation must occur before approving this THP.

Plan Fails to Provide Information Required by the California Wild and Scenic Rivers Act

California's Legislature passed the Wild and Scenic Rivers Act in 1972, following the passage of the federal Wild and Scenic Rivers Act by Congress in 1968. Under California law, "Certain rivers which possess extraordinary scenic, recreational, fishery, or wildlife values shall be preserved in their free-flowing state, together with their immediate environments, for the benefit and enjoyment of the people of the state."

The Gualala River is on the list of California rivers receiving state and federal protection under the Wild and Scenic Rivers Act.

#15

Designated wild and scenic rivers are often managed by multiple agencies and in some cases tribal governments. An example of general steps required by these agencies when analyzing a proposed project, and a list of the laws governing these rivers, is laid out clearly in California DOT's Standard Environmental Reference (SER), Volume 1 "Guidance for Compliance", Chapter 19 "Wild and Scenic Rivers":

"1. Interagency Coordination

Consult with the designated river managing agencies as identified in the list of Wild and Scenic Rivers Decision Tree. It may be necessary to also consult with the National Park Service (NPS) Regional Office in San Francisco.

The purpose of this consultation is to determine whether the proposed project could have an adverse effect on the free-flowing characteristics of the river and whether the action could have the potential to alter the river segment's ability to meet the criteria that classify it as wild, scenic, or recreational The results of this consultation must be included in the environmental documentation. If the consultation results in the determination that there would be an adverse effect, subsequent coordination would be required to develop appropriate mitigation measures.

2. Early Coordination Meeting

- Will the proposed project have an adverse effect on the free-flowing characteristics of the river?
- Does the action have the *potential* to alter the river segment's ability to meet the criteria used to classify it as wild, scenic, or recreational?
- Can impacts be avoided by using an alternative design?
- Is mitigation possible and feasible?

3. Report Content

The environmental document shall discuss the issue, all coordination among agencies, any impacts to the qualities that support the river's designation, and any mitigation measures."

[https://dot.ca.gov/programs/environmental-analysis/standard-environmental-reference-ser/volume-1-guidance-for-compliance/ch-19-wild-scenic-rivers].

As far as I can tell, this THP does not mention the Wild and Scenic Rivers Act, nor the fact that the Gualala River is protected under this act. There is no mention of any interagency coordination meeting specific to this act, and no environmental document was produced or provided that discusses the issue.

#15

Clearly, this THP has the potential to alter the Little North Fork river segment. At minimum this THP, and the lack of review and factual cumulative analysis therein, demonstrably undermines and ignores California's Wild and Scenic Rivers Act.

IX. The CDF Reviewer may be implicitly and unconsciously biased

State agencies, including CDF, are bound by ethics laws. One of the key concepts of those laws is that a public agency's decisions should be based solely on what best serves the public's interest. CDF's behind-the-scenes, biased review practice does not uphold the intent of the State's laws and rules, nor does it uphold the part of CDF's stated mission to protect California's natural resources.

"Unconscious bias (UB) arises from a feature of the human brain that helps us make decisions faster via a series of shortcuts. It shapes our perception of the world and our fellow human beings and can lead us to make questionable decisions. It means that we often end up treating people and situations based on unconscious generalizations and preconceptions rather than using a set of objective qualitative or quantitative parameters."
[https://www.elsevier.com/open-science/science-and-society/unconscious-bias]

#16

It is well established that unconscious bias exists in every workplace and at every level of human decision making, from hiring a new employee to reviewing a timber harvest plan. Good people can – and do – make biased decisions.

In my experience with the THP review process, I have found it is quite often the case that the Review Chair on the THP review team is a RPF themself and may already have a personal relationship, through past work or school experiences, with the RPF submitting the proposal. Often these RPF's are alumni of the same University Schools of Forestry, may be or have been members of the same Forestry Clubs, Logging Sports Teams, etc. . These kinds of close associations and kinship, as described, can provide a CDF Review team member with an immediate and undeniable implicit and unconscious bias.

Any CDF reviewer who recognizes an unconscious bias should recuse themselves immediately from reviewing a THP for which the bias exists.

CDF must immediately take steps to tackle unconscious bias:

1. Introduce bias testing.
2. Introduce double blind peer review and/or other forms of peer review for THPs where appropriate.
3. Issue internal briefings to raise staff awareness of the subject and provide tools and resources to further spread awareness among reviewers and staff.
4. Draw attention to UB – and give advice on how it can be reduced – in guides for reviewers and staff.

#16

5. Review and address the gender diversity of reviewers, staff, and applicants.
6. Produce analytics and studies on potential implicit and unconscious bias in the industry.
7. Review and address implicit and unconscious bias at organized conferences and events.
8. Strive for greater transparency and diversity with regards to reviews and reviewers.

X. Conclusion

Given the overwhelming and irrefutable scientific and factual evidence provided throughout this public comment, it is clear that THP 1-22-00029-MEN "Doty", is woefully misguided, has completely failed to provide an accurate cumulative impacts analysis as required by law, and should be denied. The Doty Creek planning watershed should be off limits to any future timber harvesting until adequate cumulative impacts, baselines, and thresholds have been scientifically established, and river base flows have returned to pre-2010 levels.

Sincerely,

Ethan Arutunian
Friends of the South Fork Gualala

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APPENDIX A

UNIT, ER, RPF, CalT 22PC-000000 056

From:	Jeanne Jackson <jackson2@mcn.org>	PC2
Sent:	Wednesday, May 11, 2022 4:03 PM	
To:	Santa Rosa Public Comment@CALFIRE	
Subject:	Timber Harvest Plan No. 1-22-00029 -MEN (Doty)	
Attachments:	McBride Comments on Doty THP 5-8-2022.docx; DECLARATION OF DR. CHRISTOPHER A. FRISSELL on Little THP.pdf	

Hello Cal Fire,
Please enter into public comments:

Evaluation of the Doty Timber Harvest Plan by Joe R. McBride

The following report is referenced in Dr. McBride's evaluation and should also be entered into public comments:

DECLARATION OF DR. CHRISTOPHER A. FRISSELL – Little THP

Two more reports to follow.

Thank you, Jeanne Jackson

Attachments not routed due to volume. They are available for review in the Santa Rosa Forest Practice Office or online at: https://caltreesplans.resources.ca.gov/caltrees

Evaluation of the Doty Timber Harvest Plan

Joe R. McBride

5/8/2022

I. Executive Summary

The following report presents the results of my evaluation of Timber Harvest Plan No. 1-22-00029 -MEN (Doty). My evaluation is based on a review of pertinent documents (listed below), my familiarity with the area of the proposed logging based on prior visits I have made to the area in connection with other Timber Harvest Plans and forestry activities, as well as my experience and expertise in the field of redwood forest ecology and environmental impact evaluation. This report was prepared in response to a request by the Friends of the Gualala River.

Based on the evaluation below my conclusion are that Gualala Redwood Timber Company (GRT) proposed timber harvest plan (THP) will (1) impact the water quality of streams in the Gualala River watershed by increased release of sediment, (2) result in increased stream water temperature detrimental to salmon and steelhead, (3) is vague on the use of herbicides, (4) will result in increased fire hazard, (5) has presented an inadequate analysis of the impact of harvesting on carbon sequestration, and (6) has failed to sufficiently address the impact of the complete harvesting plan on Franklin's Bumblebee, stands supporting Grand fir, Sonoma tree vole, Monterey clover, and the Californis Red-Legged frog.

In addition to my evaluation of the Doty THP, I reviewed depositions prepared by Kamman, Frissell, and Kupferberg concerning the Little THP. Although these depositions do not directly address the Doty THP the do present information and conclusions that are relevant to the Doty THP.

II. Background

I am a registered professional forester in California (license #1306), Fellow of the Society of American Foresters, Charter Member of the California Association of Environmental Professionals, member of the International Society of Arboriculture and a recipient of the Research Award of the International Society of Arboriculture. My education includes a B.S. in Forestry from the University of Montana, M.S. (Forestry) and Ph.D. (Botany) degrees from the University of California, Berkeley.

I am a Professor Emeritus of Forestry and Landscape Architecture at the University of California, Berkeley where I taught courses in forest ecology, forest operations management, urban forestry, and ecological analysis for 44 years. Among the forest ecology courses I have taught was a course in physiological ecology that examines physiological processes in trees in relation to the environment. Because of the relevance of the redwood tree to forestry in California, many aspects of this course dealt with the physiology of the redwood. I also taught Forest Operations Management, a course covered forest road construction and the impacts of heavy equipment on forest soils.

I have published 321 scientific articles, reports and books. These include 35 environmental impact reports focused on impacts to vegetation and 46 vegetation management plans. Of these 81 reports, 15 concerned properties supporting redwood forests.

These reports were prepared for the U.S. National Parks Service, U.S. Army, U.S. Attorney Office, California State Department of Parks and Recreation, Golden Gate National Park Conservancy, Presidio Trust, county planning departments, city planning departments, private landowners, private companies, homeowners associations, conservation organizations, and environmental consulting firms. Seventeen of the scientific articles I have published concerned redwood trees and redwood forests. Among these was an annotated bibliography of the human impacts on redwoods in California Parks. A copy of my current resume is attached.

III. Materials Reviewed

I reviewed the following materials in the course of preparing my analysis:

1. 20220302_1-22-00029-MEN_Sec6.pdf - Archaeology report statement
2. 20220302_1-22-00029-MEN_Sec1.pdf - General information
3. 20220302_1-22-00029-MEN_Sec3.pdf – Site description, Project Alternatives Analysis. Elaboration on Section II 19-21 (h), and 27 (j)
4. 20220302_1-22-00029-MEN_Sec4.pdf - Cumulative Impact Assessments
5. 20220302_1-22-00029-MEN_Sec2.pdf - Item # 14- Silviculture
6. 20220302_1-22-00029-MEN_Sec5.pdf – Soil erosion calculations, erosion, water temperature, embeddedness, canopy cover
7. /Reports/NOF_20220310_093219.pdf – Date of Preharvest inspection
8. 20220321_1-22-00029-MEN_XPHI.pdf – Extension of date of Preharvest Inspection
9. /Reports/THPSecondReviewLetter_20220428_122327.pdf – RPF Questions
10. 20220302_1-22-00029-MEN_1stMemo.pdf – Invitation to review THP
11. 20220302_1-22-00029-MEN_NOI.pdf – Notice of intent to harvest timber
12. 1-22-00029-MEN.zip – Pre-Approval GeoReferenced Map
13. 20220418_1-22-00029-MEN_PHI_Resp-RPF.pdf – NSO Maps
14. 20220302_1-22-00029-Men_1stRTQs – RPF Responses
15. 20220302_1-22-00029-Men_Doty_1st Review CDFW
16. 20220302_1-22-00029-Men_1stRTQs_Resp-RPF Archaeology report sent to Willits and Santa Rosa for review
17. 20220302_1-22-00029-Men fc – Letter from California Geologic Survey
18. 20220302_1-22-00029-Men_PHI_Resp-RPF - PHI Recommended responses
19. scan0486.pdf – scan of topography map
20. 1-22-00029 MEN PHI.pdf - Preharvest Inspection Report from Cal Fire
21. /Reports/PHI_20220408_065404.pdf - Preharvest Inspection Report from Cal Fire (same as above)
22. Deposition by Greg Kamman in a case brought by the Friends of the Gualala against Gualala Redwood Timber concerning the Little THP (Case No. 22-cv-00317-LB, March 17, 2022)
23. Deposition by Christopher A. Frissell in a case brought by the Friends of the Gualala against Gualala Redwood Timber concerning the Little THP (Case No. 22-cv-00317-LB, March 17, 2022)
24. Deposition by Sarah Kupferberg in a case brought by the Friends of the Gualala against Gualala Redwood Timber concerning the Little THP (Case No. 22-cv-00317-LB, March 17, 2022)
25. Report by Greg Kamman estimating sediment yields from Roadway and Skid trails in the Doty Creek THP

IV. Negative Impacts of the proposed Doty THP

(1) Impact on the water quality in the Gualala River watershed by increased release of sediment

Logging operations by their nature disturb forest litter through various means of yarding. This results in erosion during the rainy season. The construction and use of forest roads additionally contributes to sediments reaching streams. These sediment can embed stream gravels and reduce the number and quality of sites where salmon and other fish spawn. I believe the justification of the use of skid trail on slopes greater than 65% presented by GRT [3. 20220302_1-22-00029 ME-Sec 3, page 109 – item 19-21 (h)] is inadequate in view of the intense rainfall the north Coast of California has received in recent years. Climate change has and will continue to result in more intense storm (Allen et al., 2021). Although the GRT concluded that "Implementing the appropriate mitigation measure will minimize potentially significant impacts resulting from ground-based equipment in these areas", the California Geologic Survey raised concerns over the "potential for sediments delivery to the North Fork of the Gualala River" (17. 20220302_1-22-00029-Men fc, page 1). This view is supported by the deposition by Kamman concerning the Little THP when he addresses roadway and skid trail sediment yield logging (22. Deposition by Greg Kamman in a case brought by the Friends of the Gualala against Gualala Redwood Timber concerning the Little THP (Kamman - Case No. 22-cv-00317-LB, March 17, 2022), p. 24 - Exhibit #1). His report presented calculation of sediment yield from some of the same roads that will be used in the Doty THP. Likewise, similar soil types and topographic positions where skid trails will be used in the Little THP are the same soil types and topographic positions that will be logged during the Doty Creek THP. Frissell's declaration also supports my concern over sediment production during logging in the Gualala River watershed. He states, "The cumulative effect of past and ongoing practices in the Gualala watershed that contribute to habitat impairment by excess sediment create a context where even modest or small quantities of additional sediment load, especially chronic suspended fine sediments such as those originating from skid trails and logging roads, cause disproportionate harm to Coho and Steelhead." (23. Deposition by Christopher A. Frissell in a case brought by the Friends of the Gualala against Gualala Redwood Timber concerning the Little THP (Frissell - Case No. 22-cv-00317-LB, March 17, 2022), p. 32/33 – Exhibit A). Calculations present by Greg Kamman (Report by Greg Kamman estimating sediment yields from Roadway and Skid trails in the Doty Creek THP) support my concern over the Impact on the water quality in the Gualala River watershed by increased release of sediment.

#17

(2) Increased stream water temperature will be detrimental to salmon and steelhead

The Doty THP states that "All Class II watercourses within this plan will maintain at least 50% canopy cover. The slight canopy reduction on Class II watercourses is not expected to have a significant effect on adjacent stream water temperatures" (4. 20220302_1-22-00029 ME-Sec 4, page 126). Their assumption of are based on Cajun James' 2003 study of stream temperature in ponderosa pine forest in the Sierra Nevada (James, 2003). She measured reported that angular cover was no less than 80% within in the riparian buffer. No data on angular cover was present by GRT to support their conclusion that their harvesting plan "is not expected to have a significant effect...".

#18

GRT reported stream temperature that ranged from 56°F to 64°F (6. 20220302_1-22-00029-Men_Sec 5, page 216). They reported "This is a suitable water temperature range for salmonids". This data was collected from June 20 to August 2, 2001. This data seem inappropriate in view of its timing (date collection ended on August 2) and the increase in air temperatures and reduction in the duration of summer fog resulting from climate change since 2001 (Johnstone and Dawson, 2010).

A study by Roon et al. (2021) in coastal forests of northern California and Oregon presents data that indicates harvesting within and adjacent to streamside buffers results in increasing stream temperatures. Harvesting reduces the amount of shade on a stream surface and thus stream temperatures increase. Vertical crown canopy cover as proposed by GRT is not an adequate measurement of stream shading. Angular canopy cover and total crown canopy cover measured with a fish eye lens provide better estimates of stream shading. These measurements incorporate heights, widths, and shapes of the tree crowns immediately adjacent to the stream and at various distances from the stream depending on tree density and spacing.

#18

The Doty THP failed to address the cumulative impact of forest harvesting on stream temperatures in the North Fork of the Gualala River watershed. Studies by Pollock et al., 2009 indicate that stream temperature go up in relation to the area of a watershed that has been harvested. This relationship has implications for the Doty timber harvest and future timber harvests in the Gualala River watershed. Taken together, the recent experimental studies measuring stream temperature response to shade loss caused by forest thinning along coastal streams establish that unacceptable summer water temperature increases often occur even with relatively low levels of tree removal within 50-150 feet of stream margins.

GRT reported that "The mean percent canopy density for the stream was 92% (6. 20220302_1-22-00029-Men_Sec page 217). Reducing the canopy cover to 50% will, in my opinion, negatively impact stream temperature.

My conclusion concerning the impact of the Doty THP is similar to the conclusion reached by Frissell in his deposition when he states "By reducing canopy cover and warming these tributaries, the Little THP is reasonably certain to shrink or eliminate cold water thermal refugia, thereby rendering summer habitat in the Little North Fork and North Fork Gualala rivers increasingly thermally hostile to Coho and Steelhead. Canopy removal from logging within the riparian areas of these tributaries is reasonably certain, therefore, to take Steelhead and Coho by reducing the availability of critical summer coldwater refugia at tributary junctions with the Little North Fork Gualala River and in the lower reaches of the North Fork"(Frissell - Case No. 22-cv-00317-LB, March 17, 2022), p. 38/39 – Exhibit A). He further states (p. 40) "The cumulative outcome of all the effects covered above is, in my opinion, an extremely high probability—i.e., beyond a reasonable certainty—of take of Coho and Steelhead by adverse habitat alteration, which, in addition to compounding existing habitat loss and damage, more seriously curtails or reverses the natural processes of habitat recovery that are currently underway on the Gualala River floodplain and nearby slopes."

#19

(3) The use of herbicides

#19

The Doty THP is vague on the use of herbicides. In the section of the THP concerned with silviculture (5. 20220302_1-22-00029-Men_Sec 2 – Item # 14, page 13/14) GRT indicates that herbicides will be used to kill hardwood species. Following the Preharvest Inspection, Patrick Hovland (Cal Fire) advised GRT to revise the THP to state that "either no hardwoods trees treated with herbicides shall be left standing within the Fire Protection Zone along Fish Rock Road or hardwood trees within this Fire Protection Zone shall not be treated with herbicides" (18. 20220302_1-22-00029-Men_PHI_Resp-RPF, Q3). It is unclear to me at this time what decision was made by GRT with regard to herbicide use. If herbicides are to be used, the THP should identify the area or areas where they are to be used, the precautions worker applying the herbicides must take, and the potential impact and mitigations of herbicide use.

#20

(4) Increased fire hazard

The proposed timber harvest will result in increases levels of surface fuels and reduced fuel moisture content. The Doty THP states that " Downed woody debris will be retained post-harvest within the THP (4. 20220302_1-22-00029 ME-Sec 4, p.132). The Doty THP acknowledges that fog drip will be reduced ("...at least temporarily") as a result of the timber harvesting (4. 20220302_1-22-00029 ME-Sec 4 p. 128/129). This increased level of surface fuel and the reduction of summer fog (Johnstone and Dawson, 2010) will result in greater fire hazard. This issue was not addressed in the Doty THP. The issue of treating hardwood trees with herbicides in the Fire Protection Zone in Unit 1 along Fish Rock Road is addressed in part in item (3) above. It is unresolved at this time as to what method (herbicide or tree falling) will be used to eliminate the hardwoods. What is also not explained in the THP is what procedures will be used to mitigate the fire hazard resulting from the herbicide killing and/or falling of the hardwood trees.

#21

(5) Inadequate analysis of the impact of harvesting on carbon sequestration

The discussion of forest management and carbon sequestration in the Doty THP (4. 20220302_1-22-00029 ME-Sec 4, page 178 #5) makes a case for the proposed harvesting on the basis that "...intensively manages commercial forests are more effective in sequestering carbon ...". This depends very much on the age structure of the managed forest and the silvicultural methos used. Clearcutting eliminates the canopy cover and results in the release of carbon dioxide from the soil as the below ground portions to tree and forest litter decay (Simard et al., 2020). Many years of regrowth of trees in clearcuts are required before carbon sequestration reaches preharvest level. The same is true for forest thinning and shelterwood cutting due to the reduction in total tree canopy cover. I do not believe that GRT made a convincing case for "no impact" of the forest harvesting proposed in the Doty THP.

#22

(6) Failure to sufficiently address the impact of the harvesting plan on Franklin's Bumblebee, stands supporting Grand fir, Sonoma tree vole, Monterey clover, and the California Red-Legged frog.

The biological analysis presented in the Doty THP did not recognize the potential presence of the Franklin's bumblebee (14. 20220302_1-22-00029-Men_1stRTQs, page 2) and the existence of the Grand fir Alliance (15. 20220302_1-22-00029-Men_Doty_1st ReviewCDFW, page 3). Mitigation proposed for the potential impacts to this insect and the Grand fir Alliance

#22

were not presented so it is not possible at this time to evaluate them. The Doty THP failed to evaluate any potential impacts of the 41 acre clearcut on the habitat of the Sonoma vole (15. 20220302_1-22-00029-Men_Doty_1st ReviewCDFW, page 2). The botanical survey did not adequately identify a species of clover (identified as *Trifolium sp.)*. Could this clover have been the endangered Monterey clover (*Trifolium trichocalx*)(6. 20220302_1-22-00029-Men_Sec 5, page 221)? It should also be noted that no representative of the California Department of Fish and Wildlife (CDFW) attended the Preharvest Inspection (20. 1-22-00029 MEN PHI, page 1). These shortcomings in the evaluation of impacts on species of special interest and Alliances may have been addressed in subsequent revisions of the Doty THP, but those revisions should have been made available to interested parties. To this concern I would add concerns raised by Kupferberg (24. Deposition by Sarah Kupferberg in a case brought by the Friends of the Gualala against Gualala Redwood Timber concerning the Little THP (Case No. 22-cv-00317-LB, March 17, 2022) over the potential impact to the California Red-Legged Frog. She stated "Harm, harassment, or mortality of individual Red-legged frogs and destruction of habitat they need to reproduce, feed, and/or shelter is reasonably certain to occur given (**a**) the mismatch between 30 ft dry season and 300 ft wet season "no-cut" buffers around aquatic habitat, on the one hand, and empirical studies of radio-tagged frogs showing movement and occupancy at much greater distances away from water, on the other; and (**b**) the mismatch between the small and limited area designated as suitable habitat for Red-Legged Frog by GRT in the THP and the geographically wide extent of Red-legged Frog occupancy in the Gualala River watershed (Exhibit 2 hereto)." Kupferberg futher identifies the problem of the insufficient designof corridor/habitat connectiveity (p.32). This issue was also not addressed in the Doty THP. Although no California Red-Legged Frogs were observed in the proposed Doty logging areas, the silviculture section of the Doty THP (5. 20220302_1-22-00029-MEN_Sec2.pdf - Item # 14-Silviculture, p. 70/71) states "Several potential CRLF habitiat locations have been identified throughtout the biological assessment area including one approximately 1,100 feet south of the THP area at a water drafting hole labeled Map Point WD2". I am concerned that the issues raised by Kupferberg with regard to the Little THP have also not been addressed in the Doty THP with regard to the California Red-Legged frog.

Literature Cited

Allen, R. P., et al. 2021. Climate Change 2021: The Physical Science Basis. Working Group. Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK

James, C. 2003 Ph.D. Thesis University of California at Berkeley 2003: Southern Exposure Research Project: 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 by Cajun Elaine James, Doctor of Philosophy in Wildland Resource Science, University of California, Berkeley, Professor Joe McBride, Chair. Spring 2003 This dissertation is available on file at CDF Office, Redding.

Johnstone, J. A. and T. Dawson. 2010. Climatic context and ecological implications of summer fog decline in the coast redwood region. Proceedings of the National Academy of Sciences 107(10):4533-8

Pollock, M. 2009. Stream Temperature Relationships to Forest Harvest in Western Washington. Journal of the American Water Resources Association Vol. 45 (1):141-156.

Roon, D.A., Dunham J.B., Groom J.D. (2021) Shade, light, and stream temperature responses to riparian thinning in second-growth redwood forests of northern California. PLoS ONE 16(2): e0246822. https://doi.org/10.1371/journal. pone.0246822; Groom, J. D., L. Dent, and L. J. Madsen (2011), Stream temperature change detection for state and private forests in the Oregon Coast Range, Water Resour. Res., 47, W01501, doi:10.1029/2009WR009061.

Simard, S. W. et al. (2020) Harvest Intensity Effects on Carbon Stocks and Biodiversity are Dependent on Regional Climate in Douglas-Fir Forests of British Columbia Front. For. Glob. Change. 2020-July-24.

Joe R. McBride
Consulting Forest Ecologist
Berkeley, CA 94703

Education:

B.S. (Forestry) - University of Montana - 1960
M.S. (Forestry) - University of California, Berkeley - 1964
Ph.D. (Botany) - University of California, Berkeley - 1969

Employment:

Assistant Professor. Department of Forestry. Iowa State University. 1969-70.
Assistant Professor, Associate Professor, Professor. University of California. 1970-2014.
Chair, Department of Forestry, University of California, 1986-89
Chair, Department of Environmental Science, Policy, and Management, University of California, 1996-98.
Chair, Forest Science Division, University of California. 1996-2003.
Emeritus Professor. University of California. 2014-present.
Visiting Professor of Hydrology. Department of Science, University of Navarra, Pamplona, Spain 2009-2018.

Teaching:

Courses in urban forestry, landscape ecology, forest ecology, and hydrology.

Research:

Studies concerned with urban forestry, forest ecology, forest succession, and riparian woodland ecology.

Professional Experience:

Worked as a consultant in the fields of urban forestry, vegetation analysis, and management for over 40 years. Served as an advisor to federal, state, regional, county, and city agencies. Registered professional forester in California (license #1306).

Professional Affiliations:

American Association for the Advancement of Science
American Society of Landscape Architects
California Botanical Society
Ecological Society of America
International Society for Landscape Ecology
International Society for Arboriculture
Society of American Foresters
Society for Restoration Ecology

Awards:

Merit Award for Stanford University Vegetation Management Plan. ASLA. 1983
Resources Preservation Award for San Francisco Presidio Study. National Resources Council. 1987
Distinguished Teaching Award. University of California. 1991
Carl Alwin Schenck Award for Distinguished Teaching. Society of American Foresters. 1992
Honor Award for Sutro Baths Historic Restoration Plan. ASLA. 1993
Donald P. Gasser Award for Distinguished Contributions to Forestry Education. University of California 1997.
Fellow Society of American Foresters. 1997
Research Award International Society of Arboriculture– 2003
Elected Member of the Chinese Academy of Forestry – 2004
The Outstanding Educator Award. Council of Educators in Landscape Architecture, 2009

Publications:

321 books, articles and research reports concerning various aspects of forest ecology, vegetation management, and urban forestry

Community Service:

Blue Ribbon Fire Management Committee, EBRPD, Oakland, CA - 1982 to 1983

Task Force on Prescribed Burning in the National Parks, NPS - 1986 to 1987
Task Force on Biological Diversity, SAF, Washington, DC - 1987 to 1989
Advisory Task Force on Vegetation Management in the National Parks of China - 1992-94
California State Forests Advisory Committee, Sacramento, CA – 2005-2007
Hill Fire Committee, UC Berkeley – 2010-2015

APPENDIX A

From: Jeanne Jackson <jackson2@mcn.org>
Sent: Wednesday, May 11, 2022 4:05 PM
To: Santa Rosa Public Comment@CALFIRE
Subject: Timber Harvest Plan No. 1-22-00029 -MEN (Doty)
Attachments: DECLARATION OF GREG KAMMAN - Little THP.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Cal Fire,
Please enter into public comments:

The evaluation of the Doty Timber Harvest Plan by Joe R. McBride was previously emailed to you.

The following report is referenced in Dr. McBride's evaluation and should also be entered into public comments:

DECLARATION OF GREG KAMMAN – Little THP

Thank you, Jeanne Jackson

Attachments not routed due to volume. They are available for review in the Santa Rosa Forest Practice Office or online at: https://caltreesplans.resources.ca.gov/caltrees

APPENDIX B

November 11, 2019

TO: John Bennett, Forest Manager
Gualala Redwood Timber, LLC
PO Box 197, 39951 Old Stage Road
Gualala, CA 95445

FROM: Matthew O'Connor, PhD, CEG #2449 (Exp. 10-~~31-21~~)
President and Principal Geomorphologist/Hydrologist

PROFESSIONAL GEOLOGIST ★ M.D. O'Connor No. 2449 CERTIFIED ENGINEERING GEOLOGIST ★ STATE OF CALIFORNIA

Jeremy Kobor, MS, PG #9501
Senior Hydrologist

PART OF PLAN

SUBJECT: Response to '*Review of OEI Reports for the Little North Fork Gualala River, Timber Harvest Plan (THP) 1-18-095 MEN*' by Kamman Hydrology & Engineering, dated October 2, 2019

Overview

Kamman Hydrology & Engineering's (Kamman's) primary review comment is as follows: "*many of the findings presented in these reports are inaccurate due to the significant underestimation of the flow magnitude for the 20-year recurrence interval event on the Little North Fork Gualala River.*" We have carefully reviewed the discussion and data analysis presented by Kamman and have also reviewed our original analysis and completed some limited additional data analysis. We remain confident in the validity of our estimate of the magnitude (instantaneous discharge) of the 20-yr recurrence interval flood as presented in our March 21, 2019 "Floodplain Study for the Little North Fork Gualala River" (Floodplain Study). We acknowledge that there is uncertainty associated with estimating flow magnitudes and the associated floodplain inundation in any ungauged watershed.

Estimating floodplain inundation in the Little North Fork Gualala is further complicated by the effect of flood elevations of the North Fork Gualala on flow dynamics of the Little North Fork. Flood waters of the North Fork determine the hydraulic base elevation of the Little North Fork in a manner akin to the effect of ocean tides on estuary water levels that create a backwater zone. When the tide is high, incoming flows from a river encounter the ocean elevation farther upstream, and during periods of flood, the effect of backwater is to redistribute incoming river water laterally, vertically, and upstream depending on the river discharge, channel slope and channel geometry. Likewise, the fluctuating elevation of the North Fork Gualala River creates backwater that affects the depth and extent of inundation on the Little North Fork floodplain. Our prior analyses used the hydraulic base elevation in the North Fork Gualala associated with the recent flood event of February 2019; in hindsight, we recognized that the February 2019 flood was probably less than that of the 20-yr flood. Consequently, we have updated the simulation described in the Floodplain Study by adopting a more conservative backwater elevation for the North Fork Gualala from historic silt deposits on redwood trees that is 1.7 ft higher than the February 2019 flood. The result of the supplemental hydraulic simulation shows that the extent of increased inundation of the floodplain

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APPENDIX B

is quite limited (Figure 4). This strongly suggests that the extent of flooding in the Little North Fork is not very sensitive to the backwater elevation of the North Fork for floods with recurrence intervals between 5 and 35 years.

The following response to Kamman's comments is organized based on Kamman's subject headers.

Floodplain Study-Similarity of Flow Magnitudes between Navarro and Gualala River

Kamman states that *"They do not include the area-normalized runoff rate for the North Fork Gualala River gauge, stating it was not operated from 2000-2006".* We did not state that this gauge was not operated, on the contrary we stated on page 5 of the Floodplain Study that *"The North Fork Gualala gage not included in the analysis was operated from 2000-2006"* and that *"Stage data is available for this gage, however high flow discharge data is not available for hydrologic analysis due to a lack of flow measurements and rating curve development during high flow conditions."*

It is our practice to review the field measurements of streamflow that provide the basis for developing rating curves and calculating discharges to evaluate their accuracy and understand the expected uncertainty associated with the discharge data prior to working with stream gauge data for analyses such as this. As part of our original analysis we considered using the discharges from the North Fork Gualala gauge; however, we found that the highest measured discharge used in the rating curve for the gage was only 1,410 cfs, which is grossly insufficient for calculating streamflow of 13,600 cfs such as was reported for the December 2005 flood.

Additionally, it is readily apparent from Figure 1 of Kamman's review that the annual peak discharges for this site (particularly the 2003 peak) are unrealistically high compared to those from the Navarro River and South Fork Gualala gauges. To further illustrate this point, we have compiled peak discharges at four nearby gauges with available data for the three water years with published annual peak discharges at the North Fork Gualala gauge which demonstrates that the peak flows at the North Fork gauge are unrealistically high, ranging from 136% to 800% of those reported at regional stations (Table 1). Based on the limited extent of high flow measurements used to construct the rating curve for the North Fork Gualala gauge and the anomalously high annual peak discharges, we concluded that the discharge data for this site was unreliable and therefore we did not use it in our analysis. It is also worth noting that the USGS stopped publishing high flow discharge data after water year 2006, presumably because of the lack of high flow discharge measurements available to constrain the rating curve.

Table 1: Comparison of area normalized annual peak discharges in units of cfs/mi^2 between the North Fork Gualala River gauge and four nearby gauges.

Gauge Location	North Fork Gualala River	Noyo River	Navarro River	Wheatfield Fork Gualala River	South Fork Gualala Above Wheatfield
USGS Station ID	11467553	11468500	11468000	11467485	11467295
Water Year 2003	488	61	100		
Water Year 2005	190	30	25	95	160
Water Year 2006	289	129	205	195	212

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Floodplain Study-Flood Frequency Analysis of South Fork Gualala River

Kamman's principal assertion under this heading is that the South Fork Gualala gauge record provides a more accurate means of estimating flood flows in the Little North Fork Gualala. We concur that USGS's Bulletin 17B protocols suggest a minimum length of annual peak flow records of 10 years. However, when shorter periods of record are used to perform flood frequency analyses, the uncertainty and error associated with those estimates may be quite high, and the accuracy of the estimates is expected to increase in relation to the length of record (e.g. Feaster, 2010). We considered performing a flood frequency analysis on the 12 years of data from the South Fork Gualala River near Sea Ranch gauge. A review of the field measurements for this site suggests that the rating curve is well-constrained at higher flows. However, field measurements are not available for the South Fork Gualala River near Annapolis gauge making it difficult to verify the completeness of the rating curve and thus the 21 years of annual peak flow data. We were reluctant to use these data without being able to verify the quality of the underlying rating curve, particularly considering the potentially erroneous discharges published at the nearby North Fork gauge as discussed above. If, despite the foregoing concerns, the data were to be used in combination with the 'Near Sea Ranch' data as Kamman has presented, the 33 year record would have greater uncertainty than the 69 year record from the Navarro River gauge that we chose to utilize for our analysis.

In addition to the issue of the duration of hydrologic records and associated uncertainty, there are other watershed factors to consider when evaluating alternative watershed hydrologic records for purposes of estimating flows in an ungauged watershed. Kamman presents no evidence that the South Fork Gualala watershed is more representative of the Little North Fork Watershed than the Navarro River watershed. In reviewing our selection of the Navarro River hydrologic data as the basis for estimating peak flows in the Little North Fork, we conducted some additional investigation of watershed hydrologic factors comparing the Navarro, the South Fork Gualala, and the Little North Fork Gualala. Our investigation suggests that the characteristics of the Navarro watershed more closely match those of the Little North Fork Gualala than do those of the South Fork Gualala. To help illustrate this point, we compared proximity, precipitation and soil conditions between the three watersheds. In terms of distance, both gauged watersheds are located a similar distance from the Little North Fork watershed. However, the centroid of the Little North Fork is slightly closer to the centroid of the Navarro than it is to the centroid of the South Fork (Figure 1, Table 2).

Table 2: Comparison of proximity, precipitation, and soil properties between the Little North Fork Gualala River, the Navarro River, and South Fork Gualala River watersheds; mean annual precipitation from Flint & Flint (2014), 25-yr, 24-hour storm depth from NOAA Atlas 14, and saturated hydraulic conductivity from USDA (2007). All values are watershed averages from spatially distributed data.

	Distance to Centroid of Little North Fork Watershed (miles)	Mean Annual Precipitation (in)	25-yr 24-hr Precipitation (in)	Mean Soil Saturated Hydraulic Conductivity (micro m/s)
Little North Fork Gualala River		49.8	8.3	23.8
Navarro River	17.8	46.6	7.3	16.7
South Fork Gualala River	18.4	57.0	9.9	8.1

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The South Fork experiences significantly more precipitation than the Little North Fork and most other watersheds in the region. Based on mean annual precipitation data from the regional rainfall-runoff simulation Basin Characterization Model (Flint & Flint, 2014), the South Fork receives approximately 14% more precipitation on an annual basis than the Little North Fork (Figure 1). Based on the NOAA Atlas 14 dataset, the South Fork also receives 19% more precipitation than the Little North Fork during the 25-year, 24-hour storm (Figure 2, Table 2). In comparison, the Navarro is somewhat drier than the Little North Fork receiving approximately 7% less precipitation on an annual basis and 12% less during a 25-yr 24-hr storm.

Aside from precipitation, another critical factor controlling peak discharges is the capacity of the soil to infiltrate water. A commonly used measure of this capacity is the soil saturated hydraulic conductivity (K-sat). We compiled K-sat data for the three watersheds from the Soil Survey Geographic Database (USDA, 2007) and found that the average K-sat for the South Fork is only 34% of the value for the Little North Fork, whereas the average value for the Navarro is 70% (Figure 3, Table 2). The lower K-sat values in the gauged watersheds would be expected to result in higher runoff rates relative to the Little North Fork; however, the average soil infiltration capacity in the Navarro is more representative of the Little North Fork than that of the South Fork. The low K-sat values in the South Fork suggest that this watershed would generate relatively high rates of runoff per unit of precipitation during high-magnitude, low-frequency storm events compared to the Little North Fork.

In summary, it is our opinion that estimated peak flows in the Little North Fork watershed based on flood frequency analysis for the Navarro River are reasonable. We believe that estimating peak flows for the Little North Fork based on flood frequency analysis for the South Fork Gualala would overestimate peak flows in the Little North Fork. The longer period of record and verifiable rating curve for the Navarro reduces uncertainty in the estimates relative to uncertainty associated with estimates that could be made from the South Fork hydrographic data. More importantly, precipitation and soil characteristics believed to strongly influence peak flow magnitudes of the Navarro are more representative of the Little North Fork than those of the South Fork.

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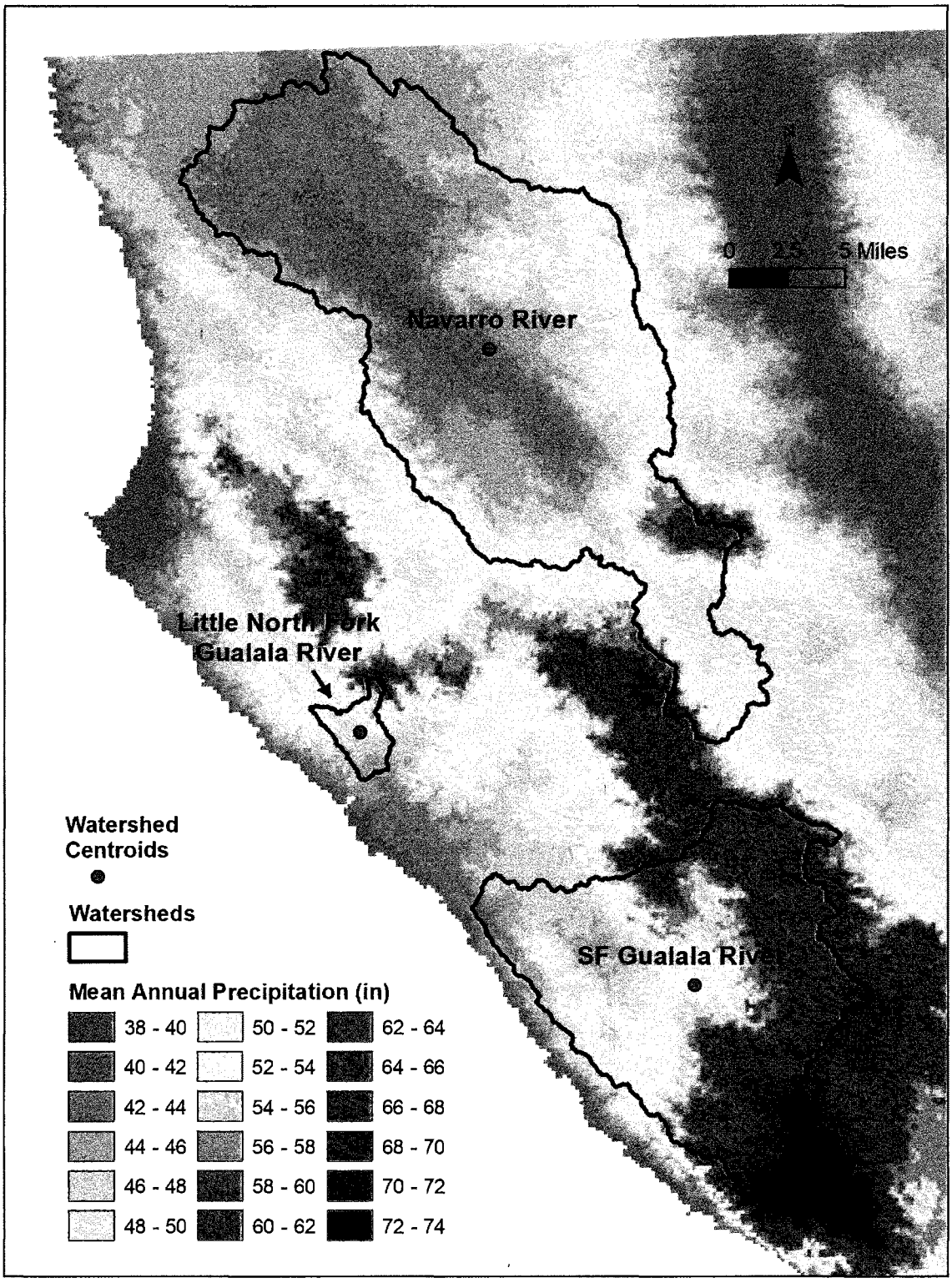

Figure 1: Mean annual precipitation from 1981-2010 (Flint & Flint, 2014) in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds.

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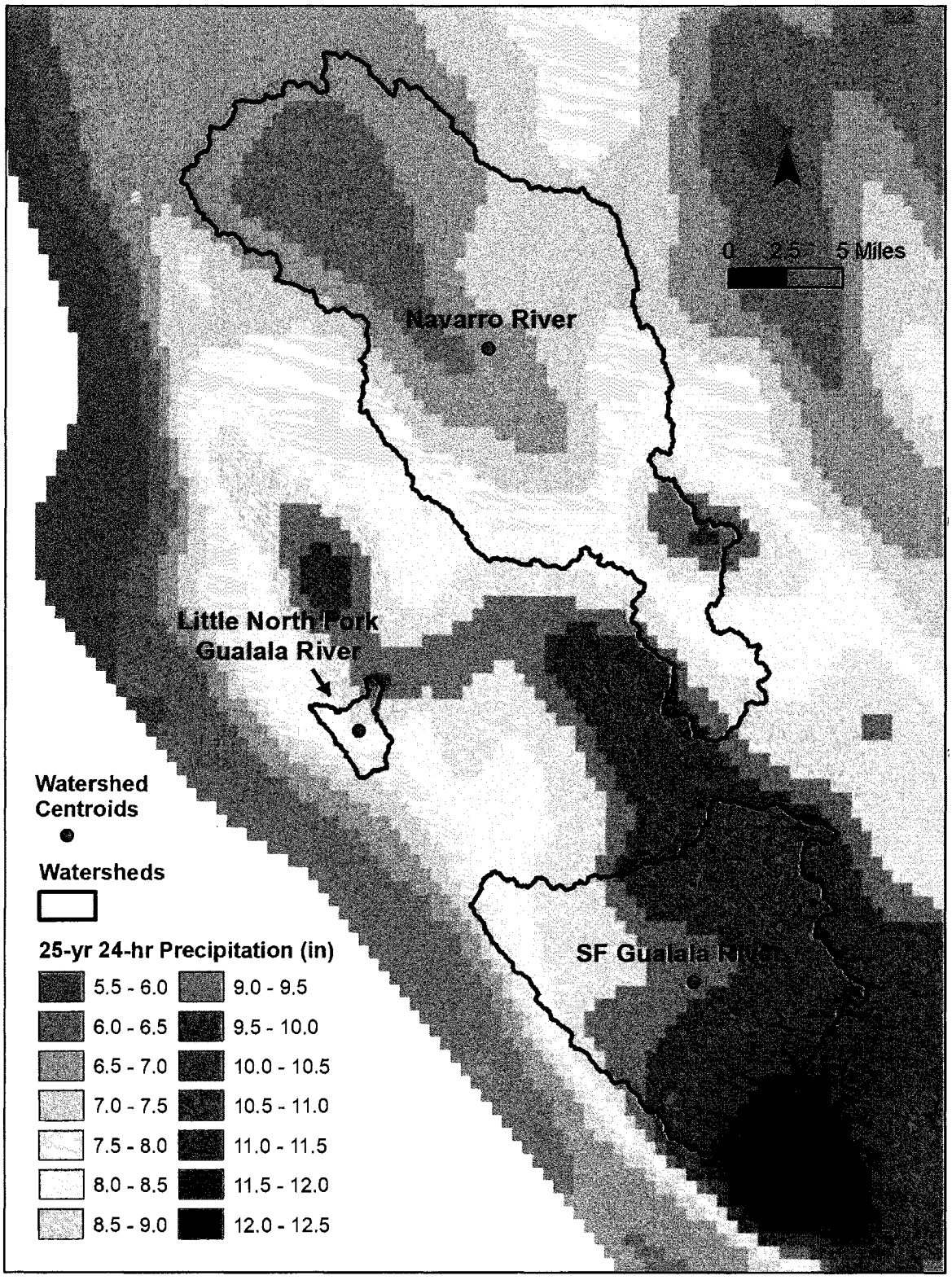

Figure 2: NOAA Atlas 14 25-yr 24-yr total precipitation in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds.

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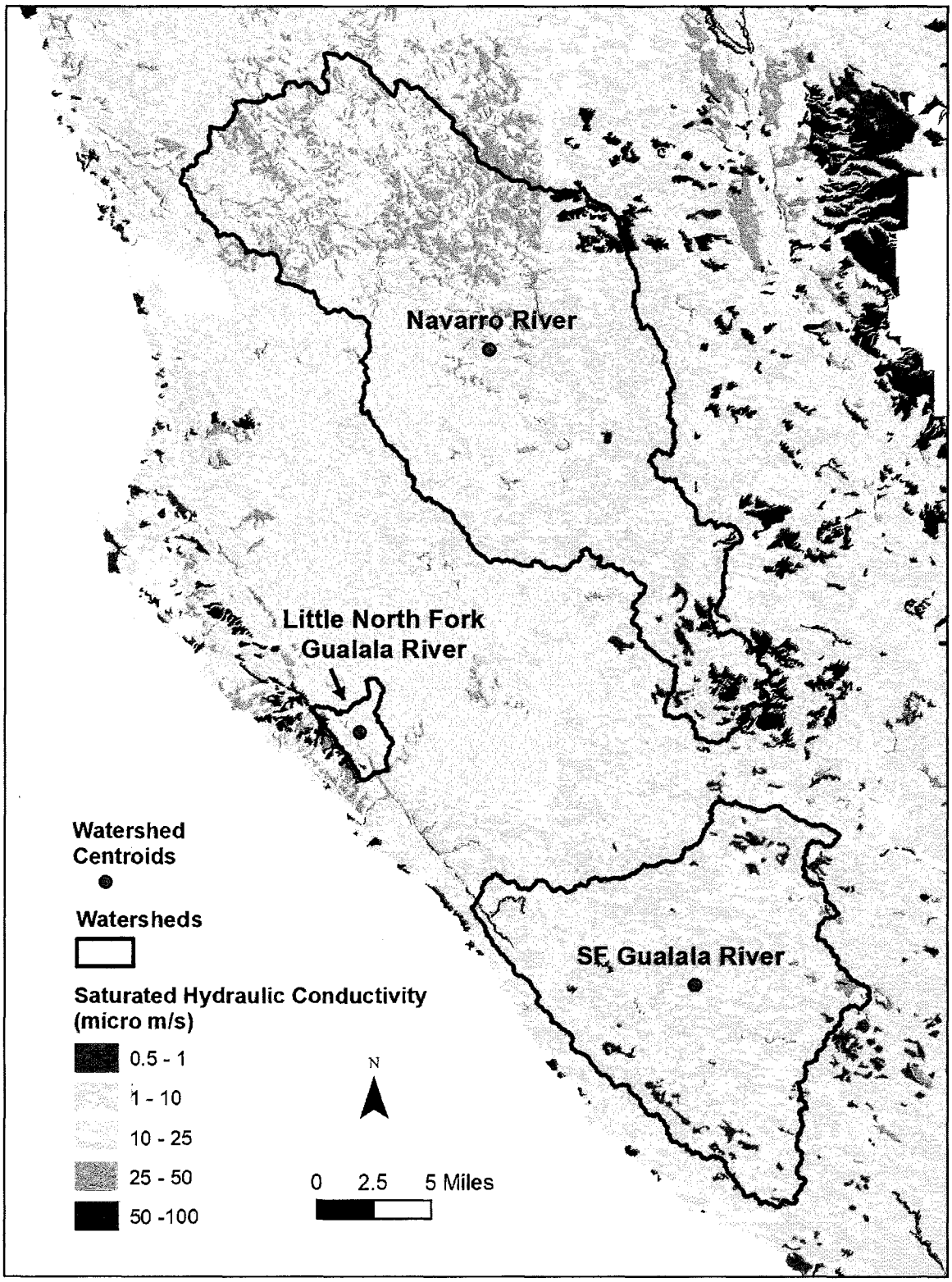

Figure 3: Soil saturated hydraulic conductivities (Ksat) in the Little North Fork Gualala River, Navarro River, and South Fork Gualala River watersheds (USDA, 2007).

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Comments on Floodplain Inundation Duration Study Report

Kamman's comments pertaining to OEI's July 10, 2019 report "Floodplain Inundation Duration Study for the Little North Fork Gualala River" (Inundation Duration Study) suggest that (1) the area and duration of inundation are inaccurate because the 20-yr flood magnitude has been under-estimated (as discussed above), and (2) OEI also utilized incorrect (lower) flood elevations of the North Fork Gualala for the downstream boundary condition used in the Inundation Duration Study. With regard to the first component of Kamman's comment, we believe that our estimates of the flood magnitude (instantaneous discharge) for the Little North Fork based on the Navarro River hydrologic record are the best available (as described above).

The second component of Kamman's comment suggests that the model significantly under-estimated downstream water surface elevations based on a reproduction of OEI's Figure 4 from the July 10, 2019 report in which Kamman superimposed the stage data from the North Fork Gualala USGS gauge. The data plotted as North Fork stage on Figure 4 is the same measured data from the North Fork gauge and represents the boundary condition imposed on the model rather than elevations simulated by the model. Unfortunately, OEI's Figure 4 contained a mislabeled secondary y-axis on that plot which should read "water surface elevation (meters)". The time series was generated directly from the USGS stage data, which is not explicitly tied to an elevation (i.e. the published stage data reference a local datum). In order to utilize the USGS stage data, we conducted a local topographic survey so that we could convert the reported stage data to an elevation based on the LiDAR-determined elevation of the ground surface near the USGS gauge. We then converted the gauge elevation to units of meters to conform to the operational units system of the model. Consequently, the maximum stage at the gauge of approximately 19-ft is equivalent to a maximum water surface elevation of 14-meters as shown on Figure 4. Since we directly used the USGS North Fork stage data to derive our downstream water level boundary, the model conforms directly to the gauge data.

Setting aside the misunderstanding regarding the downstream water level boundary condition used for modeling in the Inundation Duration Study, Kamman suggests that the water level used in the model from the North Fork gauge during the February 2019 event was significantly less than a 20-yr water level. As discussed in our reports, we considered various options for estimating the downstream water level and elected to use the peak stage from the February 2019 flood event. Estimating the recurrence interval associated with a given water level in the North Fork (for a steady-state model) is inherently difficult because of the limited period of record and lack of high flow gauging for the North Fork gauge. Compounding the difficulty further, the site is subject to backwater flooding from the South Fork so the stage/discharge relationship may be complex and depend in part on the relative timing of peak precipitation intensities and durations associated with the a given storm event affecting the North and South Forks of the Gualala. Unfortunately, it is not possible to use water levels from the North Fork gauge for the 2005 event because the gauge was since moved from that location and the USGS only georeferenced the gauge elevation to the nearest 10-ft contour (USGS, personal communication). We were fortunate to have a significant flood event that could be directly observed coincident with our analyses and to have had the water level recorded at the North Fork gauge. Without this data, the only means of estimating an appropriate time-varying downstream water level suitable for inundation duration analysis (i.e. for a simulation of unsteady flow) would be developing and calibrating a combined hydrologic and hydraulic model of both the North and South Forks, an effort which would present a host of technical issues and was judged to be far beyond the scope of the analyses we intended.

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In our review of Kamman's comments, we recognized that there is evidence that the February 2019 flood was less than a 20-yr event as we implicitly assumed in our original simulation described in the Floodplain Study. The recurrence interval of the February 2019 flood on the Navarro was less than 10 years, and, assuming the shorter data record for that gauge produces reliable flood frequency estimates, Kamman is correct that the discharge on the South Fork for the February 2019 event represents approximately a 5-yr flood on that river. Notwithstanding the aforementioned difficulties of determining the most appropriate water level in the North Fork for use in hydraulic models of the Little North Fork, we have elected to re-run the steady-state model described in the Floodplain Study using a more conservative (higher) downstream water level boundary condition as discussed below.

During development of the steady-state model for the Floodplain Study, we surveyed observable high-water marks in the form of a set of historic silt lines on mature redwood trees as shown in Figure 6 of the Floodplain Study. These high-water marks extend about 0.25 miles upstream from the confluence of the Little North Fork and North Fork and were found to be about 1.7 ft higher (47.5 ft NAVD88) than the February 2019 flood event as recorded at the North Fork gauge (45.8 ft NAVD88). The particular flood event associated with these high-water marks is unknown; however, the most recent flood larger than the 2019 event for which hydrographic data are available was the December 2005 flood, which was approximately a 35-yr flood on the Navarro based on our flood frequency analysis. The South Fork Gualala gauge was not in operation at that time. We used the water elevation represented by these high-water marks to provide a more conservative model simulation of the extent of floodplain inundation in the Little North Fork.

As shown in Figure 4, the difference in the extent of inundation resulting from the more conservative boundary condition is small. This suggests that the lateral extent of flooding in the Little North Fork is not very sensitive to the backwater elevation of the North Fork for floods with recurrence intervals between about 5 years (estimated recurrence interval of the 2019 flood on the South Fork Gualala per Kamman) and about 35 years (estimated recurrence interval of 2005 flood on the Navarro River presumed to be associated with high water marks).

Comments on Channel Migration Zone Evaluation Report

Kamman's comments are general in character and presented in two bullet-point paragraphs. In the first paragraph, Kamman offers several general statements regarding the relationship between overbank flow, floodplain features, and channel migration processes. He states that it "would be helpful to know" how a range of flood flows interact with floodplain channels, that "channel avulsion may be a long-term process and dependent on flow magnitudes", and that "channel avulsion may be an episodic process triggered by flows with recurrence intervals greater than the 20-year recurrence". He asserts that the absence of evidence of channel migration is inconclusive, and that historic and/or future channel migration may occur. This set of statements is not so much a critique of the OEI report as it is a statement of an initial set of questions that would likely occur to a researcher setting out to better understand channel migration phenomena. The OEI report performed the CMZ evaluation per guidance set forth by the State of California and identified and discussed evidence of contemporary and potential future channel migration observed in the field.

Kamman's second bullet-point paragraph suggests that the CMZ evaluation did not consider the possibility that secondary or floodplain channels might represent filled-in channels and could provide evidence of past channel migration. That possibility was considered, but despite observations of numerous floodplain

flow features (sometimes classified as Class III channels by the RPF), we did not observe compelling evidence indicating that these were filled/abandoned channels. If such were the case, we would have expected to observe vegetative evidence in the form of linear/arcuate stands of seral vegetation (typically trees) in the 60-year aerial photo history of the area. We concluded that there was evidence of channel migration manifested by relatively short secondary channels associated with islands along a narrow strip associated with the existing primary channel.

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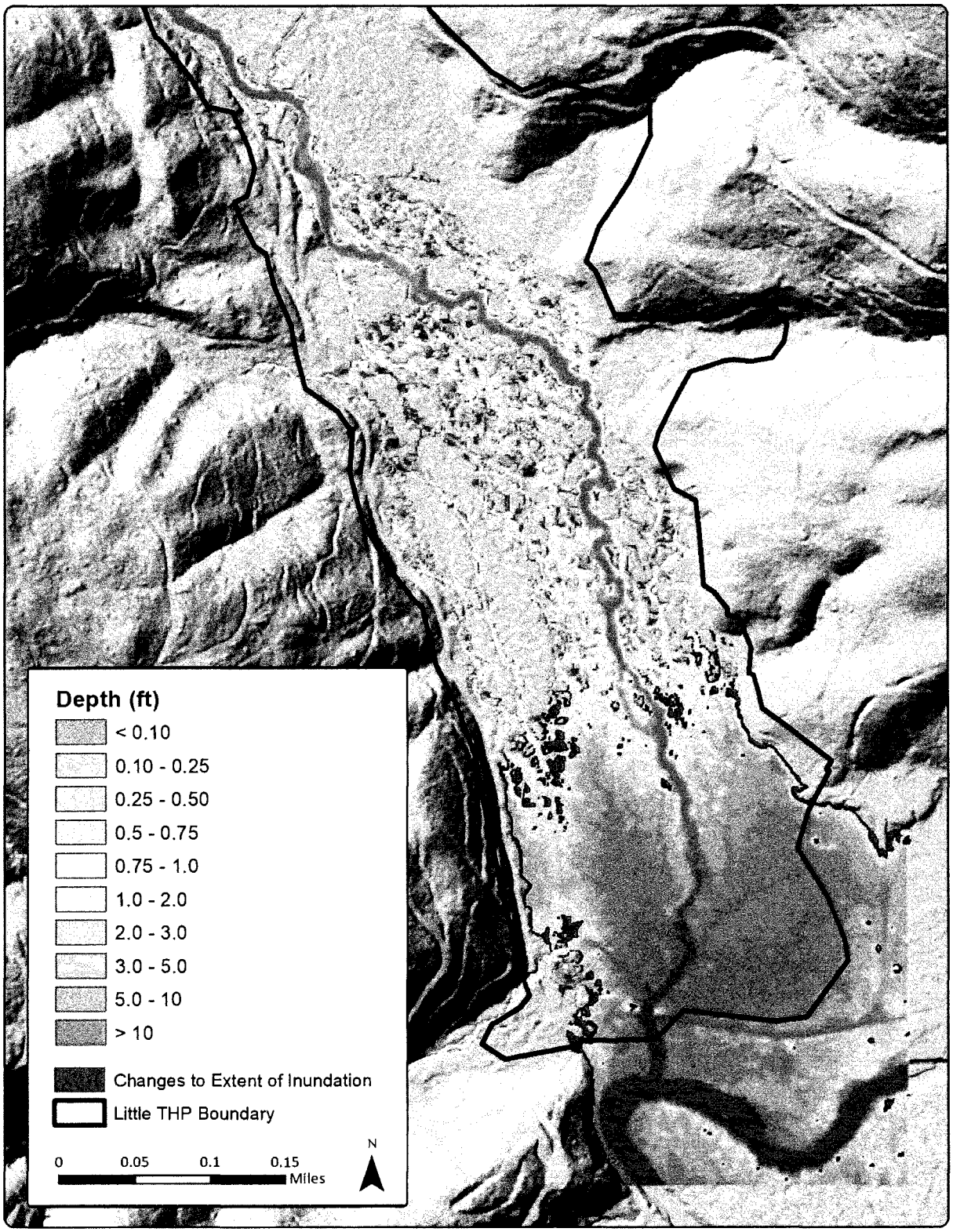

Figure 4: Revised extent and depth of inundation of the estimated 20-year flood in the Little North Fork Gualala River emphasizing areas of change in comparison with the Floodplain Study (March 21, 2019).

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PACIFIC WATERSHED ASSOCIATES INC.

PO Box 4433 • Arcata, CA 95518-4433
Phone 707-839-5130 • Fax 707-839-8168
www.pacificwatershed.com

Date: January 21, 2021

To: John Bennett, Forest Manager
Gualala Redwood Timber, Inc.
P.O. Box 197
39951 Old Stage Road
Gualala, CA. 95445

From: Danny Hagans, Principal Earth Scientist
Pacific Watershed Associates
P. O. Box 4433, Arcata, CA 95518
(707) 839-5130, dannyh@pacificwatershed.com

Subject: Comments on the Proposed Far North THP 1-20-00150 MEN, Little THP 1-18-095 MEN and the Elk THP 1-19-098 MEN, as well as on the analysis provided by Kamman Hydrology & Engineering, Inc. on behalf of the Friends of Gualala River.

Introduction

My name is Danny Hagans, and I am a Principal Earth Scientist at Pacific Watershed Associates (PWA), a geological and environmental engineering consulting firm with offices in McKinleyville and Petaluma, California. Our 35-person environmental firm specializes in science-based watershed and fisheries restoration and protection work throughout northern and central California, and elsewhere. Our staff includes licensed and certified geologists, engineering geologists, water resource engineers, erosion and sediment control specialists, certified stormwater specialists and trainers, as well as hydrologists, fisheries biologists and botanists. I am coauthor of the *Handbook for Forest, Ranch and Rural Roads* (PWA, 2015) and Part X of the California Salmonid Stream Habitat Restoration Manual, titled *Upslope Erosion Inventory and Sediment Control Guidance (CDFW, 2006)*. These manuals and guidance documents have been funded and adopted by various state and federal agencies as the standard of practice. PWA has also played a substantial role in developing TMDL sediment source investigations and recovery targets related to sediment for the US EPA and NCRWQCB in the Gualala River watershed, as well as many other North Coast watersheds.

Because of our past extensive work on properties owned by Gualala Redwood Timber (GRT), and at the request of John Bennett, GRT Forest Manager, I have prepared a brief summary concerning our two decades of on-the-groundwork conducting road erosion assessments, restoration planning activities, and road "storm-proofing" on the former Gualala Redwood, Inc. (GRI) timberland properties, now owned and managed by GRT.

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My comments herein are specifically related to comments recently received by CAL FIRE regarding the proposed Far North THP's 1-20-00150 MEN, Little THP 1-18-095 MEN and the Elk THP 1-19-098 MEN from Kamman Hydrology & Engineering, Inc. (Kamman) dated November 20, 2020 in which they described their analysis and estimates of roadway sediment yield to the Gualala River and some of its tributaries. My comments will serve to: 1) document and illustrate the faulty assumptions employed in the Kamman estimates to derive the calculated sediment yield from forest roads in the 3 THP areas; and 2) describe and present evidence that all the roads within these THP areas and beyond were aggressively treated to hydrologically disconnect road surfaces and cutbanks from local streams in 2003, thereby dramatically decreasing sediment yields from road surfaces, ditches and cutbanks by over 90%, compared to what they would have been had the work on GRI properties not been done. The road storm-proofing measures PWA designed and that were performed were approved and jointly funded by state of California watershed restoration grants.

Background

PWA principals and professional staff has been refining the methods for, and conducting, watershed restoration activities at a significantly large geographic scale throughout public and privately-owned coastal watersheds in California for more than 3 decades. Specifically, the large body of work undertaken and completed by PWA over the last 30 years includes field-based sediment source investigations and studies that have led to the implementation of comprehensive, on-the-ground "road storm-proofing" projects involving literally thousands of miles of public and private road systems in California to protect water quality and contribute to the restoration of aquatic habitats as well as the restoration, recovery and protection of salmonids. These implementation projects have involved both: a) road upgrading to improve road drainage designs and drainage structures to accommodate 100-year recurrence interval streamflow events; and/or b) road decommissioning and road closure projects to significantly limit future erosion and sediment delivery from poorly located and designed roads that are either abandoned or no longer needed for access or future land management for an indeterminate amount of time.

In the late 1990's, PWA working in conjunction with the Sotoyome Resource Conservation District (SRCD), Santa Rosa, CA, (now known as the Sonoma RCD) initiated salmon recovery and protection efforts on several large rural subdivisions in both the Gualala River tributary Fuller Creek watershed near Annapolis, as well as in the upper South Fork Gualala River headwaters near Cazadero. These erosion and sediment control efforts were primarily funded by the California Department Fish and Game (CDFG) Fisheries Restoration Grant Program (FRGP) and constituted nearly 70 miles of road upgrading and storm-proofing to eliminate/reduce road erosion and sediment impacts to nearby streams, and eliminate future cumulative watershed impacts from the treated road systems.

Doty Creek Planning Watershed and Comments on the Far North, Little, and Elk THP's

In about 2000, the SRCD, on behalf of the non-profit Gualala River Watershed Council (GRWC) and PWA, applied for and received a CDFG FRGP Grant (#P9985012) to conduct the initial sediment reduction and salmonid recovery planning project on the GRI lands in the whole of the 7 mi^2 Little North Fork Gualala River (LNFGR) watershed, which constitutes the complete Doty Creek Planning Watershed Area. This area encompasses all the lands included in the Far North and Little THP's and a portion of the Elk THP. Over the next work year PWA professionals conducted

field-based inventories of all 45 miles of drivable and abandoned (non-drivable) roads in the Planning Watershed to identify, quantify, and develop preventative erosion control treatment plans to minimize ongoing and future anthropogenic sediment sources from degrading water quality and salmonid habitat.

In April 2002, the pre-requisite planning assessment project was completed, and the final report was provided to CDFG, along with a follow-up grant proposal seeking matching implementation funding to "storm-proof" the 45 miles of assessed roads in the LNFGR watershed (see Attachment A: PWA 2002 CDFG Watershed Assessment and Erosion Prevention Planning Project, LNFGR Watershed, Mendocino County Final Report). The road erosion assessment report identified 224 sites of current or potential erosion and sediment delivery risk from stream crossing, landslide and gully erosion sites, as well as 17 miles (38%) of mapped and field measured hydrologically connected roads in the LNFGR. The field-based erosion assessment estimated a total of 64,480 yd^3 of future erosion and sediment delivery (i.e., 31,235 yd^3 from the 224 sites of large storm generated episodic erosion, as well as 33,245 yd^3 of expected chronic, fine sediment delivery from the hydrologically connected roads and road segments over the next 2 decades, using the same methods utilized by Kamman but based on field measurements) would be prevented from entering the stream network in the LNFGR assessment area by implementing the erosion control plan.

In 2003, the SRCD received CDFG FRGP grant funding (CDFG contract #P0140405) to conduct the first comprehensive GRI basin-wide storm-proofing implementation project in the 7 mi^2 LNFGR watershed. Between May 15, 2003 and November 15, 2003, with joint funding from GRI and CDFG, two (2) qualified local construction companies (under PWA construction management and oversight) implemented the erosion prevention and sediment control treatments along the 45 miles of road in the 2002 LNFGR assessment area, as well as at several additional sites and road reaches outside the LNFGR watershed area in the North Fork Gualala River and Robinson Creek watersheds.

As shown on the attached CDFG final report map of the Doty Creek Planning Watershed Area prepared by GRI in 2004, virtually all the roads were treated with erosion control and erosion prevention measures either by: 1) upgrading and storm-proofing; and/or 2) decommissioning or properly closing. The water quality protection effort resulted in 35 miles of roads, which included the 17 miles of hydrologically connected roads identified in the 2002 assessment, being outsloped and receive periodic rolling dip drainage structures to insure effective and permanent hydrologic disconnection of roads from streams (i.e., little or no future sediment delivery from those treated road reaches), and 248 stream crossing, landslide and gully erosion sites being treated to largely prevent future episodic (storm related) erosion from the road network (see Attachment B. April 2004 CDFG Contract #P0140405 GRI Little North Fork Gualala River Sediment Reduction Project Final Report and Photo Album).

It is intended that my comments (above) about documented pre- and post-treatment ground conditions on these forest roads within the LNFGR watershed dismiss the remote analysis of "theoretical" road erosion provided in the Kamman reports, and that the documented state funded erosion prevention and storm-proofing work that has been done provides very significant reductions in current and future road erosion and sediment delivery threats to streams, as well as meets and exceeds the requirement for normalizing sediment reduction targets as established by the

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NCRWQCB in the Gualala River TMDL. Hopefully, these comments profoundly refute, with documentation, the estimated sediment production and sediment yield calculations provided by the Kamman reports submitted to CAL FIRE.

I would also like to provide a final comment on the long-term effectiveness of road storm-proofing efforts pioneered and documented by Pacific Watershed Associates. Over the last 30 years, PWA has been a principal advocate encouraging landowners and land managers in proper road storm-proofing techniques, with an emphasis on hydrologically disconnecting connected segments and lengths of rural, ranch and timberland roads that annually impact water quality (Weaver and Hagans (1994), Weaver, Hagans and Weppner (2006), and Weaver, Weppner and Hagans (2015)). These road management principles and practices have become the standard-of-practice for forest, ranch and rural roads in much of northern and central California, been adopted by land and road managers and regulatory agencies, and implemented on public, private and industrial road systems with great effectiveness and success. In the process of implementing storm-proofing measures at 1,000's of stream crossings and hydrologically disconnecting roads from streams along 1,000's of miles of wildland roads since the early 1990's, we have worked extensively on virtually all the commercial timberland properties in northern California.

I have personally worked extensively guiding water quality protection efforts on GRI forest road systems and lands while these properties were under the management direction of Henry Alden, the former GRI timberland manager for nearly 15 years. My experiences over the years viewing the various north state timberland managers' approaches to hydrologically disconnecting roads from streams, indicates they are all strongly committed to utilizing road outsloping and frequent rolling dips as a key road drainage component in each of their management strategies for protecting water quality. Having seen and worked on various public and private road systems, especially those on commercial forest lands, it is my personal observation and experience that the aggressive methods GRI adopted and utilized to provide long-term permanence and effectiveness in their efforts to hydrologically disconnect roads as chronic sources of sediment delivery is unparalleled. GRI totally grasped and adopted the commitment to protecting water quality from road erosion impacts, but most importantly, they frequently outsloped and disconnected roadbeds and ditches that were not connected to streams as a measure to lower long-term road maintenance requirements and costs, and this is reflected in all their storm-proofed roads in the LNFGR, as well as elsewhere on their ownership in other Planning Watersheds.

Comments of the Methodology used in the Kamman Reports on the Far North, Little and Elk THP Sediment Yield Estimates.

As one of the coauthors of Part X of the *California Salmonid Stream Habitat Restoration Manual* (CDFW, 2006), which is the document referenced and utilized by Kamman in their computational approach and methods to estimate roadway sediment yields, it is also relevant for me to comment on the assumptions that were made and that drove their findings. In terms of the approach and methods utilized by Kamman per Part X, I find no irregularities with utilizing the computational methods as published by PWA. However, the methods as described in Part X are primarily describing *field methods* for conducting on-the-ground road erosion and connectivity assessments to develop real-time estimates for quantifying future erosion and sediment delivery risk. This field-based approach to data collection and condition assessment is necessary where the individual

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hydrologically connected lengths of road within the overall road system assessment area are identified, field mapped and measured. Making desktop assumptions about the percentage of the road that is hydrologically connected (e.g., 100% or 50% as was done by Kamman) is potentially fraught with error and will lead to erroneous estimates of sediment delivery from the road network being discussed, especially where those road systems have already been effectively treated with state grant funding for hydrological disconnection.

In fact, the above described 45-mile 2002 road erosion and connectivity assessment within the LNFGR watershed only identified 17 miles of road (or 38%) as being hydrologically connected, based on direct field observations and measurements. That means the other 62% of the road network was not hydrologically connected or delivering eroded fine sediment to the stream system on an annual basis even before the roads were treated with CDFG monies. Subsequently, the 2003 CDFG grant funded and approved storm-proofing implementation work, as discussed above, where a total of 35 miles of road (or nearly 80% of the road network) was hydrologically disconnected, even if it was not, because of the aggressive approach taken by GRI to reduce erosion. This just reflects the GRI strategy at the time to drain all their roads properly, so very minimal lengths of road have any potential for surface and gully erosion risk and subsequent sediment delivery to nearby streams.

Finally, Kamman (paragraph 2 on page 1 in each of their three November 20, 2020 reports submitted to CAL FIRE in response to the 3 GRT THP's (Far North, Little and Elk)) suggests there are many other unquantified potential sediment sources, such as gullying, landslides and stream crossing failures that will contribute to additional sediment cumulative effects in the Planning Watershed. This conclusion is inaccurate and unrealistic as the 2003 CDFG grant funded and approved watershed restoration and erosion prevention work resulted in over 150 stream crossings that were: 1) reconstructed with properly sized culverts or armored fills designed to accommodate the 100-year return runoff event, installed at grade with stable fillslopes and critical dips to prevent stream diversion and gully formation; or 2) the stream crossings were properly decommissioned per the guidelines provided in the *Handbook for Forest, Ranch and Rural Roads* (Weaver, Weppner and Hagans, 2015). In addition, the 2003 watershed-wide storm-proofing work included the excavation and preventive stabilization of a minimum of 51 potential road-related unstable fillslopes that PWA had identified as exhibiting a potential for failure and sediment delivery to nearby streams.

Conclusion

The evidence presented here illustrate the difficulty and potential inaccuracy of utilizing and relying on remote sensed data and broad assumptions in drawing conclusions about sediment production and delivery risk associated with forest and ranch roads, especially within the three (3) proposed GRT THP areas in the LNFGR watershed, or elsewhere. The conditions and assumptions included in the Kamman reports are not consistent with those found on the ground in these areas. The field-based road erosion assessment completed in 2002, which was based on well-accepted methods published by CDFW in Part X of their restoration manual (*Upslope erosion inventory and sediment control guidance)* and approved, funded and/or adopted by other state agencies, presents actual road hydrologic connectivity data before the roads were treated, and identified the threat to the whole of the LNFGR. The mapped road threats of sediment delivery identified in 2002 were subsequently

treated and largely eliminated in 2003 with joint funding by state grants and private landowner funding. The jointly funded state and private comprehensive road storm-proofing project in 2003, along the formerly under designed and poorly drained road network, including both unmaintained and maintained roads, has significantly reduced or largely eliminated the risk of future anthropogenic sediment delivery from road-related fluvial, fillslope mass wasting, and surface erosion processes, thereby substantially addressing the potential for ongoing road-related cumulative effects from occurring in the Planning Watershed. It should be noted, between the years 2000 to 2015, PWA professionals advised GRI on a very aggressive annual program for eliminating sediment production risks from formerly poorly designed, constructed and located forest roads in all the other GRI/GRT Planning Watersheds in the lower Gualala River watershed.

If you have any questions or need further information, please contact Danny Hagans, PWA Principal Earth Scientist at dannyh@pacificwatershed.com.

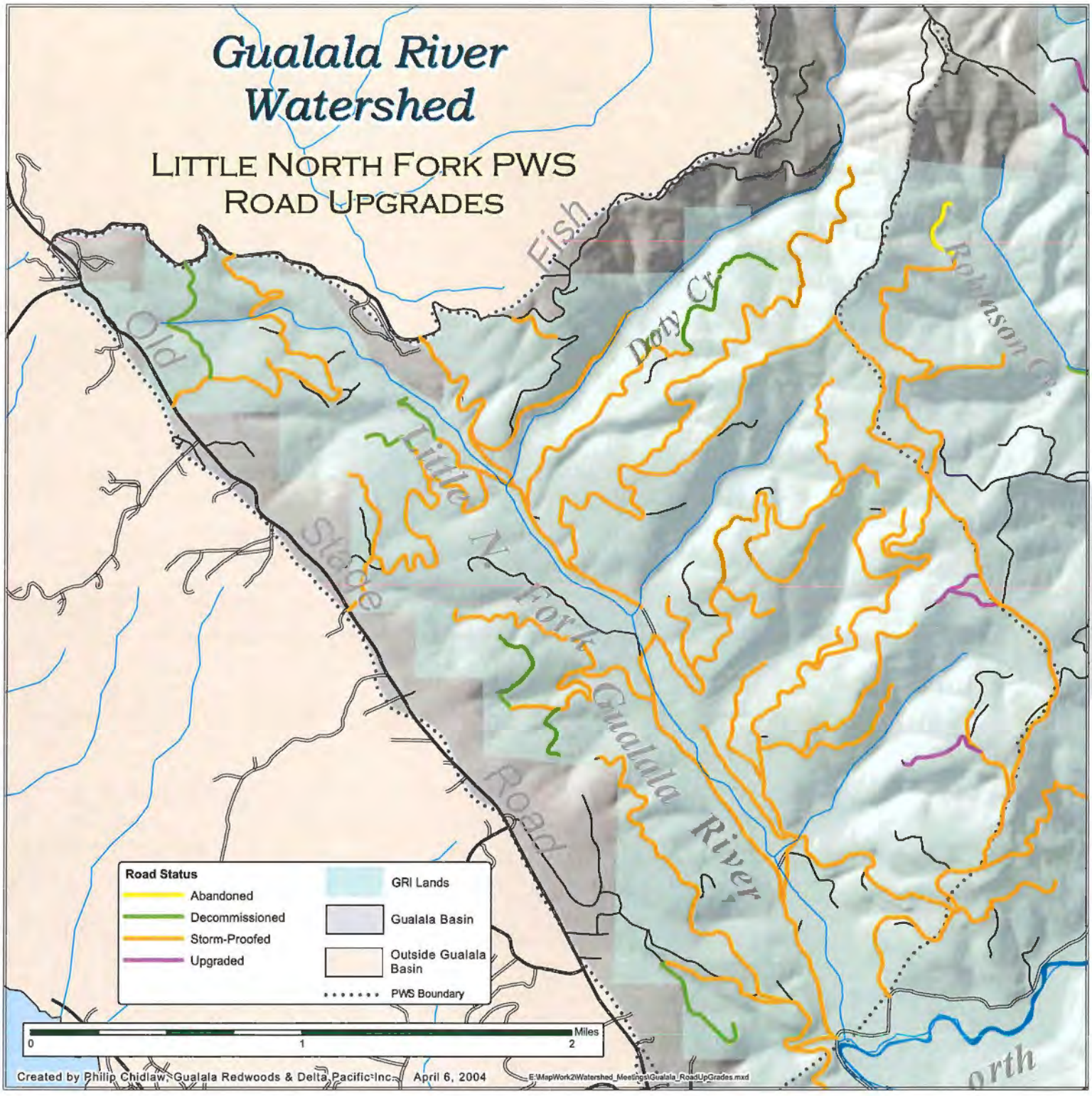
Sincerely,
PACIFIC WATERSHED ASSOCIATES INC.

Danny Hagans

Danny Hagans, Principal Earth Scientist

Encl:
Attachment 1. April 2002 CDFG Contract #P9985012 - PWA Watershed Assessment and Erosion Prevention Planning Project, LNFGR Watershed, Mendocino County Final Report.

Attachment 2. April 2004 CDFG Contract #P0140405 GRI Little North Fork Gualala River Sediment Reduction Project Final Report.



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Attachment 1.

Final Report:

PWA Watershed Assessment and Erosion Prevention Planning Project, Little North Fork Gualala River Watershed, Mendocino County, CA

for

Sotoyome Resource Conservation District
CDFG Contraet #P9985012

April 2002

Summary Report

Watershed Assessment and Erosion Prevention Planning Project for the Little North Fork Gualala River Watershed, Mendocino County, California
Contract #: P9985012

prepared for

Sotoyome Resource Conservation District,
Gualala Redwoods Inc.
and
California Department of Fish and Game

by

***P**acific **W**atershed **A**ssociates*
Arcata, California
(707) 839-5130
March, 2002

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Summary Report
2000 S.B. 271 Watershed Assessment and Erosion Prevention Planning Project for the Little North Fork Gualala River watershed, Mendocino County, California
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prepared by
Pacific Watershed Associates

for
Sotoyome Resource Conservation District,
Gualala Redwoods Inc.
and the
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I. Background

The Little North Fork Gualala River is a 7 mi^2 third order tributary to the North Fork Gualala River located in Mendocino County (Figure1). According to the USGS Gualala 7.5' quad, the Little North Fork Gualala River contains of approximately 5.8 miles of blue-line streams. Elevations in the watershed range between 40 feet at the mouth to 1,000 feet at the headwaters.

The Little North Fork Gualala River watershed is composed of private industrial timberland primarily owned by the Gualala Redwoods, Inc. Timberlands in the watershed are dominated by redwood and Douglas Fir with other hardwood species present The watershed has experienced several cycles of timber harvesting and contains an extensive historic and existing logging road network. Many of the historic or abandoned roads are currently causing erosion and sedimentation to the Little North Fork Gualala River.

The Little North Fork Gualala has value as a historic Coho salmon and Steelhead trout stream. In a stream inventory report produced by Entrix, Inc. for Gualala Redwoods, Inc. in March 1995, it was recommended that the Little North Fork Gualala River "should be managed as an anadromous salmonid, natural production stream". The report strongly recommended that the active and potential sources of erosion with sediment delivery to the stream system be identified, mapped and recommended for appropriate treatment.

The systematic inventory of road-related erosion and sediment delivery along 45 miles of logging roads and treatable sources of future erosion and delivery along 4.3 miles of Class I streams in the Little North Fork Gualala River is a part of a six-fold assessment and restoration planning project for the Gualala River watershed proposed in 1999 by the Sotoyome Resource Conservation District, the Gualala River Watershed Council, and Pacific Watershed Associates. The aim of the assessment and restoration planning project is to inventory "ongoing and potential sediment sources throughout the watershed, principally those human caused sources which can be most easily treated for control and prevention".

Figure 1. Location map of the Little North Fork Gualala study area

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II. Little North Fork Gualala River watershed assessment

Perhaps the most important element needed for long term restoration of salmon habitat, and the eventual recovery of salmonid populations in the Little North Fork Gualala River watershed, is the reduction of accelerated erosion and sediment delivery to the channel system. This summary report describes the erosion assessment and inventory process that was employed in the Little North Fork Gualala River watershed. It also serves as a prioritized plan-of-action for cost-effective erosion control and erosion prevention treatments for the watershed. When implemented and employed in combination with protective land use practices, the proposed projects are expected to significantly contribute to the long term protection and improvement of salmonid habitat in the basin. The implementation of erosion control and erosion prevention work is an important step towards protecting and restoring watersheds and their anadromous fisheries (especially where sediment input is a limiting or potentially limiting factor to fisheries production, as is thought to be the case for the Little North Fork Gualala River).

Road systems are one of the most significant and most easily controlled sources of sediment production and delivery to stream channels. Little North Fork Gualala River is underlain by erodible and potentially unstable geologic substrate, and field observations suggest that roads have been a significant source of accelerated sediment production in the watershed. In the Little North Fork Gualala River, as in many other coastal watersheds, the disturbance caused by excess sediment input to stream channels during large rainfall events is perhaps one of the most significant factors affecting salmonid populations. Chronic sediment inputs to the channel system, from roads and other bare soil areas, are also thought to be important contributors to impaired habitat and reduced salmonid populations.

Unlike many watershed improvement and restoration activities, erosion prevention and "storm-proofing" of forest road systems has an immediate benefit to the streams and aquatic habitat of the basin. It helps ensure that the biological productivity of the watershed's streams is not impacted by future human-caused erosion, and that future storm runoff can cleanse the streams of accumulated coarse and fine sediment, rather than depositing additional sediment from managed areas. A number of sites targeted for immediate implementation in the Little North Fork Gualala River watershed have been identified as high priority for implementation so that fill failures, stream crossing washouts, stream diversions and chronic erosion do not degrade the stream system.

The sediment source inventory for Little North Fork Gualala River, funded through a CDFG S.B. 271 watershed restoration grant and supplemented by Gualala Redwoods Inc. funding, has recently been completed. Among other things, the assessment identified all recognizable current and future sediment sources from roads within the watershed. The field inventory identified future sediment sources from approximately 45 miles of logging road in the watershed. A number of project sites were treated in the 2000 work season, and others have been targeted for implementation (decommissioning and upgrading) in 2002. The primary objective of these road upgrading and decommissioning projects is to implement cost-effective erosion control and erosion prevention work on high and moderate priority sites that were identified as a part of this comprehensive watershed assessment and inventory.

III. Project Description

The watershed assessment process consisted of two distinct project elements. These included: 1) a complete inventory of all future road-related sediment sources along 45 miles of logging roads

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in the watershed and 2) an inventory of sediment sources and riparian conditions along approximately 4.3 miles of Class I streams in the watershed.

The first phase of the project involved a complete inventory of the road systems, selected hillslope areas and major stream channels. Technically, this assessment was neither an erosion inventory nor a road maintenance inventory. Rather, it was an inventory of sites where there is a potential for future sediment delivery to the stream system that could impact fish bearing streams in the watershed. All roads, including both maintained and abandoned routes, were walked and inspected by trained personnel and all existing and potential erosion sites were identified and described. Sites, as defined in this assessment, include locations where there is direct evidence that future erosion or mass wasting could be expected to deliver sediment to a stream channel. Sites of past erosion were not inventoried unless there was a potential for additional future sediment delivery. Similarly, sites of future erosion that were not expected to deliver sediment to a stream channel were not included in the inventory.

Inventoried sites generally consisted of stream crossings, potential and existing landslides related to the road system, gullies below ditch relief culverts and long sections of uncontrolled road and ditch surface runoff which currently discharge to the stream system. For each identified existing or potential erosion source, a database form was filled out and the site was mapped on a mylar overlay over a 1:15,840 scale aerial photograph. The database form (Figure 2) contained questions regarding the site location, the nature and magnitude of existing and potential erosion problems, the likelihood of erosion or slope failure and recommended treatments to eliminate the site as a future source of sediment delivery.

The erosion potential (and potential for sediment delivery) was estimated for each major problem site or potential problem site. The expected volume of sediment to be eroded and the volume to be delivered to streams was estimated for each site. The data provides quantitative estimates of how much material could be eroded and delivered in the future, if no erosion control or erosion prevention work is performed. In a number of locations, especially at stream diversion sites, actual sediment loss could easily exceed field predictions. All sites were assigned a treatment priority, based on their potential to deliver deleterious quantities of sediment to stream channels in the watershed and the cost-effectiveness of the proposed treatment.

In addition to the database information, tape and clinometer surveys were completed on virtually all stream crossings. These surveys included a longitudinal profile of the stream crossing through the road prism, as well as two or more cross sections. The survey data was entered into a computer program that calculates the volume of fill in the crossing. The survey allows for an accurate and repeatable quantification of future erosion volumes (assuming the stream crossing was to washout during a future storm), decommissioning volumes (assuming the road was to be closed) and/or excavation volumes that would be required to complete a variety of road upgrading and erosion prevention treatments (culvert installation, culvert replacement, complete excavation, etc.).

In the final phase of the watershed assessment project, the main stem of the Little North Fork Gualala River was inventoried for bank erosion sites, stream side landslides and the condition of riparian vegetation. Data was collected on the location and volume of sediment sources along approximately 4.3 miles of Class I stream channels. The channel survey procedures, results and

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Figure 2. Road erosion inventory data form used in the Little North Fork Gualala River watershed assessment

*ASAP*___	PWA ROAD INVENTORY DATA FORM (3/98 version)					*Check*___	
GENERAL	Site No: _____	GPS:	Watershed:		CALWAA		
Treat (Y,N).	Photo: _ ___	T/R/S:	Road #.		Mileage: _____		
	Inspectors:_____	Date: _____	Year built:_____	Sketch (Y):			
	Maintained	Abandoned	Driveable	Upgrade	Decommission	Maintenance	
PROBLEM	Stream xing	Landslide (fill, cut, hill)	Roadbed (bed, ditch, cut)	DR-CMP	Gully	Other	
	Location of problem (U, M, L, S)	Road related? (Y)	Harvest history: (1=<15 yrs old; 2=>15 yrs old) TC1, TC2, CC1, CC2, PT1, PT2, ASG, No		Geomorphic association: Streamside, T.G., Stream Channel, Swale, Headwall, B.T.S.		
LANDSLIDE	Road fill	Landing fill	Deep-seated	Cutbank	Already failed	Pot. failure	
	Slope shape (convergent, divergent, planar, hummocky)			Slope (%) _____	Distance to stream (ft) _____		
STREAM	CMP	Bridge	Humboldt	Fill	Ford	Armored fill	
	Pulled xing. (Y)	% pulled _____	Left ditch length (ft) _____		Right ditch length (ft) _____		
	cmp dia (in) _____	inlet (O, C, P, R)	outlet (O, C, P, R)	bottom (O, C,P, R)	Separated?		
	Headwall (in) ____	CMP slope (%) ____	Stream class (1, 2, 3)	Rustline (in)			
	% washed out ____	D.F.? (Y)	Currently dvted? (Y)	Past dvted? (Y)	Rd grade (%) _____		
	Plug pot. (H, M, L)	Ch. grade (%) ____	Ch. width (ft) ____	Ch. depth (ft) ___			
	Sed trans (H, M, L)	Drainage area (mi^2) _____					
EROSION	E.P. (H, M, L)	Potential for extreme erosion? (Y, N)	Volume of extreme erosion (yds^3): 100-500, 500-1000, 1K-2K, >2K				
Past erosion...	Rd&ditch vol (yds^3) (yds^3)_____	Gully fillslope/hillslope (yds^3)_____	Fill failure volume (yds^3) _____	Cutbank erosion (yds^3)_____	Hillslope slide vol (yds^3)	Stream bank erosion (yds^3) _____	xing failure vol (yds^3)
	Total past erosion (yds) _____	Past delivery (%) _____	Total past yield (yds) _____	Age of past erosion (decade)_____			
Future erosion...	Total future erosion (yds) _____	Future delivery (%) _____	Total future yield (yds) _____	Future width (ft) _____	Future depth (ft) _____	Future length (ft) _____	
TREATMENT	Immed (H,M,L)	Complex (H,M,L)	Mulch (ft^2)				
	Excavate soil	Critical dip	Wet crossing (ford or armored fill) (circle)		sill hgt (ft) ___	sill width (ft) _____	
	Trash Rack	Downspout	D.S. length (ft) _____	Repair CMP	Clean CMP		
	Install culvert	Replace culvert	CMP diameter (in) ____	CMP length (ft) _____			
	Reconstruct fill	Armor fill face (up, dn)	Armor area (ft^2) _____	*Clean or cut ditch*	*Ditch length (ft)*		
	Outslope road (Y)	*OS and Retain ditch (Y)*	*O.S. (ft)*	*Inslope road*	*I.S. (ft)*	*Rolling dip*	*R.D. (#)* _
	Remove berm	*Remove berm (ft)* ____	*Remove ditch*	*Remove ditch (ft)*		*Rock road- ft^2*	
	Install Dips? CMP	*Dips Adjacent*	*Check CMP size? (Y)*	*Other Imp.? (Y)*	*Install (Y)*		
COMMENT ON PROBLEM:							
EXCAVATION VOLUME	Total excavated (yds3) _____		Vol put back in (yds3) _____		Volume removed (yds3) _____		
	Vol stockpiled (yds^3)	Vol endhauled (yds^3) __	Dist endhauled (ft) ____	Excav prod rate (yds^3/hr) _____			
EQUIPMENT HOURS	Excavator (hrs) ___	Dozer (hrs) ___	Dump truck (hrs) _____	Grader (hrs) _____			
	Loader (hrs) ____	Backhoe (hrs)	Labor (hrs) _____	Other (hrs) _____			
COMMENT ON TREATMENT:							

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treatment recommendations are detailed in Section V of the report. Data collected included the type of erosional process, the current activity level, the volume of sediment delivery, and applicable treatment prescriptions at sites where work has been recommended. In addition, erosion sites and general characteristics of the riparian vegetation were mapped on mylar overlays to the 1:15,840 scale aerial photos. Results from the stream channel assessment can be found in the back of this report.

IV. Little North Fork Gualala Road Assessment and Sediment Reduction Plan

A. Inventory Results

Approximately 45 miles of roads were inventoried for future sediment sources within the Little North Fork Gualala River watershed. Inventoried road-related erosion sites fell into one of two treatment categories: 1) upgrade sites - defined as sites on maintained open roads that are to be retained for access and management and 2) decommission sites - defined as sites exhibiting the potential for future sediment delivery that have been recommended for either temporary or permanent closure. Virtually all future road-related erosion and sediment yield in the Little North Fork Gualala River watershed is expected to come from three sources: 1) erosion at or associated with stream crossings (from several possible causes), 2) the failure of road and landing fills (landsliding), and 3) road surface and ditch erosion.

A total of 224 sites were identified with the potential to deliver sediment to streams. Of these, 222 sites were recommended for erosion control and erosion prevention treatment. Approximately 67 % (n=149) of the sites are classified as stream crossings and 23 % (n=51) as potential landslides (Table 1 and Maps 1). The remaining 11 % (n=24) of the inventoried sites consist of "other" sites which include ditch relief culverts, gullies, springs and bank erosion.

Stream crossings - One hundred forty-nine (149) stream crossings were inventoried in the Little North Fork Gualala River assessment area including 54 culverted crossings, 2 unculverted Humboldt crossings, 75 unculverted fill crossings, 2 bridges, 8 fords and 8 "pulled" (decommissioned) crossings. An unculverted fill crossing refers to a stream crossing with no formal drainage structure to carry the flow through the road prism. Flow is either carried beneath or through the fill, or it flows over the road surface, or it is diverted down the road to the inboard ditch. Most unculverted fill crossings are located at small Class III streams that exhibit flow only in the larger runoff events. If the crossing has been made temporary or decommissioned by removing the majority of the fill, then these crossings are commonly known as "pulled" or decommissioned crossings.

Approximately 26,044 yds^3 of future road-related sediment delivery in the Little North Fork Gualala River watershed assessment area could originate from stream crossings if they are not treated (Table 1). This amounts to about 40% of the total sediment yield from the road system. The most common problems that cause erosion at stream crossings include: 1) crossings with no or undersized culverts, 2) crossings with culverts that are likely to plug, 3) stream crossings with a diversion potential and 4) crossings with gully erosion at the culvert outlet. The sediment delivery from stream crossing sites is always classified as 100% because any sediment eroded is delivered to the channel. Any sediment delivered to small ephemeral streams will eventually be transported to downstream fish-bearing stream channels.

At stream crossings, the largest volumes of future erosion can occur when culverts plug or when potential storm flows exceed culvert capacity (i.e., the culvert is too small for the drainage area)

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Table 1. Site classification and sediment delivery from all inventoried sites with future sediment delivery in the Little North Fork Gualala watershed assessment area, Mendocino County, California.

Site Type	Number of sites or road miles	Number of sites or road miles to treat	Future yield (yds^3)	Stream crossings w/ a diversion potential (#)	Streams currently diverted (#)	Stream culverts likely to plug (plug potential rating = high or moderate)
Stream crossings	149	147	26,044	67	12	40
Landslides	51	51	4,516	NA	NA	NA
Other	24	24	678	NA	NA	NA
Total (all sites)	224	222	31,238	67	12	40
Persistent surface erosion[1]	17.0	17.0	33,246	NA	NA	NA
Totals	**224**	**222**	**64,484**	**67**	**12**	**40**

[1] Assumes 25' wide road prism and cutbank contributing area, and 0.2' of road/cutbank surface lowering over a two decade period

and flood runoff spills onto or across the road. When stream flow goes over the fill, part or all of the stream crossing fill may be eroded. Alternately, when flow is diverted down the road, either on the road bed or in the ditch (instead of spilling over the fill and back into the same stream channel), the crossing is said to have a "diversion potential" and the road bed, hillslope and/or stream channel that receives the diverted flow can become deeply gullied or destabilized. These hillslope gullies can be quite large and can deliver significant quantities of sediment to stream channels. Diverted stream flows discharged onto steep, potentially unstable slopes can also trigger large hillslope landslides.

Of the 147 stream crossings recommended for treatment, 67 (46%) have the potential to divert in the future and 12 (8%) streams are currently diverted (Table 1). Forty of the 54 existing culverts have a moderate to high plugging potential. Because the roads were constructed many years ago, many culverted stream crossings are under designed for the 100 year storm flow. At stream crossings with no or undersized culverts, or where there is a diversion potential, corrective prescriptions have been outlined on the data sheets and in the following tables. Preventative treatments include such measures as constructing critical dips (rolling dips) at stream crossings to prevent stream diversions, installing larger culverts wherever current pipes are under designed for the 100 year storm flow (or where they are prone to plugging), installing culverts at the natural channel gradient to maximize the sediment transport efficiency of the pipe and ensure that the culvert outlet will discharge on the natural channel bed below the base of the road fill, installing debris barriers and/or downspouts to prevent culvert plugging and outlet erosion, respectively, armoring the downstream fill face of the crossing to minimize or prevent future erosion, or properly excavating the stream crossing of all fill material.

Landslides - Only those landslide sites with a potential for sediment delivery to a stream channel were inventoried. Fifty-one (51) potential landslides were identified and account for approximately 7% of the inventoried sites in the Little North Fork Gualala River assessment area

(Table 1). Most of the potential landslide sites were found along roads where material had been sidecast during earlier construction and now shows signs of instability. Potential landslides are expected to deliver approximately 4,516 yds^3 of sediment to Little North Fork Gualala River and its tributaries in the future. Correcting or preventing potential landslides associated with the road is relatively straightforward, and involves the physical excavation of potentially unstable road fill and sidecast materials.

There are a number of potential landslide sites located in the Little North Fork Gualala River assessment area that will not deliver sediment to streams. These sites were not inventoried using data sheets due to the lack of expected sediment delivery to a stream channel. They are generally shallow and of small volume, or located far enough away from an active stream such that delivery is unlikely to occur. For reference, all landslide sites were mapped on the mylar overlays of the aerial photographs, but only those with the potential for future sediment delivery were inventoried using a data sheet (Figure 2).

"Other"sites - A total of 24 "other" sites were also identified in the Little North Fork Gualala River watershed assessment area. "Other" sites include ditch relief culverts, major springs, gullies and bank erosion sites which exhibited the potential to deliver sediment to streams. One of the main causes of existing or future erosion at these sites is surface runoff and uncontrolled flow from long sections of undrained road surface and/or inboard ditch. Uncontrolled flow along the road or ditch may affect the road bed integrity as well as cause gully erosion on the hillslopes below the outlet of ditch relief culverts. All 24 sites have been recommended for erosion control and erosion prevention treatment. We estimate 678 yds^3 of sediment will be delivered to streams if they are left untreated (Table 1). Sediment delivery from these sites represents nearly 1% of the total potential sediment yield from sites recommended for erosion control and erosion prevention treatment.

Chronic erosion - Road runoff is also a major source of fine sediment input to nearby stream channels. We measured approximately 17 miles of road surface and/or road ditch (representing 38% of the total inventoried road mileage) which currently drain directly to stream channels and deliver ditch flow, road runoff and fine sediment to stream channels in the Little North Fork Gualala watershed assessment area (Table 1). These roads are said to be "hydrologically connected" to the stream channel network.

From the 17 miles, we calculated approximately 33,246 yds^3 of sediment could be delivered to stream channels within the Little North Fork Gualala watershed over the next two decades, depending on road use, if no efforts are made to change road drainage patterns. This will occur through a combination of 1) cutbank erosion (e.g. dry ravel, rainfall, freeze-thaw processes, cutbank failures and brushing/grading practices) delivering sediment to the ditch, 2) inboard ditch erosion and sediment transport, 3) mechanical pulverizing and wearing down of the road surface, and 4) erosion of the road surface during wet weather periods.

Relatively straight-forward erosion prevention treatments can be applied to upgrade road systems to prevent fine sediment from entering stream channels. These treatments generally involve dispersing road runoff and disconnecting road surface and ditch drainage from the natural stream channel network.

B. Treatment Priority

An inventory of future or potential erosion and sediment delivery sites is intended to provide

information which can guide long range transportation planning, as well as identify and prioritize erosion prevention, erosion control and road decommissioning activities in the watershed. Not all of the sites that have been recommended for treatment have the same priority, and some can be treated more cost effectively than others. Treatment priorities are evaluated on the basis of several factors and conditions associated with each potential erosion site. These include:

1) the expected volume of sediment to be delivered to streams (future delivery - yds^3),
2) the potential or "likelihood" for future erosion (erosion potential - high, moderate, low),
3) the "urgency" of treating the site (treatment immediacy - high, moderate, low),
4) the ease and cost of accessing the site for treatments, and
5) recommended treatments, logistics and costs.

The ***erosion potential*** of a site is a professional evaluation of the likelihood that future erosion will occur during a future storm event. Erosion potential is an estimate of the potential for additional erosion, based field observations of a number of local site conditions. Erosion potential was evaluated for each site, and expressed as "High", "Moderate" or "Low." The evaluation of erosion potential is a subjective estimate of the probability of erosion, and not an estimate of how much erosion is likely to occur. It is based on the age and nature of direct physical indicators and evidence of pending instability or erosion. The likelihood of erosion (erosion potential) and the volume of sediment expected to enter a stream channel from future erosion (sediment delivery) play significant roles in determining the treatment priority of each inventoried site (see "treatment immediacy," below). Field indicators that are evaluated in determining the potential for sediment delivery include such factors as slope steepness, slope shape, distance to the stream channel, soil moisture and evaluation of erosion process. The larger the potential future contribution of sediment to a stream, the more important it becomes to closely evaluate its potential for cost-effective treatment.

Treatment immediacy (treatment priority) is a professional evaluation of how important it is to "quickly" perform erosion control or erosion prevention work. It is also defined as "High", "Moderate" and "Low" and represents both the severity and urgency of addressing the threat of sediment delivery to downstream areas. An evaluation of treatment immediacy considers erosion potential, future erosion and delivery volumes, the value or sensitivity of downstream resources being protected, and treatability, as well as, in some cases, whether or not there is a potential for an extremely large erosion event occurring at the site (larger than field evidence might at first suggest). If mass movement, culvert failure or sediment delivery is imminent, even in an average winter, then treatment immediacy might be judged "High". *Treatment immediacy is a summary, professional assessment of a site's need for immediate treatment.* Generally, sites that are likely to erode or fail in a normal winter, and that are expected to deliver significant quantities of sediment to a stream channel, are rated as having a high treatment immediacy or priority.

One other factor influencing a site's treatment priority is the difficulty (cost and environmental impact) of reaching the site with the necessary equipment to effectively treat the potential erosion. Many sites found on abandoned or unmaintained roads require brushing and tree removal to provide access to the site(s). Other roads require minor or major road rebuilding of washed out stream crossings and/or existing landslides in order to reach potential work sites farther out the alignment. Road reconstruction adds to the overall cost of erosion control work and reduces project cost-effectiveness. Potential work sites with lower cost-effectiveness, in turn

may be of relatively lower priority. However, just because a road is abandoned and/or overgrown with vegetation is not sufficient reason to discount its need for assessment and potential treatment. Treatments on heavily overgrown, abandoned roads may still be both beneficial and cost-effective.

C. Evaluating Treatment Cost-Effectiveness

Treatment priorities are developed from the above factors, as well as from the estimated cost-effectiveness of the proposed erosion control or erosion prevention treatment. Cost-effectiveness is determined by dividing the cost ($) of accessing and treating a site, by the volume of sediment prevented from being *delivered* to local stream channels. For example, if it would cost $2000 to develop access and treat an eroding stream crossing that would have delivered 500 yds^3 (had it been left to erode), the predicted cost-effectiveness would be $4/$yds^3$ ($2000/500$yds^3$).

To be considered for a priority treatment a site should typically exhibit: 1) potential for significant (>25-50 yds^3) sediment delivery to a stream channel (with the potential for transport to a fish-bearing stream), 2) a high or moderate treatment immediacy and 3) a predicted cost-effectiveness value averaging in the general range of approximately $5 to $15/$yds^3$, or less. Treatment cost-effectiveness analysis is often applied to a group of sites (rather than on a single site-by-site basis) so that only the most cost-effective groups of sites or projects are undertaken. During road decommissioning, groups of sites are usually considered together since there will only be one opportunity to treat potential sediment sources along the road. In this case, cost-effectiveness may be calculated for entire roads or road reaches that fall into logical treatment units.

Cost-effectiveness can be used as a tool to prioritize potential treatment sites throughout a sub-watershed (Weaver and Sonnevil, 1984; Weaver and others, 1987). It assures that the greatest benefit is received for the limited funding that is typically available for protection and restoration projects. Sites, or groups of sites, that have a predicted marginal cost-effectiveness value (>$15/$yds^3$), or are judged to have a lower erosion potential or treatment immediacy, or low sediment delivery volumes, are less likely to be treated as part of the primary watershed protection and "erosion-proofing" program. However, these sites should be addressed during future road reconstruction (when access is reopened into areas for future management activities), or when heavy equipment is performing routine maintenance or restoration at nearby, higher priority sites.

D. Types of Prescribed Heavy Equipment Erosion Prevention Treatments

Forest roads can be storm-proofed by one of two methods: upgrading or decommissioning (Weaver and Hagans, 1994). Upgraded roads are kept open and are inspected and maintained. Their drainage facilities and fills are designed or treated to accommodate or withstand the 100-year storm. In contrast, properly decommissioned roads are closed and no longer require maintenance. The goal of storm-proofing is to make the road as "hydrologically invisible" as is possible; that is, to disconnect the road from the stream system and thereby preserve aquatic habitat. The characteristics of storm-proofed roads, including those which are either upgraded or decommissioned, are depicted in Figure 3.

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FIGURE 3. CHARACTERISTICS OF STORM-PROOFED ROADS

The following abbreviated criteria identify common characteristics of "storm-proofed" roads. Roads are "storm-proofed" when sediment delivery to streams is strictly minimized. This is accomplished by dispersing road surface drainage, preventing road erosion from entering streams, protecting stream crossings from failure or diversion, and preventing failure of unstable fills which would otherwise deliver sediment to a stream. Minor exceptions to these "guidelines" can occur at specific sites within a forest or ranch road system.

STREAM CROSSINGS

- ✓ all stream crossings have a drainage structure designed for the 100-year flow
- ✓ stream crossings have no diversion potential (functional critical dips are in place)
- ✓ stream crossing inlets have low plug potential (trash barriers & graded drainage)
- ✓ stream crossing outlets are protected from erosion (extended, transported or dissipated)
- ✓ culvert inlet, outlet and bottom are open and in sound condition
- ✓ undersized culverts in deep fills (> backhoe reach) have emergency overflow culvert
- ✓ bridges have stable, non-eroding abutments & do not significantly restrict design flood
- ✓ fills are stable (unstable fills are removed or stabilized)
- ✓ road surfaces and ditches are "disconnected" from streams and stream crossing culverts
- ✓ decommissioned roads have all stream crossings completely excavated to original grade
- ✓ Class 1 (fish) streams accommodate fish passage

ROAD AND LANDING FILLS

- ✓ unstable nd potentially unstable road and landing fills are excavated (removed)
- ✓ excavated spoil is placed in locations where eroded material will not enter a stream
- ✓ excavated spoil is placed where it will not cause a slope failure or landslide

ROAD SURFACE DRAINAGE

- ✓ road surfaces and ditches are "disconnected" from streams and stream crossing culverts
- ✓ ditches are drained frequently by functional rolling dips or ditch relief culverts
- ✓ outflow from ditch relief culverts does not discharge to streams
- ✓ gullies (including those below ditch relief culverts) are dewatered to the extent possible
- ✓ ditches do not discharge (through culverts or rolling dips) onto active or potential landslides
- ✓ decommissioned roads have permanent road surface drainage and do not rely on ditches

Road upgrading involves a variety of treatments used to make a road more resilient to large storms and flood flows. The most important of these include stream crossing upgrading (especially culvert up-sizing to accommodate the 100-year storm flow (including debris) and to eliminate stream diversion potential), removal of unstable sidecast and fill materials from steep slopes, and the application of drainage techniques to improve dispersion of road surface runoff.

Road decommissioning basically involves "reverse road construction," except that full topographic obliteration of the road bed is not normally required to accomplish sediment prevention goals. Generic treatments for decommissioning roads and landings range from

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outsloping or simple cross-road drain construction to full road decommissioning (closure), including the excavation of unstable and potentially unstable sidecast materials and road fills, and all stream crossing fills.

E. Treatments

Basic treatment priorities and prescriptions were formulated concurrent with the identification, description and mapping of both potential sources of road-related sediment yield and road maintenance sites with no potential sediment delivery. Table 2 and Map 2 outline the treatment priorities for all 222 inventoried sites with future sediment delivery that have been recommended

Table 2. Treatment priorities for all inventoried sediment sources in the Little North Fork Gualala River watershed assessment area, Mendocino County, California

Treatment Priority	Upgrade sites (# and site #)	Decommission sites (# and site #)	Problem	Future sediment delivery (yds^3)
High	**9** (site #: 6, 52, 56, 58, 65, 90, 130, 184, 217)	**2** (site #: 80, 220)	11 stream crossings	7,788
High Moderate	**28** (site #: 4, 14, 17, 19, 21, 22, 31, 42, 49, 53, 63, 69, 71, 75, 85, 86, 95, 97, 102, 103, 140, 154, 159, 200, 212, 213, 216, 218)	**4** (site #: 160, 173, 198, 223)	24 stream crossings, 5 landslides, 3 other	10,679
Moderate	**71** (site #: 5, 7, 10, 10.1, 11, 13, 15, 18, 28, 29, 32, 34, 41, 44, 47, 54, 57, 60, 62, 66, 68, 73, 76, 78, 81, 87, 91, 92, 93, 99, 100, 109, 119, 122, 123, 124, 125, 126, 127, 131, 133, 134, 135, 137, 139, 141, 142, 143, 144, 145, 148, 153, 161, 167, 169, 170, 171, 174, 178, 180, 182, 186, 187, 199, 206, 207, 208, 209, 214, 215, 222)	**16** (site #: 1, 30, 37, 39, 104, 105, 111, 112, 147, 156, 162, 163, 176, 183, 189, 219)	61 stream crossings, 21 landslides, 4 other	26,162
Moderate Low	**44** (site #: 8, 9, 12, 16, 25, 35, 38, 45, 48, 51, 64, 67, 72, 74, 77, 83, 89, 94, 98, 106, 107, 113, 116, 117, 128, 129, 132, 138, 146, 149, 151, 152, 157, 164, 165, 168, 172, 175, 181, 185, 188, 195, 201, 211)	**8** (site #: 2, 23, 79, 155, 190, 203, 204, 221)	31 stream crossings, 16 landslide, 5 other	12,063
Low	**38** (site #: 20, 24, 26, 27, 33, 36, 40, 43, 46, 50, 55, 59, 61, 70, 82, 84, 88, 96, 101, 108, 110, 114, 115, 118, 120, 121, 136, 150, 158, 166, 177, 179, 191, 193, 194, 196, 197, 210)	**2** (site #: 3, 205)	19 stream crossings, 9 landslides, 12 other	7,792
Total	**190**	**32**	**147 stream crossings, 51 landslides, 24 other**	**64,484**

for treatment in the Little North Fork Gualala River watershed assessment area. Of the 222 sites with future sediment delivery, forty-three (43) sites were identified as having a high or high-moderate treatment immediacy with a potential sediment delivery of approximately 18,467 yds^3. One hundred and thirty-nine (139) sites were listed with a moderate or moderate-low treatment immediacy and account for nearly 38,225 yds^3 of future sediment delivery. Finally, forty (40)

sites were listed as having a low treatment immediacy with approximately 7,792 yds^3 of future sediment delivery.

Road priority - An efficient way of addressing treatment priorities is to identify high priority roads for treatment. This manner of treating sites maximizes equipment efficiency and minimizes the need to "jump around" the watershed treating only the high priority sites. Prioritizing roads is the preferred method of establishing watershed work plans for erosion prevention, and there are several way of developing a prioritized list.

Table 3 summarizes the proposed treatments for sites inventoried on all roads in the Little North Fork Gualala River watershed assessment area. These prescriptions include both upgrading and road closure measures. The database, as well as the field inventory sheets, provide details of the treatment prescriptions for each site. Most treatments require the use of heavy equipment, including an excavator, tractor, dump truck and grader. Some hand labor is required at sites needing new culverts, downspouts, culvert repairs, trash racks and/or for applying seed, plants and mulch following ground disturbance activities.

A total of 46 critical rolling dips have been recommended to prevent future diversions at streams that currently have a diversion potential. A total of 67 culverts are recommended for installation, either to upgrade existing culverts or to install culverts at unculverted streams. It is estimated that erosion prevention work will require the removal of approximately 33,347 yds^3 at 172 sites. Approximately 59% of the total volume excavated is associated with upgrading or excavating stream crossings and about 40% is proposed for excavating potentially unstable road fills (landslides). We have recommended 298 rolling dips be constructed and 8 ditch relief culverts be installed at selected locations, at spacings dictated by the steepness of the road. A total of 949 yds^3 of mixed and clean rip-rap sized rock is proposed to construct 40 armored wet crossings and armor 7 fillslope faces. Approximately 1,409 yds^3 of road rock is required to rock the road surface at 91 rolling dips, 24 stream crossing culvert installations, 3 critical dips and 3 other site specific locations. All recommended treatments conform to guidelines described in "The Handbook for Forest and Ranch Roads" prepared by PWA (1994) for the California Department of Forestry, Natural Resources Conservation Service and the Mendocino County Resource Conservation District.

F. Equipment Needs and Costs

Treatments for the 222 sites identified with future sediment delivery in the Little North Fork Gualala River assessment area will require approximately 1,223 hours of excavator time and 1,424 hours of tractor time to complete all prescribed upgrading, road closure, erosion control and erosion prevention work (Table 4). Excavator and tractor work is not needed at all the sites that have been recommended for treatment and, likewise, not all the sites will require both a tractor and an excavator. Approximately 492 hours of dump truck time has been listed for work in the basin for end-hauling excavated spoil from stream crossings and at unstable road and landing fills where local disposal sites are not available. Approximately 453 hours of labor time is needed for a variety of tasks such as installation or replacement of culverts, and the installation of debris barriers and downspouts. Another 171 hours are allocated for seeding, mulching and planting activities. Approximately 154 hours of grader time is necessary to apply road surface treatments, including outsloping.

Table 3. Recommended treatments along all inventoried roads in the Little North Fork Gualala River watershed assessment area, Mendocino County, California.

Treatment	No.	Comment	Treatment	No.	Comment
Critical dip	46	To prevent stream diversions	Outslope road and remove ditch	97	Outslope 58,011 feet of road to improve road surface drainage
Install CMP	22	Install a CMP at an unculverted fill	Outslope road and retain ditch	9	Outslope 1,450 feet of road to improve road surface drainage
Replace CMP	45	Upgrade an undersized CMP	Install rolling dips	298	Install rolling dips to improve road drainage
Excavate soil	172	Typically fillslope & crossing excavations; excavate a total of 33,347 yds^3	Remove berm	52	Remove 30,392 feet of berm to improve road surface drainage
Down spouts	2	Installed to protect the outlet fillslope from erosion	Install ditch relief CMP	8	Install ditch relief culverts to improve road surface drainage
Wet crossing	40	Install 2 rocked fords and 38 armored fill crossing using 873 yds^3 rip-rap and armor	Clean/cut ditch	13	Clean/cut 1,545 feet of ditch
Clean CMP	1	Remove debris and/or sediment from CMP inlet	Rock road surface	121	Rock or re-rock road surface using 1,409 yds^3 road rock
Install bridge	5	Install bridge	Cross road drains	20	Install cross road drains to improve road drainage
Add trash rack	5	Install trash rack	Other	5	Miscellaneous treatments
Armor fill face	7	Rock armor to protect fillslope from erosion using 76 yds^3 of rock	No treatment recommended	3	
Inslope road	6	Inslope 590 feet of road to improve road surface drainage			

Estimated costs for erosion prevention treatments - Prescribed treatments are divided into two components: a) site specific erosion prevention work identified during the watershed inventories, and b) control of persistent sources of road surface, ditch and cutbank erosion and associated sediment delivery to streams. The site-specific work is further divided into road upgrading activities and road closure (decommissioning) activities. The total costs for road-related erosion control at sites with future sediment delivery is estimated at approximately $630,554 for an average cost-effectiveness value of approximately $9.78 per cubic yard of sediment prevented from entering Little North Fork Gualala River and its tributaries (Table 5).

Overall site specific erosion prevention work: Equipment needs for site specific erosion prevention work at sites with future sediment delivery are expressed in the database, and summarized in Table 4, as direct excavation times, in hours, to treat all sites having a high, moderate, or low treatment immediacy. These hourly estimates include only the time needed to treat each of the sites, and do not include travel time between work sites, times for basic road surface treatments that are not associated with a specific "site," or the time needed for work conferences at each site. These additional times are accumulated as "logistics" and must be added to the work times to determine total equipment costs as shown in Table 5. Finally, the

Table 4. Estimated heavy equipment and labor requirements for treatment of all inventoried sites with future sediment delivery, Little North Fork Gualala River watershed assessment area, Mendocino County, California.

Treatment Immediacy	Site (#)	Excavated Volume (yds^3)	Excavator (hrs)	Tractor (hrs)	Dump Trucks (hrs)	Grader (hrs)	Labor (hrs)
High, High/Moderate	43	11,025	344	395	137	23	149
Moderate, Moderate/Low	139	29,838	783	897	337	104	271
Low	40	2,733	96	132	18	27	33
Total	**222**	**43,596**	**1,223**	**1,424**	**492**	**154**	**453**

estimated equipment time needed to reconstruct or open roads which have been abandoned are listed as a separate line item in Table 5.

The costs in Table 5 are based on a number of assumptions and estimates, and many of these are included as footnotes to the table. The costs provided are assumed reasonable if work is performed by outside contractors, with no added overhead for contract administration and pre- and post-project surveying. Movement of equipment to and from the site will require the use of low-boy trucks. The majority of treatments listed in this plan are not complex or difficult for equipment operators experienced in road upgrading and road decommissioning operations on forest lands. The use of inexperienced operators or the wrong combination of heavy equipment would require additional technical oversight and supervision in the field, as well as escalation of the cost to implement the work.

Table 5 lists a total of 712 hours for "supervision" time for detailed pre-work layout, project planning (coordinating and securing equipment and obtaining plant and mulch materials), on-site equipment operator instruction and supervision, establishing effectiveness monitoring measures, and post-project cost effectiveness analysis and reporting. It is expected that the project coordinator will be on-site full time at the beginning of the project and intermittently after equipment operations have begun.

G. Conclusion

The expected benefit of completing the erosion control and prevention planning work lies in the reduction of long term sediment delivery to the North Fork Gualala River, an important salmonid tributary to the Gualala River watershed. A critical first-step in the overall risk-reduction process is the development of a watershed transportation analysis and plan. In developing this plan, all roads in an ownership or sub-watershed are considered for either decommissioning or upgrading, depending upon the owner's needs and the risk of erosion and sediment delivery to streams. Not all roads are high risk roads and those that pose a low risk of degrading aquatic habitat in the watershed may not need immediate attention. It is therefore important to rank and prioritize roads in each sub-watershed, and within each ownership, based on their potential to impact downstream resources, as well as their importance to the overall transportation system and to management needs.

APPENDIX C

Table 5. Estimated logistic requirements and costs for road-related erosion control and erosion prevention work on all inventoried sites with future sediment delivery in the Little North Fork Gualala River watershed assessment area, Mendocino County, California

Cost Category[1]		Cost Rate[2] ($/hr)	Estimated Project Times			Total Estimated Costs[5] ($)
			Treatment[3] (hours)	Logistics[4] (hours)	Total (hours)	
Move-in; move-out[6] (Low Boy expenses)	Excavator	95	6.0	--	6.0	570
	D-5 tractor	95	6.0	--	6.0	570
Heavy Equipment requirements for site specific treatments	Excavator	130	1,199	360	1,559	202,670
	D-5 tractor	90	1,118	335	1,453	130,770
	Dump Truck	65	492	148	640	41,600
Heavy Equipment requirements for road drainage treatments	Excavator	130	24	7	31	4,030
	D-5 tractor	90	309	93	402	36,180
	Grader	90	155	47	202	18,180
Laborers[7]		28	600	180	780	21,840
Rock Costs: (includes trucking for 1,409 yds^3 of road rock and 979 yds^3 of rip-rap sized rock)						40,596
Culvert materials costs (320' of 18", 1790' of 24", 890' of 30", 695' of 36", 50' of 42", 365' of 48", 80' of 54", 350' of 60". Costs included for couplers)						92,070
Mulch, seed and planting materials for 10.7 acres of disturbed ground[8]						5,878
Layout, Coordination, Supervision, and Reporting[9]		50	--	--	712	35,600
Total Estimated Costs						**$ 630,554**

Potential sediment savings: 64,484 yds^3

Overall project cost-effectiveness: $ 9.78 spent per cubic yard saved

[1] Costs for tools and miscellaneous materials have not been included in this table. Costs for administration and contracting are variable and have not been included. Costs and dump truck time (if needed) for re-rocking the road surface at sites where upgraded roads are outsloped are not included.

[2] Costs listed for heavy equipment include operator and fuel. Costs listed are estimates for favorable local private sector equipment rental and labor rates.

[3] Treatment times include all equipment hours expended on excavations and work directly associated with erosion prevention and erosion control at all the sites.

[4] Logistic times for heavy equipment (30%) include all equipment hours expended for opening access to sites on maintained and abandoned roads, travel time for equipment to move from site-to-site, and conference times with equipment operators at each site to convey treatment prescriptions and strategies. Logistic times for laborers (30%) includes estimated daily travel time to project area.

[5] Total estimated project costs listed are averages based on private sector equipment rental and labor rates.

[6] Lowboy hauling for tractor and excavator, 6 hours round trip for two (2) crews to areas within the Little North Fork Gualala watershed. Costs assume 2 hauls each for two pieces of equipment (one to move in and one to move out).

[7] An additional 171 hours of labor time is added for straw mulch and seeding activities.

[8] Seed costs equal $6/pound for erosion control seed. Seed costs based on 50# of erosion control seed per acre. Straw costs include 50 bales required per acre at $5 per bale. Sixteen hours of labor are required per acre of straw mulching. Does not include additional seed and mulch required on decommissioned road surfaces within the Water/Lake Protection Zones.

[9] Supervision time includes detailed layout (flagging, etc) prior to equipment arrival, training of equipment operators, supervision during equipment operations, supervision of labor work and post-project documentation and reporting). Supervision times based on 50% of the total excavator time plus 2 weeks prior and 2 weeks post project implementation.

Good land stewardship requires that roads either be upgraded and maintained, or intentionally closed ("put-to-bed"). The old practice of abandoning roads, by either installing barriers to traffic (logs, "tank traps" or gates) or simply letting them naturally revegetate, is no longer considered acceptable. Typically, roads continue to fail and erode for decades following abandonment.

All currently open and maintained roads within the Little North Fork Gualala River assessment area were recommended for upgrade treatments. Unmaintained and/or abandoned roads were evaluated on a road by road basis to determine whether roads should be upgraded and maintained, or temporarily or permanently decommissioned. With this prioritized plan of action, the landowners can work with the Sotoyome RCD or other entities to obtain potential funding to implement the proposed projects.

Road upgrading consists of a variety of techniques employed to "erosion-proof" and to "storm-proof" a road and prevent unnecessary future erosion and sedimentation. Erosion-proofing and storm-proofing typically consists of stabilizing slopes and upgrading drainage structures so that the road is capable of withstanding both annual winter rainfall and runoff as well as a large storm event without failing or delivering excessive sediment to the stream system. The goal of road upgrading is to strictly minimize the contributions of fine sediment from roads and ditches to stream channels, as well as to minimize the risk of serious erosion and sediment yield when large magnitude, infrequent storms and floods occur.

The proper word for pro-active road closure is "decommissioning". Decommissioning may be either permanent or temporary, but the treatments are largely the same. Properly decommissioned roads no longer require maintenance and are no longer sources of accelerated erosion and sediment delivery to a watershed's streams. The impacts of reopening old, abandoned roads so that they can be correctly decommissioned has been evaluated on a case-by-case basis, but the benefits (large reductions in long term erosion) almost always far outweigh the negative effects (small, short-term increases in erosion from bare soil areas). Decommissioning does not necessarily suggest permanent closure. Most decommissioned roads, if they are in stable locations, can be rebuilt and reopened at a future date, if they are needed, by simply reinstalling the stream crossings and regrading the former road bed.

V. Little North Fork Gualala Stream Channel Inventory

A. Introduction

Approximately 4.3 miles of Class 1 stream channel was inventoried within the Little North Fork Gualala River watershed in October 2000. This assessment involved inventories along the major anadromous tributaries within the watershed. Stream channel inventories were conducted along the Mainstem North Fork Gualala River (2.2 mi), Dump Creek (0.4 mi), Doty Creek (1.0 mi), Log Cabin Creek (0.2 mi), and along 2 un-named tributaries (0.5 mi). The specific reaches that were inventoried are shown in Figure 4. The goals of the stream channel assessment were two-fold: 1) to identify stream side erosional processes and channel conditions along the anadromous stream channel reaches, and 2) to identify locations where cost-effective erosion control and habitat improvements could be implemented along or within the stream channels.

Aerial photos (1:15,840) were used as a base map to record stream channel observations. The stream channel survey started at the confluence of Little North Fork Gualala River and North Fork Gualala River and extended up the various channels listed above as depicted in Figure 4.

The individual channel base map depicts the location of past and future landslides greater than 50 yds^3 (both debris landslides and deep seated landslides) and bank erosion sites greater than 10 yds^3. In addition, these base maps include estimates of the feature dimensions. Each site that was identified as having the potential for future erosion and sediment delivery was assigned a site number and was quantified and described using a stream channel inventory data form (Figure 5).

Besides documenting locations of past and current erosion and landsliding along the channel, efforts were made to document other important channel features. These included:

- the location of fish structures and concentrations of large woody debris;
- the location of log jams;
- stream gradients, and
- the location of tributary stream junctions

Channel survey protocol

Erosion sites were identified based on field observations of past and active erosion with future sediment delivery and/or field evidence of potential failure (i.e. scarps and cracks) or erosion at locations that have not yet experienced any soil loss. Most of the stream channel inventory sites with potential future sediment delivery were not considered for treatment due to limited access and/or the inability to cost-effectively control the erosion. Some active bank erosion was not quantified because 1) it was spread out over long reaches with localized areas having relatively small erosion volumes and 2) it was considered not treatable. The following information about each site was collected on the PWA stream inventory data form (Figure 5).

Location: Location of the site includes left bank, right bank, or both.

Road related: If a site was considered road related, it was meant to imply a road had some role contributing to the erosion or failure.

Problem: The problem identified was generally the dominant type of erosion observed. Most if not all of the debris slide sites were being actively undercut, so there was also a component of

Figure 4

Figure 5. Stream channel inventory data form used in the Little North Fork Gualala watershed assessment

PWA STREAM CHANNEL INVENTORY DATA FORM

General	Site #:	Station#:	Date:	Mappers:	Watershed:	Stream:
	Air Photo:	Location (LB,RB,Both)	Treat? (Y)	Road related? (Y)		
Problem	Debris slide	Debris torrent source	Slow, deep slide	Bank erosion	Log jam	Other
	Past, future, both	Activity (A,W,IA):	Age (decade):	Hillslope (%):	Land use:	Undercut? (Y)
Erosion	Past width:	Past depth:	Past length:	Past vol:	Past del (%)	Past yld (yds).
E.P.: (H,M,L)	Future width:	Future depth:	Future length:	Future vol:	Fut del (%)	Fut yld (yds):
Treatment	Immed: (H,M,L)	Complexity: (H,M,L)	Equipment or labor (E, L, B).	Access: (Easy, Moderate, Hard)	Local materials? (Y)	Import materials? (Y)
	Excavate soil (Y)	Width (ft)	Depth (ft)	Length (ft)	Vol excavated (yds^3):	Rock armor buttress (Y)	Rock armor area (ft^2)
	Rock armor size (ft)	Log protection (Y)	Log protection width (ft)	Log protection length (ft)	Log protection height (ft)	Remove logs/rocks/debris (Y)
	Plant *erosion* control (Y)	Plant riparian enhancement (Y)	Area Planted (ft^2)	Exclusionary fencing (Y)	Length of fence (ft)	Other (Y)
Hours:	Excavator:	Dozer:	Dump truck.	Backhoe.	Labor:	Other.
Problem.				Sketch.		
Treatment:						

bank erosion associated with these features. Log jams were listed as the problem if they were the causal mechanism by which erosion was occurring but their sediment yield volumes have been tabulated under the actual type of erosion associated with the log jam.

Activity: The activity level was either documented as active, waiting or inactive. Debris slides with active bank erosion undercutting their toes were listed as active. Those without significant active undercutting but with some future potential were listed as waiting.

Volumes: Quantifying erosional features, both past and future, includes an element of professional judgement. Estimation of erosional activity and future volumes of bank erosion is based on considering factors such as:

1) location (is the site on a relatively straight reach or on the outside of a tight meander bend?);
2) average channel width;
3) stream energy; influenced by the size of the stream, stream gradient, obstructions and their orientation(s), degree of channel constriction and confinement;

4) height of bank or banks being eroded;
5) composition and resistance of the materials in the hank to erosion;
6) presence or absence of natural armor.

Estimation of future volumes of debris slides is based on considering the geomorphology of the potential slide area and includes factors such as:

1) slope shape; (concave, convex, or planar)
2) break-in-slope; may indicate likely limit of slide or may extend up slope further; and
3) slope gradient or gradients if breaks-in-slope are present;

The estimation of future bank erosion volume also depends upon the time frame one is considering. In this survey, a 30 to 50 year time frame was envisioned. Past erosion was only documented when it was part of a future erosion site.

Erosion potential: The erosion potential (likelihood of future erosion) was listed as high, moderately high, moderate, moderately low, or low taking into account the factors previously noted.

Treatment immediacy: The combination of the erosion potential, the volume of sediment (in relation to the size and gradient of the stream), the feasibility of carrying out the treatment, and the long term effectiveness of the treatment factored into the treatment immediacy.

B. Results

A total of twenty-nine (29) past and potential future sites with sediment delivery were identified along inventoried Class I stream channel reaches within the Little North Fork Gualala watershed area. Inventoried sites include 20 bank erosion sites, 8 debris landslides and 1 log jam (Table 6). It is estimated that approximately 9,409 yds^3 was delivered in the past from these sites and 2,688 yds^3 could be delivered from these sites if they are not treated.

When evaluating erosion sites on the Little North Fork Gualala it is clear that the dominant erosion processes change from the main stem to the main tributaries. On the main stem, where stream gradients are low, the channel is unconfined and meandering, fluvial terraces are the dominant sediment source and bank erosion is the most common type of erosional process. On main tributaries where stream gradients are higher, the channel is confined, thick heterogeneous, low strength colluvial sediments are the dominant sideslope material and debris landsliding is the most common erosional process (Table 6).

Of the 29 sites identified, 2 have been recommended for erosion control and erosion prevention treatment. The remaining 27 sites identified have not been recommended for treatment because 1) some sites with future erosion and delivery are located in remote locations with little to no equipment access or 2) sites with no future erosion potential did not require treatment. Treating erosional sites along stream channels and tributaries is not as straight forward or cost effective as treating erosion related to the road system. In most cases, pioneering a road to allow heavy equipment access may generate more sediment and long term maintenance costs than is justifiable by either a sediment savings cost or sediment production analysis.

Estimated costs to treat the two sites recommended for erosion control and erosion prevention treatment is approximately $1,506. Heavy equipment needs for treatment implementation will

include excavator and dozer. In addition, estimated costs are included for 30% logistics for all equipment hours expended to open access to sites, travel time for equipment to move from site-to-site, conference times with equipment operators at each site to convey treatment prescriptions and strategies; and "supervision" time for detailed pre-work layout, project planning and on-site equipment operator instruction and supervision.

Taking into consideration all the factors including: treatment immediacy, total sediment delivery, treatment cost-effectiveness, likelihood of controlling or preventing erosion, treatment complexity and equipment access, leads us to the conclusion that monies would be better spent treating sediment sources along the road system where equipment access is readily available and treatments are likely to be more effective.

Table 6. Stream channel survey sites by site number, Little North Fork Gualala River assessment area, Mendocino County, California

Stream name	Site #	Erosion Type	Erosion Potential	Past delivery (yds^3)	Future yield (yds^3)	Treat?	Treatment prescription	Estimated Treatment costs ($)
LNF Gualala	1	Bank erosion	ML	23	23	No	None/No access	0
LNF Gualala r	2	Bank erosion	L	22	3	No	None/No access	0
LNF Gualala	3	Bank erosion	M	96	96	No	None/No access	0
LNF Gualala	6	Bank erosion	ML	72	72	No	None/No access	0
LNF Gualala	7	Bank erosion	ML	385	96	No	None/No access	0
LNF Gualala	8	Bank erosion	L	74	74	No	None/No access	0
LNF Gualala	9	Bank erosion	L	61	0	No	None/No access	0
LNF Gualala	10	Bank erosion	L	56	0	No	None/No access	0
LNF Gualala	11	Bank erosion	M	187	62	No	None/No access	0
LNF Gualala	12	Bank erosion	ML	741	148	No	None/No access	0
LNF Gualala	15	Bank erosion	ML	100	24	No	None/No access	0
LNF Gualala	16	Log jam	M	178	89	No	None/No access	0
LNF Gualala	17	Debris slide	L	1,422	1,333	No	None/No access	0
LNF Gualala	18	Bank erosion	L	0	44	Yes	Excavate soil	310
LNF Gualala	19	Bank erosion	M	59	36	No	None/No access	0
LNF Gualala	20	Bank erosion	ML	83	17	No	None/No access	0
Doty Creek	21	Debris slide	L	231	0	No	None/No access	0
Doty Creek	22	Debris slide	L	417	0	No	None/No access	0
Doty Creek	23	Debris slide	L	56	0	No	None/No access	0
Doty Creek	24	Debris slide	L	133	0	No	None/No access	0
Doty Creek	25	Debris slide	L	97	0	No	None/No access	0
Doty Creek	26	Debris slide	M	1,800	0	No	None/No access	0
Doty Creek	27	Bank erosion	L	59	9	No	None/No access	0
No Name #1	29	Bank erosion	ML	2,222	111	No	None/No access	0
Log Cabin	30	Debris slide	L	97	0	No	None/No access	0
LNF Gualala	31	Bank erosion	M	222	222	No	None/No access	0
No Name # 2	32	Bank erosion	L	222	0	No	None/No access	0
LNF Gualala	33	Bank erosion	ML	250	185	Yes	Excavate soil	1,196
LNF Gualala	34	Bank erosion	L	44	44	No	None/No access	0
Totals	**29**	**20 bank erosion, 8 debris slides, 1 log jam**		**9,409**	**2,688**			**1,506**

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APPENDIX C

Attachment 2.

Final Report:

GRI Little North Fork Gualala River Sediment Reduction Project, Mendocino County, CA

for

Sotoyome Resource Conservation District
CDFG Contract #P0140405

April 2004

Little North Fork of the Gualala River Sediment Reduction Project - 2003

In the summer of 2003, Gualala Redwoods, Inc. and the California Department of Fish and Game, using SB-271 funds, shared equally in the costs of upgrading all the roads in the Little North Fork of the Gualala River. The grant was awarded to and administered by the Sotoyome Resoruce Conservation District. The actual work was planned and overseen by Pacific Watershed Associates and Gualala Redwoods. CDF&G administration was by Scott Monday and Doug Albin. The pricipal contractors were McCanless Excavating and L.D. Giacomini Enterprises. The work was completed on budget and on time.

10/14/03 Before PPt Up Dir Cr Station 0 LWD Site Photo 1714 F:\GRI Photos\Small\Big Num\1714 DCP_1450.jpg
Road# 60.4 Mi. 1.610 Map Pt. 1470 THP 271 LN LNF P01030405A PID 0
Blowing straw.

Little North Fork of the Gualala River Sediment Reduction Project
2003

In the summer of 2003, Gualala Redwoods, Inc. (GRI) and the California Department of Fish and Game (DFG), using SB-271 funds, shared equally in the costs of upgrading all the roads in the Little North Fork of the Gualala River. The grant was awarded to and administered by the Sotoyome Resource Conservation District (SRCD). The SRCD contracted with GRI to conduct the work. The actual work was planned and overseen by Pacific Watershed Associates (PWA) and Gualala Redwoods, Inc. CDF&G administration was by Scott Monday and Doug Albin. The principal contractors were McCanless Excavating and L.D. Giacomini Enterprises. The work was completed on budget and on time.

1. The Little North Fork of the Gualala River sediment reduction project was completed under grant agreement P0130405.

2. The work was located in the Doty Creek (Little North Fork of the Gualala River) planning watershed.

3. The project can be accessed by turning off Highway One in Gualala on Old State Highway (GRI road 60) and proceeding 2.1 miles up the river road to the Green Bridge at the confluence of the North Fork of the Gualala River and the South Fork of the Gualala River. Turn left on GRI's river road (Still GRI road 60. Go 1.1 miles to the confluence of the Little North Fork and the North Fork of the Gualala River. This is the beginning of the project area. The landowner is Gualala Redwoods, Inc. P.O. Box 197, Gualala, CA 95445. GRI's phone number is 707-884-4226.

4. The project was initiated by the Gualala River Watershed Council and Gualala Redwoods, Inc. The SRCD applied for an SB271 assessment grant from DFG. The SRCD was awarded Contract #: P9985012 which allowed them to contract with PWA to assess the Little North Fork of the Gualala River watershed. In the summer of 2001 this work was completed and resulted in a Report Dated March 2002.

   Another SB271 grant was applied for by the SRCD to implement the recommendations of the PWA assessment. It was to be a 50/50 cost share with GRI. The SRCD was awarded Contract #: P0140405.

   In the summer of 2003, work began. The project was jointly administered by PWA and GRI. Crews from McCanless Excavating and L.D. Giacomini Enterprises were used. Two cats, two excavators and an assortment of other equipment worked all summer.

Some of the work in on the east side of the watershed was completed in the summer of 2001, but was not billed under this contract.

Danny Hagans from PWA reviewed the sites ahead of the crews and revised the prescriptions as necessary. Many changes were made. The most common change was to install a rocked ford instead of a culvert in small (class III) stream crossings.

The work went smoothly and was completed on time and on budget.

5. Work was completed on 248 PWA sites. Thirty-five miles (80%) of road in the watershed were out sloped and dipped. During the project, 38,079 yards of material were excavated which prevented 54,186 yards of sediment from entering the streams. At the end of the season, when it appeared that there would be surplus money, three additional culverts were replaced outside the project area. Nineteen minor sites were left for future work. The attached database report gives a detailed record of each site completed.

6. The work occurred between May 15 and November 15, 2003. There were 704 person hours of supervision, 4,501 person hours of equipment operation and 724 person hours of general labor expended on the project.

7. See the attached photo album for photographs of the work. The Photos are sorted by road number, mileage, direction of photo and date.

8. A total of $563,687.61 was spent on the project. The state was billed $276,382.00. GRI's share was $287,305.61.

The Little North Fork of the Gualala River Sediment Reduction Project - 2003

In the summer of 2003, Gualala Redwoods, Inc. and the California Department of Fish and Game, using SB-271 funds, shared equally in the costs of upgrading all the roads in the Little North Fork of the Gualala River. The grant was awarded to and administered by the Sotoyome Resoruce Conservation District. The actual work was planned and overseen by Pacific Watershed Associates and Gualala Redwoods. CDF&G administration was by Scott Monday and Doug Albin. The pricipal contractors were McCanless Excavating and L.D. Giacomini Enterprises. The work was completed on budget and on time.

Road Upgrading Photo # 1881
11/10/03
Map Pt 0 Road 1.08 Mi. 0.08
Old New
PPt 0 Dir 310 PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
The estuary of the Gualala River after the first rain in the fall of 2003.

People in Photo:

F:\GRI Photos\Small\BigNum\1879 DCP_1688.jpg

Road Upgrading Photo # 1882
10/19/01
Map Pt 0 Road 60 Mi. 2.8
Old New
PPt 0 Dir 320 PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
This is a view of the Little North Fork of the Gualala watershed with Elk Prairie in the foreground.

People in Photo:

F:\GRI Photos\Small\786 LNF Heli DCP_0752.jpg

Road Upgrading **Photo #** 1825
10/27/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1825 DCP_1557.jpg

Road Upgrading **Photo #** 1842
10/30/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Bob Neal Stan Stornetta

F:\GRI Photos\Small\BigNum\1842 DCP_1592.jpg

Road Upgrading **Photo #** 1843
10/30/03
Map Pt 2300 **Road** 60 **Mi.** 3.12
Culv. Replace **Old** 30" **New** 48"
PPt down **Dir** **PW** Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1843 DCP_1593.jpg

Road Upgrading Photo # 1869
11/5/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt down Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1869 DCP_1656.jpg

Road Upgrading Photo # 1870
11/5/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt down Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1870 DCP_1657.jpg

Road Upgrading Photo # 1827
10/27/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt left Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1827 DCP_1561.jpg

Road Upgrading Photo # 1826
10/27/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt Up Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1826 DCP_1560.jpg

Road Upgrading Photo # 1844
10/30/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt Up Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1844 DCP_1596.jpg

Road Upgrading Photo # 1871
11/5/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt Up Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1871 DCP_1660.jpg

Road Upgrading Photo # 1872
11/5/03
Map Pt 2300 Road 60 Mi. 3.12
Culv. Replace Old 30" New 48"
PPt Up Dir PW Robinson Cr
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

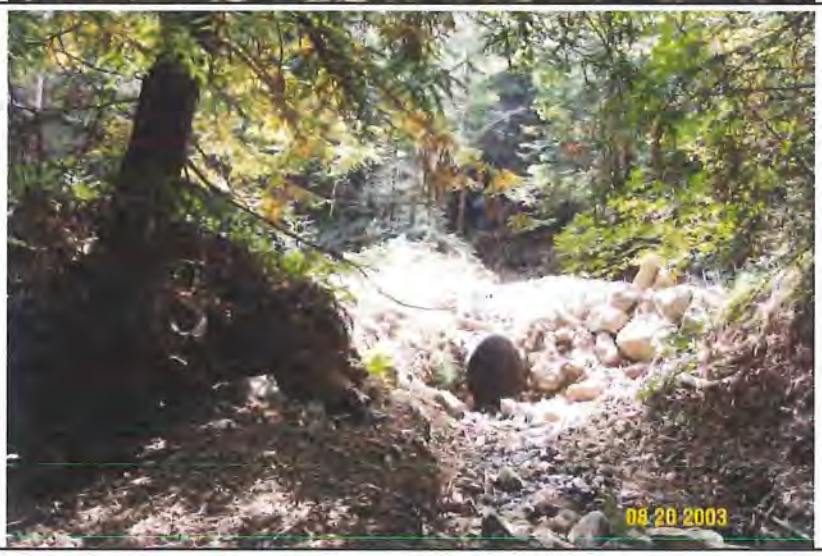
People in Photo:

F:\GRI Photos\Small\BigNum\1872 DCP_1661.jpg

Road Upgrading Photo # 1023
7/9/02
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\1023 1519 DCP_1615.JPG



Road Upgrading Photo # 1571
8/20/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1571 DCP_1235.jpg

Road Upgrading **Photo #** 1817
10/27/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1817 DCP_1526.jpg

Road Upgrading **Photo #** 1818
10/27/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon Kelly McCanless

F:\GRI Photos\Small\BigNum\1818 DCP_1534.jpg

Road Upgrading **Photo #** 1828
10/29/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1828 DCP_1562.jpg

Road Upgrading Photo # 1862
11/5/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1862 DCP_1643.jpg

Road Upgrading Photo # 1570
8/20/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1570 DCP_1234.jpg

Road Upgrading Photo # 1816
10/27/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1816 DCP_1525.jpg

Road Upgrading Photo # 1829
10/29/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1829 DCP_1563.jpg

Road Upgrading Photo # 1863
11/5/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1863 DCP_1646.jpg

Road Upgrading Photo # 1573
8/20/03
Map Pt 1519 Road 60.39 Mi. 0.210
Culv. Maintenance Old 48" New 84"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1573 DCP_1238.jpg

Road Upgrading **Photo #** 1815
10/27/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1815 DCP_1520.jpg

Road Upgrading **Photo #** 1830
10/29/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1830 DCP_1564.jpg

Road Upgrading **Photo #** 1864
11/5/03
Map Pt 1519 **Road** 60.39 **Mi.** 0.210
Culv. Maintenance **Old** 48" **New** 84"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1864 DCP_1648.jpg

Road Upgrading Photo # 1569
8/20/03
Map Pt 2171 Road 60.39 Mi. 0.9
Rock Pit Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1569 DCP_1233.jpg

Road Upgrading Photo # 1567
8/20/03
Map Pt 1506 Road 60.39 Mi. 1.19
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1567 DCP_1230.jpg

Road Upgrading Photo # 1568
8/20/03
Map Pt 1506 Road 60.39 Mi. 1.19
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

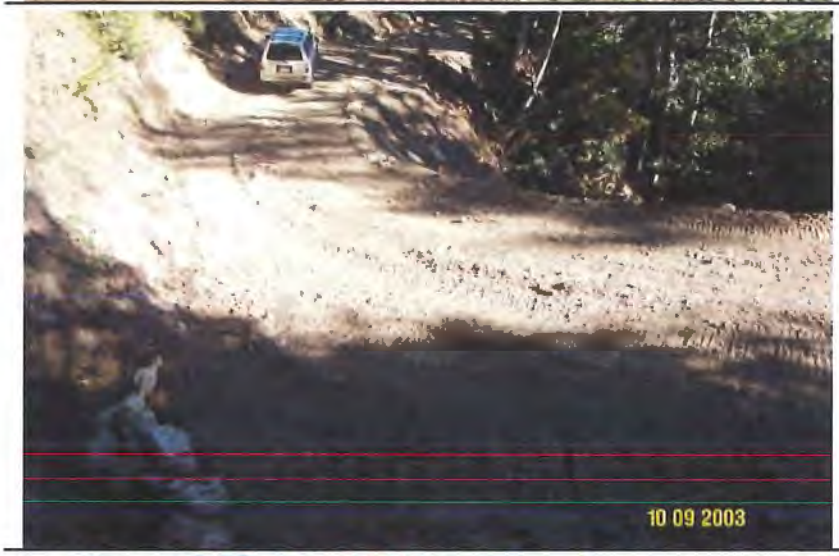
People in Photo:

F:\GRI Photos\Small\BigNum\1568 DCP_1231.jpg

Road Upgrading Photo # 1562
8/20/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1562 DCP_1206.jpg



Road Upgrading Photo # 1680
10/9/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1680 DCP_1378.jpg

Road Upgrading Photo # 1563
8/20/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1563 DCP_1207.jpg

Road Upgrading Photo # 1564
8/20/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1564 DCP_1216.jpg

Road Upgrading Photo # 1565
8/20/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Vic Spurgeon Rick Loghry

F:\GRI Photos\Small\BigNum\1565 DCP_1218.jpg

Road Upgrading Photo # 1566
8/20/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1566 DCP_1224.jpg

Road Upgrading Photo # 1678
10/9/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1678 DCP_1372.jpg

Road Upgrading Photo # 1679
10/9/03
Map Pt 1494 Road 60.39 Mi. 1.515
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1679 DCP_1374.jpg

Road Upgrading Photo # 1535
8/11/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1535 DCP_1197.jpg

Road Upgrading Photo # 1536
8/11/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1536 DCP_1198.jpg

Road Upgrading Photo # 1682
10/9/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1682 DCP_1380.jpg

Road Upgrading Photo # 1683
10/9/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1683 DCP_1381.jpg

Road Upgrading Photo # 1539
8/11/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1539 DCP_1204.jpg

Road Upgrading Photo # 1681
10/9/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

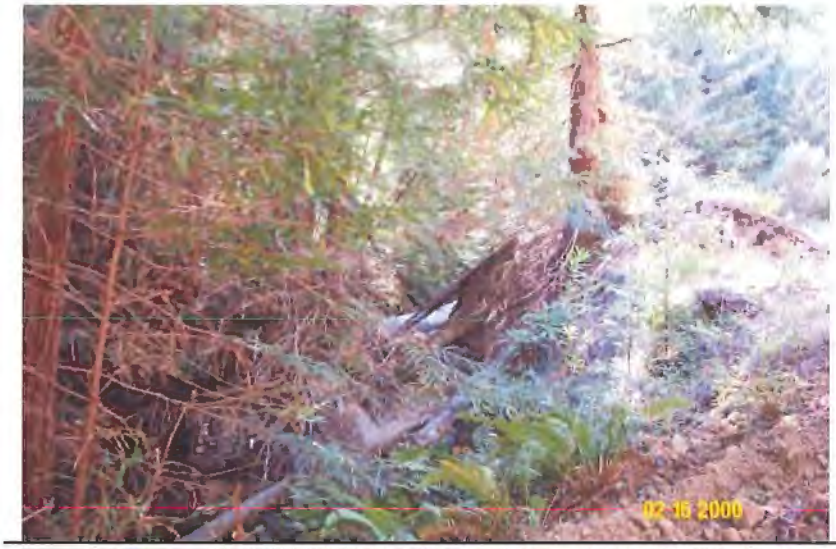
People in Photo:

F:\GRI Photos\Small\BigNum\1681 DCP_1379.jpg

Road Upgrading Photo # 1537
8/11/03
Map Pt 1516 Road 60.3915 Mi. 0.520
Other Old New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1537 DCP_1199.jpg



Road Upgrading **Photo #** 1538
8/11/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1538 DCP_1201.jpg

Road Upgrading **Photo #** 1684
10/9/03
Map Pt 1516 **Road** 60.3915 **Mi.** 0.520
Other **Old** **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1684 DCP_1383.jpg

Road Upgrading **Photo #** 1473
6/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1473 DCP_2556.jpg

Road Upgrading Photo # 1474
6/10/03
Map Pt 1553 Road 60.4 Mi. 0.04
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1474 DCP_2557.jpg

Road Upgrading Photo # 1692
10/10/03
Map Pt 1553 Road 60.4 Mi. 0.04
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1692 DCP_1400.jpg

Road Upgrading Photo # 1700
10/13/03
Map Pt 1553 Road 60.4 Mi. 0.04
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1700 DCP_1411.jpg

Road Upgrading **Photo #** 1701
10/13/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1701 DCP_1413.jpg

Road Upgrading **Photo #** 1471
6/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

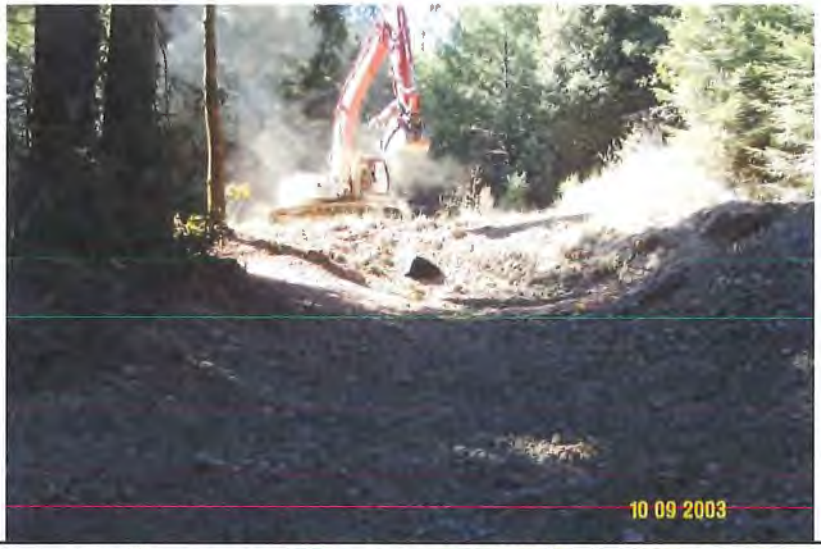
People in Photo:
Bob Neal

F:\GRI Photos\Small\BigNum\1471 DCP_2553.jpg

Road Upgrading **Photo #** 1472
6/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1472 DCP_2554.jpg



Road Upgrading **Photo #** 1690
10/9/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1690 DCP_1392.jpg

Road Upgrading **Photo #** 1691
10/9/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1691 DCP_1397.jpg

Road Upgrading **Photo #** 1693
10/10/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1693 DCP_1401.jpg

Road Upgrading **Photo #** 1699
10/13/03
Map Pt 1553 **Road** 60.4 **Mi.** 0.04
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1699 DCP_1410.jpg

Road Upgrading **Photo #** 1475
6/10/03
Map Pt 1552 **Road** 60.4 **Mi.** 0.265
Other **Old** 18" **New** 30"
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:
Bob Neal

F:\GRI Photos\Small\BigNum\1475 DCP_2560.jpg

Road Upgrading **Photo #** 1477
6/10/03
Map Pt 1534 **Road** 60.4 **Mi.** 0.49
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1477 DCP_2562.jpg

Road Upgrading Photo # 1478
6/10/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1478 DCP_2564.jpg

Road Upgrading Photo # 1661
10/6/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

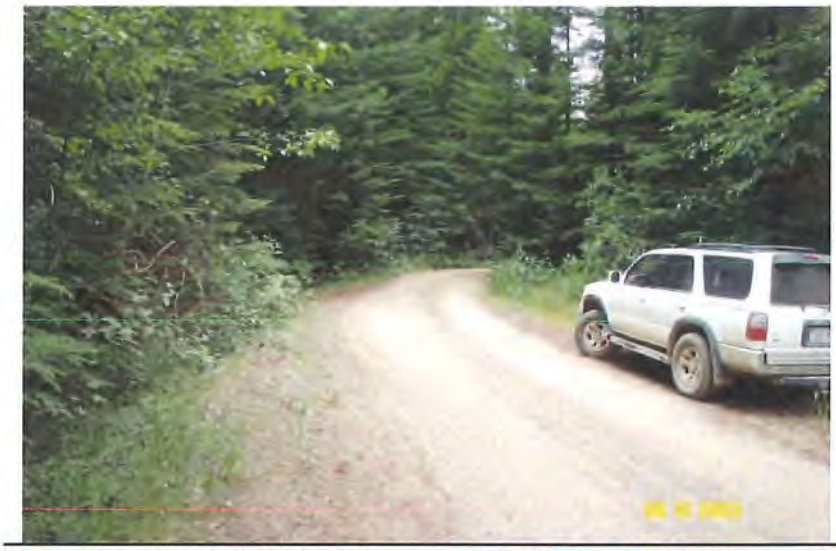
People in Photo:

F:\GRI Photos\Small\BigNum\1661 DCP_1343.jpg

Road Upgrading Photo # 1732
10/20/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1732 DCP_1491.jpg



Road Upgrading Photo # 1476
6/10/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1476 DCP_2561.jpg

Road Upgrading Photo # 1658
10/6/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1658 DCP_1337.jpg

Road Upgrading Photo # 1730
10/20/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1730 DCP_1489.jpg

Road Upgrading Photo # 1659
10/6/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1659 DCP_1339.jpg

Road Upgrading Photo # 1731
10/20/03
Map Pt 1534 Road 60.4 Mi. 0.49
Other Old 36" New 48"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1731 DCP_1490.jpg

Road Upgrading Photo # 1479
6/10/03
Map Pt 1667 Road 60.4 Mi. 0.710
Other Old 18" New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Pre work inspection with AT&T

People in Photo:

F:\GRI Photos\Small\BigNum\1479 DCP_2565.jpg

Road Upgrading **Photo #** 1654
10/5/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1654 DCP_1334.jpg

Road Upgrading **Photo #** 1657
10/6/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry Bob Neal

F:\GRI Photos\Small\BigNum\1657 DCP_1348.jpg

Road Upgrading **Photo #** 1660
10/6/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1660 DCP_1342.jpg

Road Upgrading Photo # 1710
10/14/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1710 DCP_1432.jpg

Road Upgrading Photo # 1722
10/15/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1722 DCP_1469.jpg

Road Upgrading Photo # 1653
10/5/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1653 DCP_1333.jpg

Road Upgrading **Photo #** 1667
10/9/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1667 DCP_1354.jpg

Road Upgrading **Photo #** 1708
10/14/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1708 DCP_1429.jpg

Road Upgrading **Photo #** 1711
10/14/03
Map Pt 1473 **Road** 60.4 **Mi.** 0.960
Other **Old** 36" **New** 60"
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:
Vic Spurgeon Rick Loghry

F:\GRI Photos\Small\BigNum\1711 DCP_1464.jpg

Road Upgrading Photo # 1725
10/15/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1725 DCP_1472.jpg

Road Upgrading Photo # 1669
10/9/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1669 DCP_1356.jpg

Road Upgrading Photo # 1709
10/14/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1709 DCP_1431.jpg

Road Upgrading Photo # 1723
10/15/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1723 DCP_1470.jpg

Road Upgrading Photo # 1655
10/5/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Note the bottom is worn out.

People in Photo:

F:\GRI Photos\Small\BigNum\1655 DCP_1335.jpg

Road Upgrading Photo # 1656
10/6/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1656 DCP_1347.jpg

APPENDIX C

Road Upgrading Photo # 1668
10/9/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Up

People in Photo:

F:\GRI Photos\Small\BigNum\1668 DCP_1355.jpg

Road Upgrading Photo # 1707
10/14/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1707 DCP_1427.jpg

Road Upgrading Photo # 1724
10/15/03
Map Pt 1473 Road 60.4 Mi. 0.960
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1724 DCP_1471.jpg

Road Upgrading Photo # 1665
10/9/03
Map Pt 1658 Road 60.4 Mi. 1.45
Bridge - Perm Old 42" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
down

People in Photo:

F:\GRI Photos\Small\BigNum\1665 DCP_1352.jpg

Road Upgrading Photo # 1867
11/5/03
Map Pt 1658 Road 60.4 Mi. 1.45
Bridge - Perm Old 42" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1867 DCP_1653.jpg

Road Upgrading Photo # 1666
10/9/03
Map Pt 1658 Road 60.4 Mi. 1.45
Bridge - Perm Old 42" New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Up

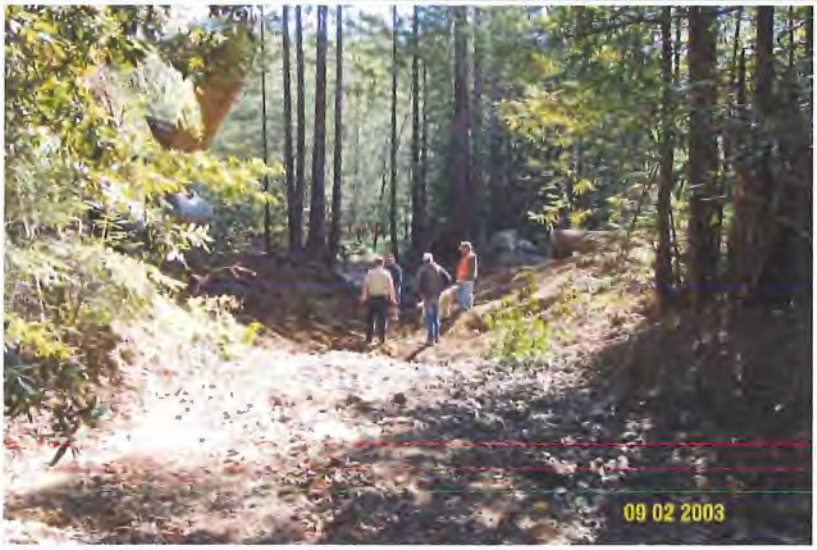
People in Photo:

F:\GRI Photos\Small\BigNum\1666 DCP_1353.jpg

Road Upgrading Photo # 1868
11/5/03
Map Pt 1658 Road 60.4 Mi. 1.45
Bridge - Perm Old 42" New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1868 DCP_1654.jpg



Road Upgrading Photo # 1604
9/2/03
Map Pt 1470 Road 60.4 Mi. 1.610
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Bridge installation.

People in Photo:
Stan Stornetta Danny Hagans
Rick Loghry Jerry Orth
Bob Neal

F:\GRI Photos\Small\BigNum\1604 DCP_1256.jpg

Road Upgrading Photo # 1605
9/2/03
Map Pt 1470 Road 60.4 Mi. 1.610
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Bridge installation.

People in Photo:
Bob Neal

F:\GRI Photos\Small\BigNum\1605 DCP_1260.jpg

Road Upgrading Photo # 1606
9/2/03
Map Pt 1470 Road 60.4 Mi. 1.610
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Bridge installation.

People in Photo:
Danny Hagans Stan Stornetta
Jerry Orth

F:\GRI Photos\Small\BigNum\1606 DCP_1265.jpg

Road Upgrading Photo # 1607
9/2/03
Map Pt 1470 Road 60.4 Mi. 1.610
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Bridge installation.

People in Photo:
Jerry Orth

F:\GRI Photos\Small\BigNum\1607 DCP_1269.jpg

Road Upgrading Photo # 1608
9/2/03
Map Pt 1470 Road 60.4 Mi. 1.610
Bridge - Perm Old 48" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Bridge installation.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1608 DCP_1277.jpg

Road Upgrading **Photo #** 1609
9/2/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Rick Loghry Stan Stornetta
Jerry Orth

F:\GRI Photos\Small\BigNum\1609 DCP_1279.jpg

Road Upgrading **Photo #** 1713
10/14/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Blowing straw.

People in Photo:
Hay Blower

F:\GRI Photos\Small\BigNum\1713 DCP_1443.jpg

Road Upgrading **Photo #** 1712
10/14/03
Map Pt 1470 **Road** 60.4 **Mi.** 1.610
Bridge - Perm **Old** 48" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Blowing straw.

People in Photo:
Hay Blower

F:\GRI Photos\Small\BigNum\1712 DCP_1440.jpg

Road Upgrading Photo # 1714
10/14/03
Map Pt 1470 Road 60.4 Mi. 1.610
Bridge - Perm Old 48" New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Blowing straw.

People in Photo:
Hay Blower

F:\GRI Photos\Small\BigNum\1714 DCP_1450.jpg

Road Upgrading Photo # 1738
10/22/03
Map Pt 1572 Road 60.4 Mi. 2.43
Other Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1738 DCP_1506.jpg

Road Upgrading Photo # 1737
10/22/03
Map Pt 1572 Road 60.4 Mi. 2.43
Other Old - New -
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1737 DCP_1501.jpg

Road Upgrading **Photo #** 1820
10/27/03
Map Pt 1590 **Road** 60.402 **Mi.** 0.64
Other **Old** 36" **New** 48"
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

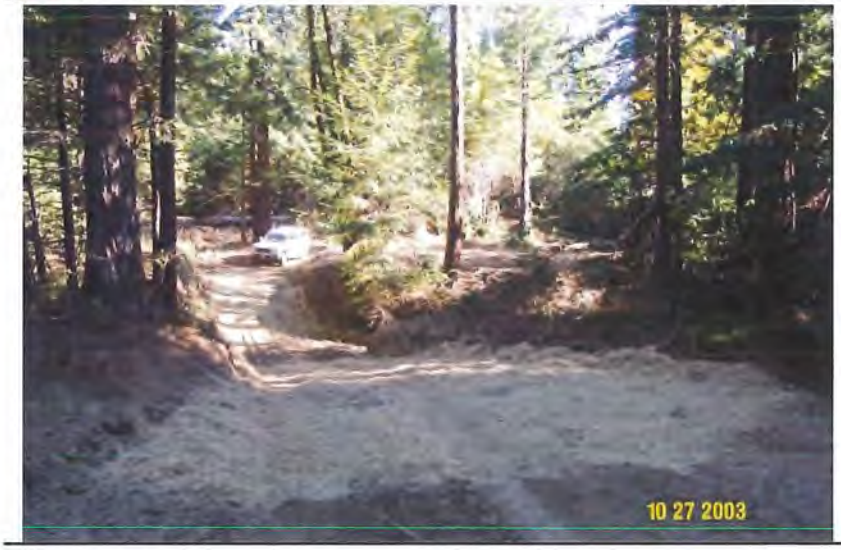
People in Photo:

F:\GRI Photos\Small\BigNum\1820 DCP_1545.jpg

Road Upgrading **Photo #** 1819
10/27/03
Map Pt 1590 **Road** 60.402 **Mi.** 0.64
Other **Old** 36" **New** 48"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1819 DCP_1543.jpg



Road Upgrading **Photo #** 1821
10/27/03
Map Pt 1586 **Road** 60.402005 **Mi.** 0.04
Temp. Crossing **Old** - **New** 1Br
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

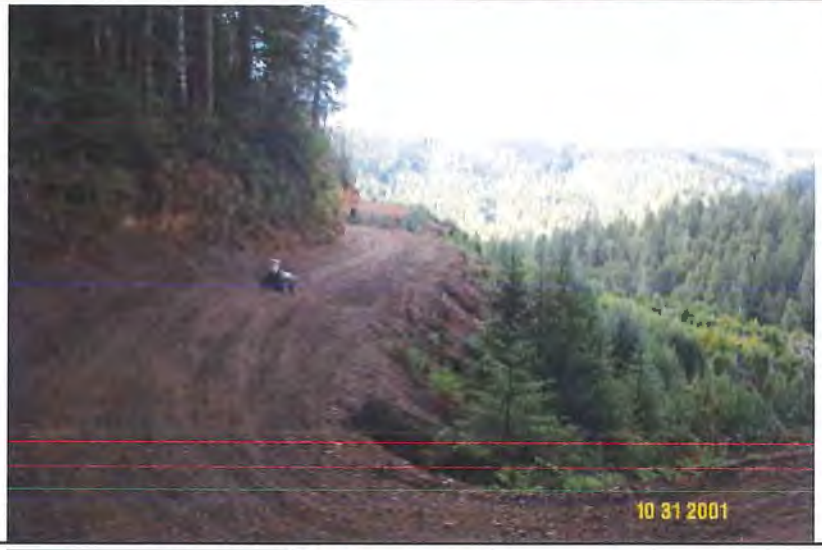
People in Photo:

F:\GRI Photos\Small\BigNum\1821 DCP_1546.jpg

Road Upgrading Photo # 764
9/10/01
Map Pt 1580 Road 60.402005 Mi. 0.770
Other Old - New -
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
This is a rocked dip in a class III

People in Photo:

F:\GRI Photos\Small\764 LNF roadDcp_0667.jpg



Road Upgrading Photo # 792
10/20/01
Map Pt 1580 Road 60.402005 Mi. 0.770
Other Old - New -
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
This is a rocked Ford with outsloping and dips on either side to disconnect the road from the Class III.

People in Photo:

F:\GRI Photos\Small\792 Rd 1580 Dcp_0954.jpg

Road Upgrading Photo # 1121
8/23/02
Map Pt 1580 Road 60.402005 Mi. 0.770
Other Old - New -
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1121 1580 DCP_0411.jpg

Road Upgrading Photo # 791
10/20/01

Map Pt 1580 Road 60.402005 Mi. 0.770
Other Old - New -
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

This is a rocked Ford with outsloping and dips on either side to disconnect the road from the Class III.

People in Photo:

F:\GRI Photos\Small\791 Rd 1580 DCP_0927.jpg

Road Upgrading Photo # 1634
9/24/03

Map Pt 2258 Road 60.40200501 Mi. 0
Dip Rolling Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

The outside berm is moved to the inside.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1634 DCP_1304.jpg

Road Upgrading Photo # 1635
9/24/03

Map Pt 2258 Road 60.40200501 Mi. 0
Dip Rolling Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

The outside berm is moved to the inside.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1635 DCP_1307.jpg

Road Upgrading Photo # 1649
9/30/03
Map Pt 2258 Road 60.40200501 Mi. 0
Dip Rolling Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
The road is outsloped and a dip has been installed about where the excavator was sitting

People in Photo:

F:\GRI Photos\Small\BigNum\1649 DCP_1324.jpg

Road Upgrading Photo # 1650
9/30/03
Map Pt 2258 Road 60.40200501 Mi. 0
Dip Rolling Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1650 DCP_1325.jpg

Road Upgrading Photo # 1636
9/24/03
Map Pt 2258 Road 60.40200501 Mi. 0
Dip Rolling Old - New -
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
The outside berm is moved to the inside.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1636 DCP_1308.jpg

Road Upgrading Photo # 1648
9/30/03
Map Pt 2258 Road 60.40200501 Mi. 0
Dip Rolling Old - New -
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
The road is outsloped and a dip has been installed about where the excavator was sitting

People in Photo:

F:\GRI Photos\Small\BigNum\1648 DCP_1321.jpg

Road Upgrading Photo # 1637
9/23/03
Map Pt 1584 Road 60.40200501 Mi. 0.53
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1637 DCP_1309.jpg

Road Upgrading Photo # 1646
9/30/03
Map Pt 1584 Road 60.40200501 Mi. 0.53
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1646 DCP_1319.jpg

Road Upgrading Photo # 1647
9/30/03
Map Pt 1584 Road 60.40200501 Mi. 0.53
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

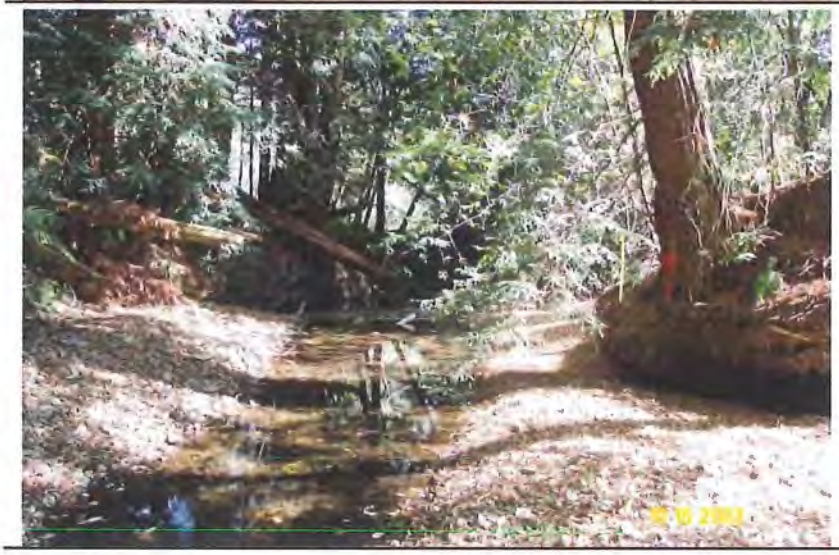
People in Photo:

F:\GRI Photos\Small\BigNum\1647 DCP_1320.jpg

Road Upgrading Photo # 701
8/21/01
Map Pt 1596 Road 60.4020051886 Mi. 0.1
Other Old - New -
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Excavated class III corssing.

People in Photo:
John Edmunds

F:\GRI Photos\Small\701 crossing Dcp_0562.jpg



Road Upgrading Photo # 1720
10/15/03
Map Pt 2293 Road 60.4024 Mi. 0.03
Bridge - Perm Old - New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1720 DCP_1466.jpg

Road Upgrading **Photo #** 1846
10/30/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Keying in riprap for the bridge abutment.

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1846 DCP_1638.jpg

Road Upgrading **Photo #** 1865
11/5/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1865 DCP_1651.jpg

Road Upgrading **Photo #** 1823
10/27/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Large logs staged for placement in stream

People in Photo:

F:\GRI Photos\Small\BigNum\1823 DCP_1552.jpg

Road Upgrading **Photo #** 1845
10/30/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt left **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
The 67' railroad car bridge is ready to place.

People in Photo:

F:\GRI Photos\Small\BigNum\1845 DCP_1636.jpg

Road Upgrading **Photo #** 1822
10/27/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1822 DCP_1549.jpg

Road Upgrading **Photo #** 1847
10/30/03
Map Pt 2293 **Road** 60.4024 **Mi.** 0.03
Bridge - Perm **Old** - **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Keying in riprap for the bridge abutment. Vic directs Rick as to proper placement.

People in Photo:
Rick Loghry Vic Spurgeon

F:\GRI Photos\Small\BigNum\1847 DCP_1641.jpg

Road Upgrading Photo # 1721
10/15/03
Map Pt 2293 Road 60.4024 Mi. 0.03
Bridge - Perm Old - New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1721 DCP_1467.jpg

Road Upgrading Photo # 1866
11/5/03
Map Pt 2293 Road 60.4024 Mi. 0.03
Bridge - Perm Old - New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1866 DCP_1652.jpg

Road Upgrading Photo # 1739
10/22/03
Map Pt 1558 Road 60.407209 Mi. 0.170
Other Old - New -
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1739 DCP_1507.jpg

APPENDIX C

Road Upgrading Photo # 1428
5/20/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1428 DCP_2418.jpg

Road Upgrading Photo # 1462
6/5/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Finishing up a critical dip on the hinge.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1462 DCP_2545.jpg

Road Upgrading Photo # 1463
6/5/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
The inlet is too high, above the road surface.

People in Photo:

F:\GRI Photos\Small\BigNum\1463 DCP_2546.jpg

APPENDIX C

Road Upgrading Photo # 1465
6/9/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
The inlet is fixed with a dam.

People in Photo:

F:\GRI Photos\Small\BigNum\1465 DCP_2547.jpg

Road Upgrading Photo # 1426
5/20/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1426 DCP_2413.jpg

Road Upgrading Photo # 1427
5/20/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1427 DCP_2415.jpg

Road Upgrading Photo # 1460
6/5/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Stan is working on 1623

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1460 DCP_2544.jpg

Road Upgrading Photo # 1464
6/9/03
Map Pt 1624 Road 80.32 Mi. 0.04
Other Old 24" New 36"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Stan fixed the inlet

People in Photo:

F:\GRI Photos\Small\BigNum\1464 DCP_2549.jpg

Road Upgrading Photo # 1461
6/5/03
Map Pt 1623 Road 80.32 Mi. 0.070
Other Old 18" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1461 DCP_2542.jpg

Road Upgrading Photo # 1429
5/20/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1429 DCP_2419.jpg

Road Upgrading Photo # 1432
5/20/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1432 DCP_2422.jpg

Road Upgrading Photo # 1433
5/20/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1433 DCP_2425.jpg

Road Upgrading **Photo #** 1435
5/21/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1435 DCP_2428.jpg

Road Upgrading **Photo #** 1430
5/20/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1430 DCP_2420.jpg

Road Upgrading **Photo #** 1434
5/21/03
Map Pt 1621 **Road** 80.32 **Mi.** 0.470
Culv. Maintenance **Old** 72" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
There can be too much outslope. This was 22%.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1434 DCP_2427.jpg

Road Upgrading Photo # 1466
6/9/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1466 DCP_2550.jpg

Road Upgrading Photo # 1470
6/9/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1470 DCP_2552.jpg

Road Upgrading Photo # 1431
5/20/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1431 DCP_2421.jpg

Road Upgrading Photo # 1467
6/9/03
Map Pt 1621 Road 80.32 Mi. 0.470
Culv. Maintenance Old 72" New 1Br
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1467 DCP_2551.jpg

Road Upgrading Photo # 1436
5/20/03
Map Pt 1620 Road 80.32 Mi. 0.74
Other Old 36" New 36"
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1436 DCP_2423.jpg

Road Upgrading Photo # 1437
5/20/03
Map Pt 1620 Road 80.32 Mi. 0.74
Other Old 36" New 36"
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1437 DCP_2424.jpg

Road Upgrading Photo # 1663
10/6/03
Map Pt 1433 Road 80.4 Mi. 0.245
Other Old 24" New 36"
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1663 DCP_1350.jpg

Road Upgrading Photo # 1664
10/6/03
Map Pt 1433 Road 80.4 Mi. 0.245
Other Old 24" New 36"
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Note the inside ditch and the large outside berm.

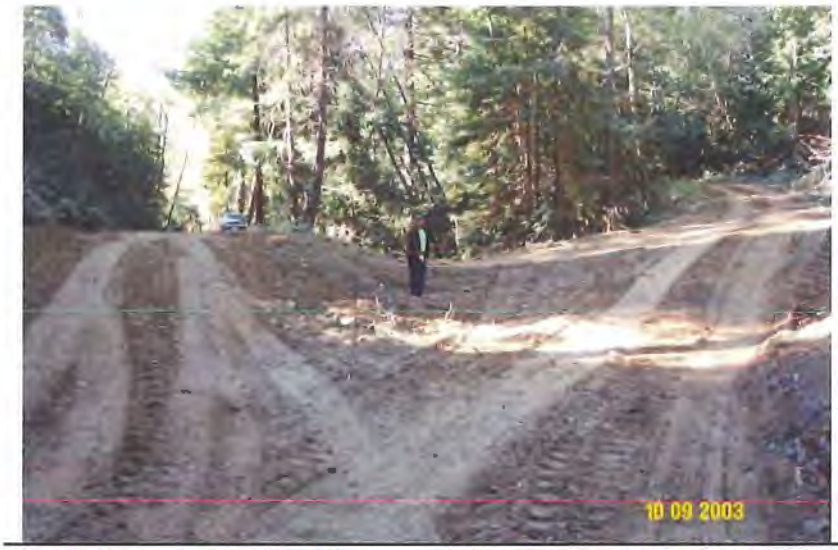
People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1664 DCP_1349.jpg

Road Upgrading Photo # 1455
6/2/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Culvert inlet

People in Photo:

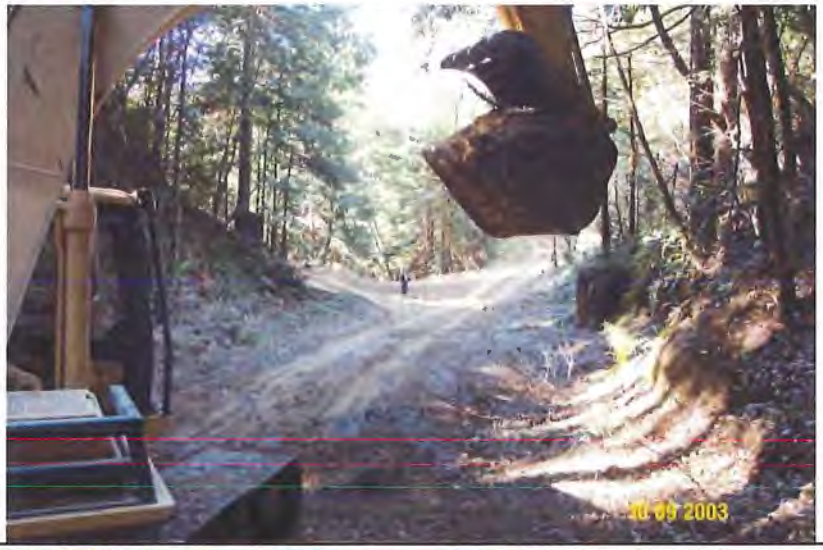
F:\GRI Photos\Small\BigNum\1455 DCP_2533.jpg



Road Upgrading Photo # 1688
10/9/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1688 DCP_1390.jpg



Road Upgrading Photo # 1689
10/9/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

This is looking downstream from where the old channel disappears.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1689 DCP_1391.jpg

Road Upgrading Photo # 1702
10/13/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1702 DCP_1417.jpg

Road Upgrading Photo # 1703
10/13/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Jerry Orth Stan Stornetta

F:\GRI Photos\Small\BigNum\1703 DCP_1422.jpg

Road Upgrading Photo # 1715
10/15/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1715 DCP_1465.jpg

Road Upgrading Photo # 1717
10/15/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta Bob Neal

F:\GRI Photos\Small\BigNum\1717 DCP_1476.jpg

Road Upgrading Photo # 1718
10/15/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Kathleen Morgan Danny Hagans

F:\GRI Photos\Small\BigNum\1718 DCP_1481.jpg

Road Upgrading Photo # 1719
10/15/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Clarence walks the walk

People in Photo:
Jerry Orth Clerance Giacomini

F:\GRI Photos\Small\BigNum\1719 DCP_1482.jpg

Road Upgrading Photo # 1733
10/20/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1733 DCP_1492.jpg

APPENDIX C

Road Upgrading Photo # 1735
10/20/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1735 DCP_1496.jpg

Road Upgrading Photo # 1452
6/2/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1452 DCP_2530.jpg

Road Upgrading Photo # 1685
10/9/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta Jerry Orth

F:\GRI Photos\Small\BigNum\1685 DCP_1386.jpg

APPENDIX C

Road Upgrading Photo # 1454
6/2/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1454 DCP_2532.jpg

Road Upgrading Photo # 1687
10/9/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1687 DCP_1389.jpg

Road Upgrading Photo # 1736
10/20/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1736 DCP_1497.jpg

Road Upgrading Photo # 1451
6/2/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1451 DCP_2529.jpg

Road Upgrading Photo # 1453
6/2/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Culvert outlet

People in Photo:

F:\GRI Photos\Small\BigNum\1453 DCP_2531.jpg

Road Upgrading Photo # 1686
10/9/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta Jerry Orth

F:\GRI Photos\Small\BigNum\1686 DCP_1388.jpg

Road Upgrading Photo # 1704
10/13/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1704 DCP_1424.jpg

Road Upgrading Photo # 1705
10/14/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

Stan removes the old culvert. The bottom is worn out.

People in Photo:
Bob Neal Stan Stornetta

F:\GRI Photos\Small\BigNum\1705 DCP_1458.jpg

Road Upgrading Photo # 1706
10/14/03
Map Pt 1436 Road 80.4 Mi. 0.49
Other Old 36" New 60"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

The bottom of the culvert is worn through

People in Photo:

F:\GRI Photos\Small\BigNum\1706 DCP_1462.jpg

APPENDIX C

Road Upgrading **Photo #** 1734
10/20/03
Map Pt 1436 **Road** 80.4 **Mi.** 0.49
Other **Old** 36" **New** 60"
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1734 DCP_1495.jpg

Road Upgrading **Photo #** 1612
9/2/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1612 DCP_1271.jpg

Road Upgrading **Photo #** 1652
10/6/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
We were able to outslope and elevate the northern approach.

People in Photo:

F:\GRI Photos\Small\BigNum\1652 DCP_1331.jpg

APPENDIX C

Road Upgrading **Photo #** 1611
9/2/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Bridge installation.

People in Photo:
Konrad Pehl Rick Loghry
Bob Neal

F:\GRI Photos\Small\BigNum\1611 DCP_1266.jpg

Road Upgrading **Photo #** 1651
10/6/03
Map Pt 1467 **Road** 80.4 **Mi.** 1.58
Bridge - Perm **Old** 60" **New** 1Br
PPt Up **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1651 DCP_1329.jpg

Road Upgrading **Photo #** 1495
6/16/03
Map Pt 0 **Road** 80.4046 **Mi.** 0
Old **New**
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Scott is using a cliniometer and a eye hight staff to make sure the dip reverses grade.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1495 DCP_2585.jpg

Road Upgrading Photo # 1496
6/16/03
Map Pt 0 Road 80.4046 Mi. 0
Old New
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Scott is using a cliniometer and a eye hight staff to make sure the road has the proper outslope.

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1496 DCP_2586.jpg

Road Upgrading Photo # 1502
6/23/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1502 DCP_2614.jpg

Road Upgrading Photo # 1503
6/24/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Stan has pulled away this site of the landing and is starting on the other side.

People in Photo:
Stan Stornetta

F:\GRI Photos\Small\BigNum\1503 DCP_2616.jpg

Road Upgrading Photo # 1694
10/9/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1694 DCP_1402.jpg

Road Upgrading Photo # 1494
6/16/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1494 DCP_2583.jpg

Road Upgrading Photo # 1519
7/20/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Kathleen Morgan

F:\GRI Photos\Small\BigNum\1519 DCP_1184.jpg

APPENDIX C

Road Upgrading Photo # 1695
10/9/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1695 DCP_1403.jpg

Road Upgrading Photo # 1493
6/16/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Scott Giacomini

F:\GRI Photos\Small\BigNum\1493 DCP_2582.jpg

Road Upgrading Photo # 1520
7/20/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Kathleen Morgan Danny Hagans
Scott Monday

F:\GRI Photos\Small\BigNum\1520 DCP_1182.jpg

Road Upgrading Photo # 1696
10/9/03
Map Pt 1488 Road 80.4046 Mi. 0.25
Other Old - New -
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1696 DCP_1404.jpg

Road Upgrading Photo # 1525
7/23/03
Map Pt 1660 Road 80.404652 Mi. 0.04
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Signal Ridge site 103 and fill that was pulled back

People in Photo:

F:\GRI Photos\Small\BigNum\1525 DCP_1191.jpg

Road Upgrading Photo # 1526
7/23/03
Map Pt 1660 Road 80.404652 Mi. 0.04
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Signal Ridge site 103 and fill that was pulled back

People in Photo:

F:\GRI Photos\Small\BigNum\1526 DCP_1192.jpg

Road Upgrading Photo # 1523
7/23/03
Map Pt 1482 Road 80.404652 Mi. 0.13
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Signal Ridge site 102

People in Photo:

F:\GRI Photos\Small\BigNum\1523 DCP_1189.jpg

Road Upgrading Photo # 1524
7/23/03
Map Pt 1482 Road 80.404652 Mi. 0.13
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Signal Ridge site 102

People in Photo:

F:\GRI Photos\Small\BigNum\1524 DCP_1190.jpg

Road Upgrading Photo # 1522
7/23/03
Map Pt 1446 Road 80.404652 Mi. 0.29
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Signal Ridge site 101

People in Photo:

F:\GRI Photos\Small\BigNum\1522 DCP_1188.jpg

APPENDIX C

Road Upgrading **Photo #** 1614
9/2/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
This is the inlet to the upper culvert

People in Photo:

F:\GRI Photos\Small\BigNum\1614 DCP_1276.jpg

Road Upgrading **Photo #** 1640
9/23/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt down **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1640 DCP_1313.jpg

Road Upgrading **Photo #** 1613
9/2/03
Map Pt 1501 **Road** 80.4051 **Mi.** 1.310
Other **Old** 36" **New** Pull
PPt Right **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Note the two culvets. The lower one is buried.

People in Photo:

F:\GRI Photos\Small\BigNum\1613 DCP_1275.jpg

APPENDIX C

Road Upgrading Photo # 1639
9/23/03
Map Pt 1501 Road 80.4051 Mi. 1.310
Other Old 36" New Pull
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1639 DCP_1311.jpg

Road Upgrading Photo # 1438
6/2/03
Map Pt 1461 Road 80.4071 Mi. 1.15
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1438 DCP_2516.jpg

Road Upgrading Photo # 1439
6/2/03
Map Pt 1461 Road 80.4071 Mi. 1.15
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1439 DCP_2517.jpg

Road Upgrading Photo # 1440
6/2/03
Map Pt 1461 Road 80.4071 Mi. 1.15
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1440 DCP_2518.jpg

Road Upgrading Photo # 1442
6/2/03
Map Pt 1657 Road 80.4071 Mi. 1.25
Other Old 24" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1442 DCP_2520.jpg

Road Upgrading Photo # 1740
10/22/03
Map Pt 1657 Road 80.4071 Mi. 1.25
Other Old 24" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1740 DCP_1508.jpg

Road Upgrading Photo # 1441
6/2/03
Map Pt 1657 Road 80.4071 Mi. 1.25
Other Old 24" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1441 DCP_2519.jpg

Road Upgrading Photo # 1742
10/22/03
Map Pt 1657 Road 80.4071 Mi. 1.25
Other Old 24" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1742 DCP_1510.jpg

Road Upgrading Photo # 1443
6/2/03
Map Pt 1657 Road 80.4071 Mi. 1.25
Other Old 24" New 24"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

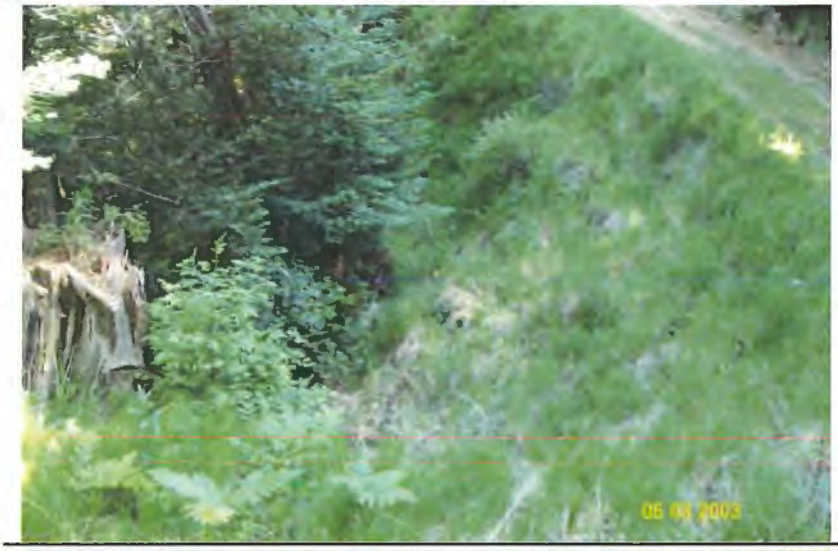
People in Photo:

F:\GRI Photos\Small\BigNum\1443 DCP_2521.jpg

Road Upgrading Photo # 1741
10/22/03
Map Pt 1657 Road 80.4071 Mi. 1.25
Other Old 24" New 24"
PPt Up Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1741 DCP_1509.jpg



Road Upgrading Photo # 1447
6/2/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1447 DCP_2525.jpg

Road Upgrading Photo # 1448
6/2/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1448 DCP_2526.jpg

Road Upgrading Photo # 1743
10/22/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1743 DCP_1511.jpg

Road Upgrading Photo # 1444
6/2/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1444 DCP_2522.jpg

Road Upgrading Photo # 1445
6/2/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1445 DCP_2523.jpg

APPENDIX C

Road Upgrading Photo # 1446
6/2/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1446 DCP_2524.jpg

Road Upgrading Photo # 1744
10/22/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1744 DCP_1512.jpg

Road Upgrading Photo # 1745
10/22/03
Map Pt 1462 Road 80.4071 Mi. 1.310
Other Old 24" New 30"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1745 DCP_1513.jpg

Road Upgrading Photo # 1488
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1488 DCP_2590.jpg

Road Upgrading Photo # 1500
6/24/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1500 DCP_2609.jpg

Road Upgrading Photo # 1747
10/22/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt down Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1747 DCP_1516.jpg

Road Upgrading Photo # 1450
6/2/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

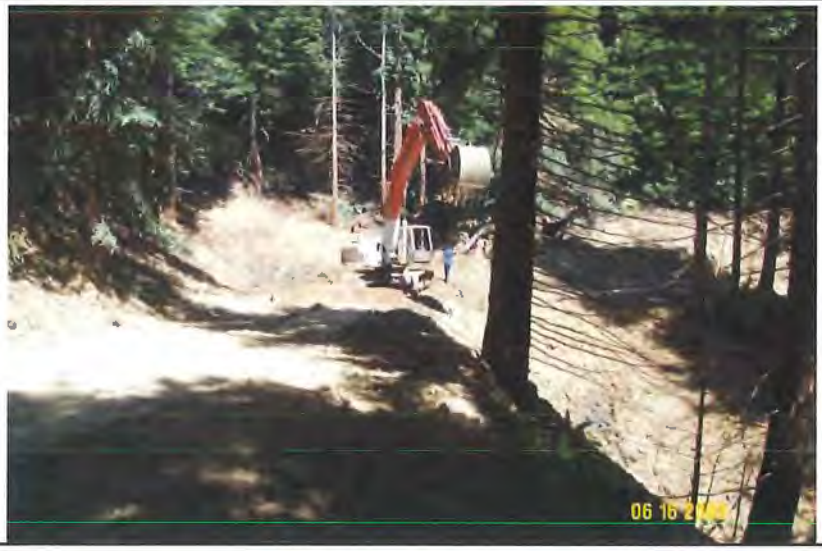
People in Photo:

F:\GRI Photos\Small\BigNum\1450 DCP_2528.jpg

Road Upgrading Photo # 1485
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Rick is digging our a large old Humboldt.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1485 DCP_2587.jpg



Road Upgrading Photo # 1486
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0
Rick is digging our a large old Humboldt.

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1486 DCP_2588.jpg

Road Upgrading Photo # 1498
6/24/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1498 DCP_2604.jpg

Road Upgrading Photo # 1748
10/22/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt left Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1748 DCP_1517.jpg

Road Upgrading Photo # 1449
6/2/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1449 DCP_2527.jpg

Road Upgrading Photo # 1487
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

Rick is digging our a large old Humboldt. The dark color is the decayed organics from the Humboldt and lets us know we are down to the original channel

People in Photo:

F:\GRI Photos\Small\BigNum\1487 DCP_2589.jpg

Road Upgrading Photo # 1489
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1489 DCP_2591.jpg

Road Upgrading Photo # 1490
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Rick Loghry

F:\GRI Photos\Small\BigNum\1490 DCP_2592.jpg

APPENDIX C

Road Upgrading Photo # 1491
6/16/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1491 DCP_2594.jpg

Road Upgrading Photo # 1499
6/24/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1499 DCP_2606.jpg

Road Upgrading Photo # 1746
10/22/03
Map Pt 1463 Road 80.4071 Mi. 1.370
Other Old 18" New 24"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1746 DCP_1515.jpg

Road Upgrading **Photo #** 1481
6/11/03
Map Pt 0 **Road** 80.4071 **Mi.** 2
Old New
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Knocking off small berm and smoothing the road.

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1481 DCP_2573.jpg

Road Upgrading **Photo #** 1482
6/11/03
Map Pt 0 **Road** 80.4071 **Mi.** 2
Old New
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Knocking off small berm and smoothing the road.

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1482 DCP_2578.jpg

Road Upgrading **Photo #** 1483
6/11/03
Map Pt 0 **Road** 80.4071 **Mi.** 2
Old New
PPt 0 **Dir** **PW** Doty Creek
THP 271 LNF LNF P01030405A
PID 0 **LWD**
Monitoring 0
Knocking off small berm and smoothing the road.

People in Photo:
Vic Spurgeon

F:\GRI Photos\Small\BigNum\1483 DCP_2581.jpg

Road Upgrading Photo # 1518
7/21/03
Map Pt 1476 Road 80.4071 Mi. 2.3
Other Old - New 36"
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1518 DCP_1186.jpg

Road Upgrading Photo # 1501
6/23/03
Map Pt 1476 Road 80.4071 Mi. 2.3
Other Old - New 36"
PPt Right Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:
Vic Spurgeon Rick Loghry

F:\GRI Photos\Small\BigNum\1501 DCP_2612.jpg

Road Upgrading Photo # 1662
10/6/03
Map Pt 1477 Road 80.4071 Mi. 2.420
Other Old - New -
PPt 0 Dir PW Doty Creek
THP 271 LNF LNF P01030405A
PID 0 LWD
Monitoring 0

People in Photo:

F:\GRI Photos\Small\BigNum\1662 DCP_1346.jpg

APPENDIX C

From: Strong, James@CALFIRE
Sent: Tuesday, February 16, 2021 4:10 PM
To: Santa Rosa Review Team@CALFIRE
Cc: Smith, Katrina@CALFIRE
Subject: FW: THP 1-20-00150-MEN, PWA comments on GRT THP's and Kamman November reports
Attachments: PWA Comments on GRT THP 1-20-00150 MEN & Kamman final w sig.pdf

Katrina. Can we please attach this document to 1-20-00150 MEN as additional info from RPF. Add-RPF

From: John Bennett <jbennett@pacificstates.com>
Sent: Monday, January 25, 2021 11:25 AM
To: Strong, James@CALFIRE <James.Strong@fire.ca.gov>
Subject: THP 1-20-00150-MEN, PWA comments on GRT THP's and Kamman November reports

Warning: this message is from an external user and should be treated with caution.

James,

Attached is the comment document we discussed from Danny Hagens rebutting Kamman's sediment analysis public comment for THP 1-20-00150-MEN (Far North).

John Bennett
Forest Manager
Gualala Redwood Timber
P.O. Box 197
39951 Old Stage Road
Gualala, CA. 95445
Office: 707-894-4245
Cell: 707-291-0819

COMMENTS AND CORRECTIONS ON: UNIVERSITY OF CALIFORNIA WILDLAND RESOURCE CENTER REPORT NO. 46 "A SCIENTIFIC BASIS FOR THE PREDICTION OF CUMULATIVE WATERSHED EFFECTS"

California Department of Forestry and Fire Protection
Forest Practice Program

April 2003

Table of Contents

Overview

Members of the UC Committee should be commended for their willingness to contribute time and expertise to the difficult question of how to assess cumulative impacts of forestry activities. However, with constraints on time and funding, the Committee did not have the benefit of background information about California's Forest Practice Program that could have prevented misconceptions and allowed a more thorough consideration of recommendations.

The recommended use of modeling to evaluate the risk of cumulative effects from different scenarios of timber operations and climatic stress could be very helpful in identifying differences between various watershed-wide timber harvesting alternatives. Unfortunately, the Committee's Report does not recognize many of the past and on-going efforts by the Department of Forestry and Fire Protection (CDF) to address cumulative watershed effects (CWEs), and the proposed use of modeling overlooks many serious deficiencies that have prevented agencies from using this approach in regulatory programs. The Report's criticism of current agency efforts also fails to recognize cases where modeling could complement or be integrated into existing programs.

The only reasonable conclusion that can be drawn from information and examples cited in the Report's Appendix is that currently available models are not adequate for prediction of cumulative watershed effects. As a result, the Committee's proposed approach cannot be substituted for current timber harvesting plan (THP) assessments. This does not mean that we should not investigate the modeling approach for future applications or conduct pilot studies. But it does clearly indicate that we should not rely on current models to make land use decisions.

It is also possible that there is a philosophical difference in approach that leads academic reviewers to favor new, but unverified, methods of decision making, while agencies place more reliance on tangible research results to guide the development of practices that are used to regulate the activities of private landowners. In contrast to the UC Committee's description of CDF's past efforts, the Department has actively promoted and supported research related to the potential on-site and cumulative impacts of timber operations in California (Dodge et al 1976, Peters and Litwin 1983, Durgin et al 1988, Lewis and Rice 1989, Euphrat 1992, Hawkins and Dobrowolski 1994, Rice 1996, Ziemer 1998, and MacDonald and Coe 2001, to name a few) and has been open to the development and application of workable cumulative impacts assessment methods. These and other studies of erosion sources and causes of large erosion events have been used to improve California's Forest Practice Rules. The Department's studies of cumulative effects have not found major impacts related to modern harvesting practices (Hawkins and Dobrowolski 1994, Bottorff and Knight 1996, Dahlgren 1998, Ziemer 1998, Holloway et al. 1998). However, data developed as part of the Caspar Creek watershed studies has shown that there can be downstream effects on both base and peak flows. Past research and reviews have not provided

workable CWE models (Reid 1993), and the UC Committee's proposal is an approach to analyzing cumulative effects, rather than a currently available method, with an expectation that operational models can be developed after more research.

Some of the Committee's criticisms and concerns appear to have come from lack of information about the Forest Practice Rules, the THP review process, and the role of the California Environmental Quality Act (CEQA) in setting standards for cumulative impacts assessment. It is unfortunate that the UC Committee did not interview CDF's watershed staff or the California Geologic Survey (CGS) THP review staff, who have been major contributors to the Department's efforts in dealing with cumulative impacts. CDF and CGS staff could have provided background information and answered questions that might have avoided misconceptions and errors in the Report's findings and conclusions. This lack of communication has led to a one-sided view of forest practice regulation, and the Committee has also strayed far from the task of assessing cumulative impacts with poorly informed comments about agency abilities and behavior.

The following observations on the UC Committee's Report are lengthy because there are numerous inconsistencies and points of concern. Comments on similar topics from throughout the Report have been grouped together as shown in the Table of Contents. Specific items of concern are referenced using the chapter number, appendix section (where appropriate), page number and the paragraph number to identify the location of the statement or issue in the hardcopy version of the Report. This gives a reference with the following parts:

(Chapter # - Appendix section - Page # - Paragraph #).

It is hoped that this review will answer some of the questions raised in the UC Committee's Report and will contribute toward greater focus on realistic improvements in cumulative impact assessment that meet both statutory requirements and the need for environmental protection.

CEQA Process

The Committee's suggestion that CWE analysis for policy making be separated from CWE analysis for THP approval or that the responsibility for review of CWE assessments be taken out of CDF and the Forest Practice Program (ES-1-1, C5- 52-2, C7-61-#1, C7-61-#2) needs to be considered in relation to the purpose for conducting these assessments. The requirement for including CWE assessments in THPs is based on legislative and judicial direction that discretionary approval by CDF makes these projects subject to provisions of the California Environmental Quality Act (CEQA), with CDF designated as the lead agency for project review. The required standards, and limitations, for cumulative impacts analysis are contained in both the California Public Resources Code and the CEQA Guidelines (CELSOC 2002). Section 15130(b) of the CEQA Guidelines states that:

> "The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided of the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness."

Section 15130(b) also specifies the elements that "are necessary to an adequate discussion of cumulative impacts." These include:

> "(1)(A) A list of past, present, and reasonably anticipated future projects producing related or cumulative impacts, including those projects outside the control of the agency, …
> "(2) A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available, and
> "(3) A reasonable analysis of the cumulative impacts of the relevant projects. …"

The standards for adequacy of the EIR, which includes its cumulative impacts analysis, are given in CEQA Guidelines Section 15151 as follows:

> "An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."

In addition, Section 15149(b) of the Guidelines states that:

> "In its intended usage, an EIR is not a technical document that can be prepared only by a registered professional. The EIR serves as a public disclosure document explaining the effects of the proposed project on the environment, alternatives to the project, and ways to minimize adverse effects and to increase beneficial effects. …"

In other words, CEQA requires:

- Identification of past, present and reasonably anticipated projects related to the environmental effects being considered.
- Identification of other information used in the analysis.
- A summary of expected effects.
- A reasonable analysis that 1) does not require the same level of detail as project specific impacts, 2) is guided by the standards of practicality and reasonableness for the project under review, and (3) provides information that allows a decision that intelligently accounts for environmental consequences.

CDF's authority to require a specific cumulative impacts analysis under current Forest Practice Rules is further constrained by the court ruling in East Bay Municipal Utilities District (EBMUD) vs. CDF (1993), which found that the Department had created an underground regulation when it used the CDF Guidelines for Cumulative Impacts as a standard of comparison to judge the adequacy cumulative impacts assessments included in submitted THPs.

This discussion illustrates that the scope and purpose of the project level analysis required under CEQA is different than the separate, watershed wide program proposed in Recommendation #1 of the UC Committee's Report. Therefore, the state needs to decide if it wants to establish a new program to analyze cumulative watershed effects that is not required for CEQA project review – keeping in mind that other legislation may require more protection for resources affected by timber harvesting than is specified in CEQA.

THP Process

The UC Committee Report includes several misconceptions about the THP Process, including the statement that neither applicants nor CDF regulators recognize that any significantly adverse, cumulative effects are likely to result from timber harvest (C4-21-3). The THP development and review process is intended to produce harvesting plans with few impacts, and these plans are revised during both preparation and review to prevent or reduce potentially significant effects; so it should not be surprising that plan submitters and CDF do not report the presence of significant impacts in proposed and approved plans, respectively.

In addition, the UC Committee has stated that the Department is responsible for arguing on behalf of plan submitters when a THP is challenged by the public or in court (C4-18-

1, C4-21-4). This is not correct. In disputes about THPs with other agencies and in court, the Department supports its own decisions about plan approval and the decision making process, rather than advocating on behalf of the plan or plan submitter. In reaching a decision, however, CDF must often chose between positions taken by plan submitters in support of their proposed activities and the positions of agencies who are advocates for other resource values. As the lead agency for approving THPs, CDF has the responsibility for identifying potentially significant impacts, deciding on what mitigations to require, and supporting these decisions. This frequently results in changes to submitted THPs. In contrast, other agencies are free to criticize without the responsibility of demonstrating the need for or the feasibility of their recommendations – including the need for complex CWE analyses in light of less stringent regulatory requirements.

A related comment by the UC Committee refers to the defense of THPs by CDF and CGS against public challenge (C6-55-3). It is not clear what this means, but if it is a reference to the Department's response to comments that is prepared for each THP, CDF is required by law and legal precedent to respond to significant issues raised by the public in comments on a given THP. This is not a post-approval defense of the THP, and THPs are frequently revised to address significant concerns raised by CDF, other agencies, and the public prior to plan approval and preparation of the Department's official response.

The UC Committee is also recommending that the Department's decisions about impact significance be based on an analysis of risk (C5-31-1 and C5-32-4). This suggestion makes sense because the interaction between landscape and the climatic events that drive watershed events are best described in terms of probability. However, the regulatory criteria for assessing environmental conditions are generally expressed in terms of quantitative limits rather than the risk that the criteria will be exceeded.

CWE Regulatory Requirements

The UC Committee members have not had the benefit of experience with preparing timber harvesting plans, so it is not surprising that they are not familiar with Forest Practice Rule requirements for preparing CWE assessments or how the THP process works. Therefore, it is unfortunate that the Committee did not interview or otherwise discuss CDF's cumulative impacts assessment process with members of the Department's watershed staff, which could have allowed misconceptions and errors to be addressed prior to publication of the Report.

Two minor corrections to the Committee's findings are that the requirement for including CWE assessments in THPs was established by a court decision in 1985, rather than 1974 (C1-6-4), and it is not true that "other rules do not mention cumulative effects directly …" (C3-10-3). There are several references to cumulative impacts in the Rules, including an entire section describing the requirements for cumulative impacts assessment, which the Committee does cite in other sections of its Report.

The Committee is correct that Technical Rule Addendum No. 2 does not include a methodology (C6-55-4). They miss the point, however, that this was done on purpose by the State Board of Forestry and Fire Protection (BOF), because the only off-the-shelf method available when these rules were adopted was the USFS Equivalent Roaded Area method, which is not well correlated with instream conditions (Roby 1991). It is also inaccurate to state that "CDF and resource agencies in other states have been unable to promulgate any defensible methodology for defining the presence and source of any CWE, even when they have consulted the scientific community" (C3-14-1). Although the methods used in THPs apparently do not measure up to the standards of the UC Committee, they have been found to meet the CEQA standards for which these assessments are conducted (East Bay Municipal Utilities District v. CDF 1993). This does not mean that improvements are not needed, but the UC Committee's proposal is a hypothetical approach that does not provide a workable method for conducting CWE analyses. Even a quick reading of the Report's Appendix shows that models are not currently available to implement the recommended approach (see additional comments under "Modeling Limitations"), which means that the Committee has left the development of models and procedures needed to implement its recommendations to the future efforts of others.

The UC Committee's statement that THP preparers are simply asked if they recognize the possibility of CWEs is not accurate, and their characterization of the required assessment area and use of mitigation is also incorrect (C1-5-3). Each THP must include an affirmative statement that the proposed timber operations will not create or add to significant impacts. The assessment area for making this determination is required to be an area where cumulative impacts are most likely to be significant, and mitigation is specified to eliminate or reduce those impacts that could create or contribute to significant cumulative impacts. In addition, the statement that "virtually no one filing a THP admits to the presence of any CWE" (C314-1) does not recognize that many THPs identify the presence of potential cumulative impacts and provide mitigations to prevent or offset any significant increase related to the proposed timber operations.

The UC Committee also incorrectly states that the terms "significant" and "adverse" are not defined (C6-55-2). These terms are defined in CEQA and the CEQA Guidelines through the phrase "significant effect on the environment," which is described as "a substantial, or potentially substantial, adverse change in the environment." This definition is admittedly not very helpful, but it not under the jurisdiction of the BOF or CDF, and legislation would be required to change it. However, the UC Committee's subsequent statement that "This often makes prevention of negative CWEs unenforceable" is wrong. CWE requirements are made enforceable by language incorporated into THPs requiring specific mitigation measures or other actions to prevent or reduce problems that were determined to be significant in the plan approval process.

The UC Committee's description of the connection between the Regional Water Quality Control Boards' waste discharge permit process and the THP process (C6-54-Legal Impediments) is also not correct. Agencies are not granted waivers. Instead, CDF and the State Water Resources Control Board have entered into a Management Agency Agreement that authorizes the Department to oversee state non-point pollution requirements, with Regional Boards retaining the ability to require waste discharge permits.

The Committee comment that requiring release of pesticides from two or more locations as a criteria for identifying CWEs in Technical Rule Addendum No. 2 "appears to be an example of misdirected complexity that could overlook direct effects of these contaminants originating from a single location" (A-VIII-100-2) shows a lack of understanding of state pesticide regulations and misses the point of cumulative impacts. The direct impacts of pesticide application are regulated by the California Environmental Protection Agency under a separate permitting process, which is administered by County Agricultural Commissioners and is not controlled by CDF. TRA No. 2 focuses on release of contaminants from two or more locations to address the potential cumulative, as opposed to direct, impacts of contaminant releases.

The UC Committee concludes its comments about pesticides with the following paragraph (A-VIII-100-3):

> "However, the application of forest herbicides is rarely addressed in THPs. Application rates are not well documented and effects on biota are generally unknown except in laboratory situations. There is a lack of monitoring data, except for the few studies conducted that have shown little or no evidence of transfer of pesticide residues to aquatic ecosystems or animals. There is also no predictive modeling capability. It is suspected that fat-soluble pesticide constituents may be transferred by runoff from roads that are sealed with oil, but there are few of these in the north coast of California and no experiments have yet been conducted to measure biological responses to this potential source. Even consistent and credible, qualitative predictions of watershed-scale effects of pesticide application await resolution of some of these technical issues, but the CWE modeling efforts of runoff and sediment transfer into aquatic habitat outlined above could provide a framework for field studies that might yield some predictive capacity."

This is a convoluted criticism of the Department's process for analysis of cumulative impacts that does not account for the label requirements for applying herbicides and pesticides, monitoring requirements for aerial applications, and the County Commissioner's role in the permit process. The concern about lack of information about potential pesticide impacts in current CWE assessments is contradicted by the statement that available studies "have shown little or no evidence of transfer of pesticide residues to aquatic ecosystems or animals" and, at the same time, this analysis is found to be infeasible since "There is also no predictive modeling capability." Then the Committee goes on to criticize the current CWE analysis process for not providing the

framework for a research project to test a hypothesis that road oil might mobilize fat soluble pesticides. At best, this seems to have slipped off the topic of CWE assessments for THPs.

Forest Practice Rule Requirements

The UC Committee conclusion that the Forest Practice Rules are not backed by empirical studies (C6-55-4) either ignores or dismisses the work of many well qualified experts in forestry, hydrology, geology, soils, and other fields related to natural resource management over a period of more than 25 years. These scientists and agency specialists have relied on the best available published literature to guide the development of Forest Practice Rules, and CDF has both directly sponsored and participated as a cooperator in many studies that have led to a better understanding of landscape responses to timber harvesting. However, research is not available to answer all questions, and science often does not provide clear thresholds to make decisions about limits and cut-off points, which must then be based on the best judgment of the BOF and RPFs applying the Rules.

The date and details of changes to WLPZ widths described by the UC Committee (A-II-80-4 and A-II-83-1) are incorrect. And although the Report's description of potential reductions in riparian zone composition with multiple operations is mathematically accurate, CDF does not interpreted the Rules to allow such progressive reductions, and the Department's Hillslope Monitoring Project (Cafferata and Munn 2002) has not found the large decreases in WLPZ canopy that would accompany reductions in basal areas from "100% to 25% to 6%" for Class I watercourses, as listed by the UC Committee. In fact, this serves as a good example of how even simple modeling outcomes can be driven to false conclusions by incorrect assumptions.

The follow-up comments that the effectiveness of the watercourse and lake protection zone rules has never been established (A-II-80-4, and A-II-83-2) are also incorrect. Rule compliance and the effectiveness of Class I and II WLPZs in maintaining required canopy levels and the frequency of disturbance features such as gullies and bare areas is being determined as part of CDF's Hillslope Monitoring Project (Cafferata and Munn 2002). Measurement of Class III watercourse conditions has begun more recently, but the UC Committee statement that "the effectiveness of current regulations for ensuring woody debris recruitment is certainly very low" (A-II-80-4) both presumes an outcome and assumes that woody debris requirements for these non-fish bearing and ephemeral channels are well established when, in fact, this is still being determined.

The UC Committee comments that "There is an escape from every rule" (C3-14-1) and "virtually all rules are written with escape clauses" (C4-21-3) show a lack of understanding of both the requirements and application of the Forest Practice Rules. In fact, relatively few rules allow exceptions or in-lieu practices, and these require equal or better protection along with explanation and justification in the THP. Additionally, the requirements for proposing and justifying alternatives to the standard watercourse and

lake protection rules, as specified in 14CCR Section 916.6, are very difficult to meet; and alternatives to the harvesting practices rules (14 CCR Section 914.9) must be approved by all agencies involved in the THP review process. It is worth noting at this point that the Rules are also frequently criticized as lacking flexibility to meet site specific conditions.

The Report section on "Conceptual impediments" (C6-55-4) includes many criticisms that are addressed elsewhere in this review. However, the part titled "Excessive reliance on rule-making rather than problem solving" (C6-55-4) needs to be specifically addressed. CDF cannot impose requirements on property owners that fall outside of authorities contained in state law and the Forest Practice Rules, which are developed by the BOF under authority included in the Forest Practice Act and must follow requirements for promulgating regulations specified in the state Administrative Procedures Act. One of the tenets of representative democracy is that government is supposed to follow the law, as laid down by the voter's elected representatives, despite the inconvenience that this may cause agencies and other interested parties.

CWE Assessment

The need for larger CWE assessment areas is a central theme of the UC Committee's report (C4-24-1). However, the Report does not account for the scope of the project under review. The assessment area used for THPs is constrained by both the scale of the project and the potential to detect impacts from one or more projects. It is, of course, true that sediment from a THP will travel downstream. But at some point, the connection between upstream sources and downstream impacts, whether measured or modeled, becomes so tenuous in large watersheds that it can no longer provide a reasonable basis for decisions about plan approval.

For example, the analysis area of 40-80 square miles (25,000 to 50,000 acres) recommended by the UC Committee (C5-43-4) does not recognize many situations where smaller watersheds drain into large rivers where it makes more sense to concentrate on the smaller watershed while also considering the downstream condition of the receiving channel.

Relieving THP submitters from the responsibility for "basin-wide" analysis (C5-29-1) does make sense, because this is beyond the scope of reasonable review for individual THP projects. However, the presence of a watershed wide assessment, by itself, does not relieve plan submitters from the CEQA requirement for CWE assessment. In addition, the UC Committee at this point recognizes that a separate process is needed for these larger scale inventories and assessments, but is still critical of THP assessments for not accomplishing what they are not designed or required to do (C4-23-8). This criticism is, at best, disingenuous. And a state-sponsored program of multi-disciplinary watershed analysis for CWEs (C3-17-2) could easily turn into an extremely large and low utility undertaking if it isn't preceded by some recognition of overall

landscape sensitivity that would direct more intensive analyses to areas where the “risk” of cumulative impacts justifies such an effort.

The results of basin-wide assessments are usually constrained by the level of detail of inventory information available for resources that need to be considered. This is why assessments covering large areas, such as Sustained Yield Plans (SYPs), do not usually include CWE analyses that can be used with individual THPs. Faced with local analyses that do not adequately deal with big picture issues, and basin-wide analyses that are too general to evaluate local impacts, the best approach would be to use basin wide analyses to identify potential impacts on downstream resources and to incorporate information from these smaller scale analyses into plan-specific assessments that can be used to determine how proposed activities will or will not contribute to cumulative impacts.

Assembling a digital database on “the spatial pattern of physical, chemical, biological and socio-economic properties of California landscapes” along with “Digital maps of topography, stream channel networks, lithology, landslides (from CGS or other sources), roads and skid trail, fish distribution, vegetative cover, and THP submissions” and then combining these into “a common geographic framework” (A-IX-100-4) would not be a trivial or simple task. In effect, the UC Committee is asking for a complete, digital landscape description. This data is going to vary in availability, quality, formats, scale, registration, and a myriad of other ways that make putting it together in a useful way extremely difficult. It should be recognized that going through the time and expense of developing this digital watershed database is not necessary to make generalized interpretations about potential salmonid habitat. And the suggestion of using computerized tools to generate interpretations to make region-wide comparisons of watersheds (C5-51-3) would require assembling a database for the entire North Coast.

The state may chose to implement a program to “correctly formulate predictions of how land use affects water quality, biodiversity, and other resources at a whole-watershed scale” as recommended by the UC Committee (C7-61-#2), but this would be well beyond the scope of CEQA compliance. However, the Department must also meet conditions mandated by the Endangered Species Act and water quality standards that can go beyond CEQA requirements. But it should be recognized at the outset that a new program established in response to this recommendation would be primarily involved with research and development activities that may or may not lead to useful products and that this should build on the work of existing efforts, such as North Coast Watershed Assessment Program.

A program requiring 3 PhD employees, 5 Masters Degree employees, some field technicians, and several GIS specialists (C5-43-2) along with analysts, clerical staff, a significant computing environment, office space, and vehicles would easily cost more than $1,500,000 per year, not counting start-up costs. Before asking for new or redirected fees to finance this new CWE technical unit and related research activities

(C7-63-#8), a specific plan of action should be prepared in addition to the recommended plan for funding.

With the body of the report focusing on cumulative watershed effects, which was the purpose of the undertaking, it is surprising that the first and very lengthy description of modeling methods deals with terrestrial wildlife (A-I-76-2). If the recommended Scientific Committee and CWE modeling effort are expected to deal with terrestrial wildlife in addition to water-related issues, it will greatly expand the number of Committee members and data needed to implement the proposed program.

Including the effect of roads and skid trails on increasing large flood flows as a component of CWE analysis (C3-15-3) is hypothetically possible, but has yet to be demonstrated or quantified. And the UC Committee's discussion of the effect of timber harvesting on flood runoff (C3-15-4 through 16-1) seems to be saying that we can't measure this effect, so we will predict it, then establish risk based on what we think is happening but can't actually determine. This level of certainty does not create much confidence for making decisions about land use.

The UC Committee is also proposing the use of generalized models to "assign" specific timber harvesting prescriptions before the watershed analysis work is done (A-IX-101-4). This leap from cumulative effects analysis to developing site specific prescriptions is hard to justify considering the Committee's listing of problems with the available models.

CDF agrees with the UC Committee's conclusion about the inadvisability of relying on threshold values in CWE analysis (C5-36-2, C6-56-2). It is not clear how the UC Committee concluded that CDF has a different view.

The UC Committee conclusion that THPs use mitigation to avoid acknowledging cumulative effects (C6-56-3) is incorrect. Many THPs conclude that the potential for creating or adding to existing CWEs is "no with mitigation". This clearly acknowledges that CWEs are possible and indicates that something has been done about them. Whether the UC Committee agrees that on-site and off-setting mitigation works or not, it should at least recognize that the issue was identified.

Modeling Limitations

The UC Committee's statement that "The process of constructing conceptual models should not be seen as a complicated or exclusive process" (C5-47-2) would seem to indicate that constructing the models needed to implement their recommendations is a simple task. But after further discussion, the task becomes more complicated, with "a tremendous amount of work to be done just to implement a number of these linked models to predict CWEs for a single watershed" and "In the appendix, we will also refer to issues for which modeling is still in a crude state, employing statistical and other empirical rules transferred to the site from elsewhere. These are subjects requiring research …" (C5-50-3). In fact, information in the Appendix clearly indicates that few, if

any, of the recommended models are capable of even stand-alone application. The take-home message from this seems to be that conceiving the model is easy, but developing working models is hard and will require research. In other words, the UC Committee is recommending a research project from which useful models may someday emerge. This is clearly beyond the CEQA requirements for CWE assessment.

The UC Committee concept of matching model complexity to "the sophistication of our understanding and data available for calibration or testing" (C5-49-2) creates a situation where models would be relying on currently available data of questionable accuracy, with gaps in data availability for key resources. This is certain to result in unreliable outcomes, while obtaining data of adequate scope and better quality would be very time consuming and expensive.

The discussion about using spatial databases and remote sensing tools (C5-44-1) recognizes the difficulty of acquiring data for analysis and that there will be gaps in data, but still concludes that models of unknown reliability combined with low resolution remotely sensed data can be used to assess risk and restrict land use. The effort and expense of any such program needs to be considered with the understanding that the resulting "predictions of models will not be precise" (C5-50-2). And it is not clear what is achieved by expressing communal understanding through "computing their best estimate of the consequences of that belief" (C5-50-2)?

The UC Committee seems unwilling to accept qualitative evaluations of physical watershed conditions and impacts, as are used in CDF's CWE Guidelines (CDF 1994), but then finds similarly qualitative assessments as being adequate for making "generalizations" about the effects of watershed conditions on aquatic populations (A-VII-93-3). This means that after the time, effort, and expense of model creation, data collection, and model running, final interpretations would still be based on professional judgment. But in this case, it would be the judgment those developing and using models, rather than experienced RPFs who are familiar with the project site. And the implication of this section is that these judgments will not include the effects of downstream conditions on fish populations, which defeats a primary objective of conducting more quantitative analysis.

The UC Committee's recognition that models can be used imperfectly as well as responsibly (C5-Modeling-35-4) points out the influence of both model developers and users on predicted outcomes. The Committee describes the model parameterization process as "estimating coefficients that represent the average behavior of various small-scale mechanisms that are too fine-grained for the model to represent explicitly" (A-III-84-2), which comes down to assigning values to model coefficients that cause the model to give expected outputs. Even with the best of intentions, the assignment of coefficients and parameters will reflect the judgment of the model developers about how the world should work and the consequences of management activities. And the transference of model coefficients (A-III-85-3) based on the skill, experience, and

viewpoints of the modeler would simply replace the judgment of field personnel with the judgment of model developers and users.

More specifically, the UC Committee is proposing that models be used to determine the "spatially registered calculation of risk to resources such as biodiversity, ecosystem functioning, and water quality" to "distill policies about allowable rates of cutting, differential requirements for BMPS … and other guidelines, depending on the risk they are willing to accommodate" (C5-29-3). In each of these cases (biodiversity, ecosystem function, and water quality), predictions will require linking separate models that represent different ecosystem and watershed functions, and then comparing outputs to criteria establishing risk. This approach may provide useful information about how the world might work for a given set of assumptions, but it has serious limitations as a predictive tool for land management. Each of the assumptions and relationships built into a model has its own range of uncertainty and potential errors, and the accumulation of this uncertainty for all of the model components leads to much greater potential prediction errors. And when model predictions exceed our quantitative experience with the variable being predicted, or the range of data on which component relationships have been established, the determination of whether predicted outcomes are reasonable must be based on individual judgments that are not backed up by data or experience. The UC Committee confirms these problems when it states that "Unfortunately, the technical state of the art of environmental prediction is, and for the foreseeable future will be, unable to avoid large uncertainties" (C5-30-3), and the discussion of model misuse (C5-36-2) describes further difficulties in assigning values to variables and parameters (C5-36-3). As a result, watershed models can be useful for investigating relationships and refining questions, but they do not, as yet, provide good decision making tools.

The scenario described by the UC Committee for predicting harvesting and road effects on flood peaks and sediment transport (A-III-85-1) serves as an example of the complications faced even in those situations where individual processes (such as evaporation, compaction, and infiltration) are well understood. The question of runoff generation from harvest units may be answered with some confidence by available models, but adding the effects of roads on runoff generation adds much uncertainty to model results because of large differences in road system configurations and because the relationship between roads and runoff is not well established. Using these modeled flows to predict sediment production and transport adds more uncertainty because sediment inputs are very difficult to predict, the point at which bedload transport is initiated varies with the changes in channel characteristics along the length of the stream, and channel transport capacity varies with flow, channel characteristics, and the nature of the load being carried. In addition, the relationship between flow and risk is not easy to establish for these processes. Return periods for flows are known for some streams and can be modeled based on anticipated or assumed rainfall characteristics for others. But data from which to extrapolate sediment production return periods or other criteria for expressing the risk are much harder to come by.

The UC Committee's risk based decision making approach (C5-31-1) also suffers from the problem that the large errors in model outcomes, as described above, are translated directly into the prediction of risk. And the recognized unreliability of numeric predictions (C5-36-2) combined with limitations on information available for assigning risk to extreme climatic events and to effects on individual species (C5-36-3 and A-VII-93-3) make it even more difficult for models generate trustworthy estimates of risk for decision making. In addition, this uncertainty increases as the geographic area shrinks toward a determination of the risk at any particular site (e.g., we may be certain that landslides will occur every year in a large area, but we don't know where for any given year). So predicting quantitative differences in risk, which requires a comparison of numeric outcomes, becomes problematic. In other words, one cannot reliably base a decision on differences in risk if there is no confidence in the predictions. Instead, we end up with risk evaluations that are no better than the current practice of avoiding or modifying practices on potential problem sites. However, modeling based on relationships established from data can provide a valuable tool for identifying those site characteristics and combinations of characteristics where avoidance or modification of practices should be applied, which links modeled risk to the site specific application of Forest Practice Rules and THP mitigations.

The statement that "The whole watershed view of the CWE problem requires that broad patterns of risk be computable" (C5-50-1) captures the main difficulty in relying on the Report recommendations. If this were easy or clearly feasible, it would have already been done. In fact, the Committee is recommending an expensive experiment to see if such an approach will work. This is clearly beyond the scope of what is envisioned in CEQA and the Forest Practice Act.

While the UC Committee's concerns about the effects of time lags and the difficulty of measuring downstream impacts (A-X-103-2) are certainly true, this serves an example of the problems involved in verifying results of CWE modeling. The Team's basic recommendation is to use process based models to predict CWEs in large watersheds. Therefore, it is the modeled CWE projections, rather than individual processes, that need to be verified by monitoring. However, the UC Committee indicates that such monitoring could take decades (A-X-103-2) and is even more pessimistic in its statement that "It is impossible to analyze and predict the long-term consequences of land use on erosion, sedimentation, ecosystem structure and function, or aquatic habitat through experiments or other empirical approach because to do so would require monitoring large, complex watersheds during land use of varying nature and intensity for many decades of variable weather" (C5-33-4). This begs the question of how we can successfully develop and verify CWE models if it is not possible to measure the effects that we would be modeling.

The Report section on Cumulative Effects of Watershed Changes on Sediment Sources (A-IV-86-3 through 88-3) gets to the heart of problems associated with modeling of land use effects. Here we find that spatially registered modeling of sediment loading is in its infancy, and that "models would not be able to match short-term measurements … nor meet the standards of replication established in the laboratory sciences." We are also

informed that such models "should be physically based yet parameter-poor such that it can be calibrated, however crudely …" which means that those variables that we can't calibrate will be left out, along with their influence on sediment production. And it is pointed out that models of the effects of root reinforcement "are difficult to calibrate due to the large number of parameters and the large spatial (and temporal) variation in those parameters." The same could be said of most other landscape processes related to sediment production. But this constraint is ignored in order to make predictions of "general magnitudes of sediment loads" (that are not tested or validated) for assigning risks that become the basis for regulating timber operations. In addition, we are informed that current models are likely to overestimate the intensity of shallow landsliding unless data on soil depth is available, which is almost never the case at the scale needed to make these predictions, while deep seated landsliding "is more of a challenge to modelers." In addition, we are informed that aerial photos can be used to estimate mean flow rates of large landslides, but not quantitatively, to analyze the approximate magnitude of changes resulting from land use, although it is not clear how quantitative differences are derived from non-quantitative flow rates. Then we are supposed to estimate the frequency of gullies related to land use and destabilizing of channels, for which no models are available. This is clearly the realm of research and pilot projects, rather than an operational approach to land use regulation.

Following are more specific comments on the Committee's proposed use of modeling:

- The statement that "in a landscape which contains a large amount of spatial variability of topographic form and material properties, including transient properties such as evolving tree-root reinforcement of hillside soils, or aquatic primary production, all of which may be sufficiently variable that it is impractical to measure or map them with foreseeable resources in a particular application" (C5-39-Item a) points out that watershed scale modeling will not be able to account for some of the basic, site specific factors that control erosion resistance and susceptibility.

- The proposal to use the empirically based ESI model (A-IV-90-2) seems inconsistent with the recommendation to use physically based modeling. Also, the UC Committee appears to be placing great reliance on an unpublished model for surface erosion without commenting on currently available approaches, such as WEPP and SEDMODL.

- The translation of the paragraph about the state of the art in sediment routing (A-V-91-3) seems to say that we understand the process of sediment transport, but the physically based models don't work very well in quantifying downstream sediment transport, and the state could help overcome the problems with current models by paying for more research on sediment routing (A-VI-92-3). This does not sound like an operational approach to land use regulation.

- The discussion of modeling sediment from roads (A-IV-89-3) acknowledges the lack of information about actual quantities of sediment from roads in California, which reinforces the argument against using such modeling without verification. But the

Report fails to mention that use of best management practices, such as outsloping, can greatly reduce the noted concerns about road sediment without resorting to the uncertainties of modeling sediment production.

- The use of empirical rating curves for estimating turbidity is not as easy or straight forward as is implied by the UC Committee (A-VIII-99-4). There are large differences related to time of year, rising and falling limbs of individual storms, instantaneous sediment inputs that vary by both antecedent watershed conditions and storm size, and other factors. Also, no model is cited, and the Report is silent about where the sediment budgets and suspended sediment samples that are required for calibrating turbidity to both suspended sediment and flow will come from.

- Modeling of stream water temperature should be more straightforward than flow, sediment, habitat, and populations. However, documentation for the Stillwater Sciences model cited by the UC Committee needs to be provided (A-VIII-99-3).

- The Appendix section on Riparian Biota (A-II-79-4 through 83-3) seems to have much to say about the Forest Practice Rules, but contains little in the way of useful information about modeling the impacts of timber operations on riparian resources.

- The Report contains a good discussion of the dilemma faced when trying to establish criteria for large woody debris and for many other natural features (A-II-81-1). One approach that is not mentioned is to identify a desired habitat condition, and then estimate the amount of woody debris that would be needed to provide it.

- The discussion of large woody debris source areas (A-II-81-6) does not address the likelihood and importance of providing larger diameter woody debris as distance from the stream increases within the length of a site potential tree. This larger diameter wood is much more likely to come from trees falling at the bank or very near the stream, with the proportions varying by topography, tree type, and degree of bank undercutting (Benda et al. 2002). The other significant source of larger diameter wood is from landslides that directly enter the stream system (A-II-81-6), which means that risk assessment models should also distinguish the benefits of LWD from the consequences of sediment.

- The UC Committee's statement implying that larger streams don't need wider buffer strips because the larger wood that is important for these streams is produced closer to the stream bank (A-II-82-1) should be qualified to recognize that buffers provide benefits for resources other than large woody debris. For example, buffers are intended to help minimize sediment inputs, prevent streamside landsliding, and provide wildlife habitat.

- It also seems inconsistent for the UC Committee to state that the empirical record of large floods is too short to define land use effects on risk, and then argue that we

should evaluate the impacts of how such changes in flow frequencies would affect scour of gravels and large woody debris (A-III-85-2).

- The statement that "… the prediction of morphological change in aquatic habitat remains difficult, or at least undeveloped" (A-VI-91-4) means that despite much effort in modeling effects on the physical state of the watershed, the tools for linking this to impacts on habitat have not been developed. And the step from habitat to actual impacts on stream biology would be even more tenuous.

- The discussion of gradient effects on channel characteristics (A-VI-92-2) provides a description of generally expected conditions, but gives no guidance on how or what models would be used to predict changes to these characteristics and makes no linkage to aquatic habitat, which is the subject of this section of the Report.

- The idea of using digital elevation as a surrogate for "guiding, interpreting, and extrapolating field work … as a foundation for a general model linking ecological and geomorphic processes" (A-VI-91-5) stretches the limits of correlation past the breaking point. This puts the UC Committee in the position of first rejecting the use of studies based on statistical correlation, and then proposing to use guesses based on an assumed relationship to channel gradient to represent complex processes.

- Combining the statement that there is no mechanistic modeling capability available for changes in aquatic habitat characteristics caused by logging of headwater streams (A-VII-94-1) with the proposal to use available censuses from sample environments to make quantitative statements in probabilistic terms integrated over entire watersheds (A-VII-94-1) is substituting assumptions about transference of inventory results in place of the previously recommended process modeling, and then somehow extending the result across an entire watershed. This is followed by another statement that methods for predicting mainstream habitat changes from fundamental mechanics are not well developed, while proposing to predict habitat changes based on empirical evidence that is "extended to yield some credible predictive capability" (A-VII-96-1). The Report goes on to say that that the capability to predict changes in rearing habitat is "seriously limited by the lack of population models that contain information on habitat quality" (A-VII-96-3). And after stating that the lack of predictive population models is a serious limitation, the Committee suggests using an approach for prediction that is heavily reliant on the estimation of many parameters (A-VII-98-4). With this level of confidence in model capabilities, it is hard to imagine how combining highly uncertain predictions of sediment, wood, and habitat impacts could be used to make operational decisions about THP prescriptions and mitigations.

- Considering the limitations on use of models described above, the UC Committee's statement that "CWE prediction needs to … establish causal linkages between land use and ecosystem condition" (C5-38-item 1) indicates that there is still a major disconnect between what is needed for cumulative impacts analysis and the available models.

- The UC Committee's proposal for using landslide susceptibility interpretations to identify habitats at risk of excessive sedimentation (A-IX-101-3) oversimplifies a much more complex problem that often includes other sediment sources and would require linkage to habitat conditions that other sections of the report clearly state are not available. The difficulty of doing this has already been described earlier in the Report's Appendix.

- It is not encouraging that the Report does not recommend using the example models given in Appendix A (C5-49-2). If the best examples are not good enough, where are the models required to implement the Report's recommendations going to come from? And if research is needed on quantitative model development, linkage analysis, methods for field quantification, and monitoring methods (A-X-101-5), what is left that is ready for application?

CDF Guidelines

The CDF cumulative watershed effects assessment Guidelines (CDF 1994) critiqued by the UC Committee (C4-18-3) were designed to work in concert with Forest Practice Rule and CEQA requirements. This procedure is intended to walk the THP preparer though the gathering of information on field conditions, consideration of information available from other sources, applying professional experience, and the integration of this information in a way that leads to a conclusion about the potential impacts of the proposed activities. It is not clear whether the Committee members were provided access to Appendix A of the Guidelines, which includes instructions and definitions of terms that answer several of their comments, and the Committee also appears to have criticized the Guidelines without any effort to see if they provide reasonable conclusions. Following are responses to the Committee's specific "editorial comments" (C4-18-3 through C4-20-3):

1) What an RPF will be "aware" of in conducting a watershed assessment under the Forest Practice Rules is based on the requirements of Technical Rule Addendum No. 2 and other sections of the rules that require information development. These include:

    - The use of information that is "… reasonably available before submission of the THP."
    - Specific information sources listed in the Addendum to TRA#2 that must be identified in the THP.
    - Information about past and future projects, where:
        - project is defined as "… an activity which has the potential to cause a physical change in the environment, directly or ultimately, and that is: 1) undertaken by a public agency, or 2) undertaken with public agency support, or 3) requires the applicant to obtain a lease, permit, license or entitlement from one or more public agencies [including THPs].

  - Past projects are defined as "… previously approved, on-going, or completed projects which may add to or lessen impact(s) s created by the THP under consideration. These generally include, but may not be limited to, projects completed within the last ten years."
  - And "reasonably foreseeable probable future projects" can be summarized as "projects with activities that may add to or lessen impacts(s) of the proposed THP", such as another THP under control of the current THP submitter and expected to commence in 5 years, THPs on other ownerships where the plan has been submitted or on-the-ground work has materially commenced, non-THP projects requiring a permit that are under review by a public agency, or a project that has been announced by a public agency.
- Information about past and future activities obtained from "… plan submitters (timberland or timber owner), and from appropriate agencies, landowners, and individuals …".
- Other information or conditions that the RPF may have personal knowledge of based on current and previous work in the assessment area or downstream.

For the most part, these requirements are based on the CEQA Guidelines, which form the legal basis for cumulative impacts assessment. By the time the task of assembling and reviewing this information has been completed, an RPF will have amassed a substantial amount of background data on which to base judgments about what has happened in the watershed.

Conducting an on-site review of channels is required by the Rules and, as used in the CDF Guidelines, is intended to provide the RPF with both an understanding of current conditions and a context in which to consider how past projects have interacted with the landscape. Riparian zone protections are also specified in the rules. The Committee's implication that channel and riparian zone conditions are not considered is simply not correct and shows a lack of understanding of both the rules and the THP development process.

As part of Technical Rule Addendum No. 2, an RPF is required to determine the beneficial uses of water that exist on the plan site and downstream. These beneficial uses establish which water quality parameters must be protected. Consideration of effects on peak flow (including flooding) is specified in TRA # 2. And assessing the effects of timber operations on slope stability is also required by the rules.

2) Assessment area instructions in Appendix A of the CDF Guidelines specify using an area where cumulative impacts of the project may be significant. The Guidelines also include specific instructions for considering downstream effects.

3) Instructions for the qualitative evaluation of channel condition features and for assigning ratings are given in Guidelines Appendix A. The rating of these channel features is based on observed presence and relative frequency. Criteria

for whether gravels are buried in sediment, pools are filled, the channel is downcutting, and the requested characteristics of other listed features are based on field observations that foresters can determine.

4) See no. 1 above regarding how RPF is aware.

5) See no. 1 above regarding how RPF is aware.

6) The interpretation of whether practices used in the past have resulted in particular impacts is to be based on the RPFs observations in the field, information available for the THP, and the RPFs experience in the plan area.

7) The criteria for determining whether the potential for an impact is “High, Medium, or Low” is contained in Appendix A of the Guidelines.

8) Identification and evaluation of potential impacts from future projects is a requirement of CEQA. Types of projects to be included are described in the Forest Practice Rule definition of “reasonably foreseeable probable future projects.”

9) The criteria for determining the potential for cumulative impacts are given in Appendix A of the Guidelines.

10) The criteria for determining the potential for cumulative impacts after mitigation are given in Appendix A of the Guidelines. Whether it is realistic to give a one word answer or not, a statement of whether the project will result in significant cumulative impacts (which comes down to yes or no) is required by CEQA.

THP Mitigations

The Report does note in passing that THP level identification of problem sites and implementation of mitigation measures is helpful and is complementary to the recommended, larger effort (C5-50-1).

The BMP “leaks” described by the UC Committee (C3- 13-1) may be widely identified by some environmental scientists, although this is not documented, but are rarely measured. And when carefully measured, the overall effects of these “leaks” are usually found to be small (Bottorff and Knight 1996, Dahlgren 1998, Holloway et al. 1998, Lewis et al. 2001, Cafferata and Munn 2002).

The UC Committee recommendation that modeling and gaming strategy be used to overcome deficiencies in the THP process and application of site-scale BMPs (C5-53-1) would substitute generalized and highly uncertain predictions in place of the site specific field information that is presently used to prescribe BMP mitigations.

The report recognizes that loss of downstream rearing habitat has had a major effect on fish populations, which is then used to justify restricting upstream activities to preserve remaining small pockets of rearing habitat (A-VII-96-2). However, preventing habitat loss is already a focus of the WLPZ Rules, and working to restore the original, downstream habitat that is important to outward migration would seem to be a more productive solution to the problem of forcing under-developed fish into the ocean.

The UC Committee's criticism of using mitigation to reduce or offset potential cumulative impacts (C6-56-3) is disingenuous and inconsistent with the Report's earlier recognition of the potential for "positive CWEs resulting from rehabilitation projects" (C3-13-3). While the Report's authors conclude that cumulative effects are not quantifiable and recommend that these impacts be addressed in terms of risk through the use of unverified models, the UC Committee would then require that the benefits of practices aimed at offsetting CWEs be quantitatively substantiated. In effect, the Committee is requiring that non-quantified impacts be compared to quantified mitigations, from which no conclusion can be reached, and they are not willing to accept the basic premise that fixing clearly evident problem sites and known sources of sediment can be used to off-set unknown and un-measurable impacts. Before CDF adopts this viewpoint, there needs to be at least some documentation of why we would be better off by not fixing existing problems.

The UC Committee observation that CDF rarely considers mitigations outside of the plan area (C3-12-4) is the result of ownership constraints and because plan submitters have not proposed that outside activities be used to mitigate project area impacts. There have been exceptions – primarily through the use of road system mitigations within an assessment area, such as PALCO and Georgia Pacific in the Mokelumne River Watershed. In addition, the Committee's concern over lack of mitigation outside of the plan area seems to be inconsistent with the Report's criticism of using mitigation to off-set potential CWEs in general (C6-56-3).

The UC Committee has also incorrectly concluded that CDF expects impacts to be "mitigated out of existence by application of a Best Management Practice" (C4-21-3). Instead, THP mitigations for cumulative effects, whether included in the rules or required during the THP review process to meet a specific problem, are viewed as reducing a plan's contributions to CWEs to a point where they no longer meet the definition of a significant adverse effect.

Past Studies

It is not clear what the UC Committee considers to be a "short-term empirical study" (ES-3-1), but the results of past studies should provide the best information for forming a "communal understanding", and the results of these studies, such as the work at Caspar Creek (Ziemer 1998), should not be dismissed in the absence of better information. For example, the work reported by Hawkins and Dobrowolski (1994) on the cumulative impacts of watershed management on stream biota is dismissed by the UC

Committee as a region-wide statistical analysis of watershed conditions (C1-6-3), presumably because it did not find widespread adverse effects resulting from cumulative impacts, when this study had, in fact, specifically tried to identify impacts at the watershed scale that the UC Committee now recommends we use modeling to predict.

The UC Committee's discussion about prediction and its criticism of statistical studies in the section about "Spatially Registered Simulation Models and Gaming" (C5-39-Item 4) can be paraphrased as – an educated guess is better than results of a study that identifies significant factors. This is equivalent to looking at the world with blinders that prevent seeing or considering how or why statistically identified watershed factors are important in controlling or correlated with watershed responses. Statistical studies can show us preferred methods of expressing environmental variables that can actually be measured. And the best of both worlds is to use statistical methods to identify and quantify coefficients and parameters used in mechanistic models.

Statistics provides a systematic approach for interpreting data, which may or may not start with variables that have been selected or structured to represent expected processes. At one extreme, variables can be entered into a statistical model based solely on their ability to improve correlation and significance. At the other extreme, statistical methods can be used to determine best fit values for coefficients for process based models in which variables have been pre-selected and structured to represent a hypothesis of how the world works. In either case, the accuracy of such models is likely to be greater than models created from un-calibrated assumptions about natural systems, which are actually hypothesis waiting to be tested.

After criticizing the use of empirical studies and promoting processes based models, the Committee states on page 96 of the Appendix that "The lack of predictive population models, even of the coarse-grained, conceptual type … remains a serious limitation for resource managers and policy makers …" and that we will need to rely on formalized judgments and empirical statistical relationships (A-VII-96-4).

Although the data and tools available now are likely to have improved, it is worth mentioning that an extensive ranking of watershed sensitivity as suggested by the UC Committee (C5-51-3) has already been completed under a contract sponsored by the BOF's Monitoring Study Group (McKittrick 1994). This work was conducted by CGS based on available geology, slope, and precipitation data. The application of satellite imagery to analyze changes in land cover has also been used in the past by CDF's Fire and Resources Assessment Program with results that should encourage further investigation. And more recent work on watershed level analysis and sensitivity has been conducted by several of the state's resource agencies, including CDF, as part of the North Coast Watershed Assessment Program.

In addition, it is unclear what studies the UC Committee is referring to in its comments about nutrient losses related to timber harvesting in California that have raised concerns about the potential for eutrophication of lowland and estuarine habitats (A-VIII-99-5).

Water quality effects of harvesting have been measured in the Caspar Creek Watershed by Dahlgren (1998), who found only minor increases in nutrient flux, while Bottorff and Knight (1996) found no significant adverse effects on stream biology. Another water quality study in the Mokelumne River Watershed found that nutrient concentration increases occurred below the timber management zone in areas of residential and commercial development and, unexpectedly, as a result of leaching from one, specific rock formation (Holloway et al. 1998). Each of these studies was supported by CDF, and one reason that more work has not been done is that the magnitude of observed impacts has been small.

Agency Efforts

An uncritical or uninformed reading of the UC Committee's Report, and Chapter 4 in particular, would lead one to believe that modeling can accurately predict where and when to limit timber harvesting, can establish the risk of in-unit landslides, can monitor channel effects, and can determine the long-term impacts of timber harvesting on landsliding and aquatic habitat, among other things. This, however, ignores the limitations of available information and models that are described later in the Report's Appendix and pointed out in this review. The Committee would also lead readers to believe that CDF, with the complicity of CGS, has been accepting without question plan submitter denials of landslide potential and that CDF uses best management practices to avoid analysis of timber harvesting impacts. In addition, the Committee has determined that there is no monitoring despite pre-harvest inspections, active inspections, post-harvest inspections, systematic follow-up studies of hillslope and WLPZ impacts, periodic reviews of mitigations to prevent landslides, studies of instream impacts, and CDF sponsored watershed research projects (Ice et al., in press). In fact, the UC Committee has ignored the ongoing efforts by hundreds of scientists and agency "technical specialists" over the past 20 years that have resulted in radical changes in the way that timber operations are conducted and the impacts of these operations on the landscape.

Agency scientists and "specialists" who have been working on problems related to timber operations know that, in reality, timber harvesting rates and the magnitude of even-aged treatments have been effectively reduced by adjacency requirements, smaller unit sizes, and restrictions placed on both unit locations and type of harvesting as a result of land stability and other concerns identified during THP development and review. A Hillslope Monitoring Program and complementary Modified Completion Report Monitoring Program have been established as an additional check on compliance and to determine long-term effectiveness of the Forest Practice Rules as best management practices. These programs are focused on roads, skid trails, landings, and watercourse crossings because previous studies sponsored by CDF and others (Rice and Datzman 1981, Rice and Pillsbury 1982, McCashion and Rice 1983, Peters and Litwin 1983) have shown that these disturbance features produced much more erosion and sediment than in-unit erosion. Watercourse and lake protection zones are also included because of concerns about canopy and riparian impacts, and a

Class III watercourse survey has recently been added to the Hillslope Monitoring Program (Cafferata and Munn 2002). Much work has also been done to try to characterize instream impacts and to determine instream monitoring methods (Rae 1995, Barber 1999, CDF and NCRWQCB 2002), but these efforts are hampered by real world problems of access, high study costs, long time frames (especially for determining trends related to larger flows), and the recognition that large flow events often reset channel conditions and interrupt shorter-term trends.

Agency Expertise

The UC Committee has concluded that "The personnel currently in charge of recognizing and regulating CWEs could not provide the conceptual leadership and guidance with methods for CWE prediction described in this report and its 'tool-box' Appendix." (C6-57-3). This conclusion does not come as a surprise since the UC Committee has not found anything done by CDF sufficient for addressing cumulative effects. However, it is worth noting that the Committee made this determination without meeting with or otherwise interviewing CDF's watershed staff and that the Report Appendix does not provide a tool box, since the described models are not operational. In fact, the only possible conclusion that can come from reading the Appendix is that the proposed modeling approach to CWE analysis cannot be implemented with currently available watershed models. In contrast, CDF is constrained by a requirement for using feasible measures and cannot impose untested hypothesis on private landowners.

The UC Committee's further statements about "agency personnel" being unaware of developments in the technical literature, having an "insular view of what constitutes the best scientific information on a subject", and "hiring consultants to make quick, 'policy relevant' surveys as a basis for short-term decision-making" (C6-58-5) are highly critical CDF and other state agency staff. To provide some substance to support these findings, it would be helpful to know more specifically what agencies being criticized, in what way views of the scientific literature are insular, and in what situations quick policy-relevant studies are being misused.

In comments about available data, (C5-48-2 through 48-4), the Report makes some optimistic projections about data availability, followed by a pessimistic view of the usefulness of available data, then acknowledges the probable need for field inventories, while minimizing the difficulty of conducting such inventories by assuming that the people who have done this work in the past were not sufficiently experienced. In other words, the UC Committee would be able to more efficiently acquire the necessary data than hydrologists and fisheries biologists conducting stream surveys, geologists conducting mass wasting inventories, soil scientists conducting soil surveys, and other professionals engaged in inventorying the resources in their areas of expertise However, the outcome of "an analysis" based on low quality data and using, as described in the Report Appendix, inadequate models should not be expected to yield results from which land management decisions can be made.

The purpose of the UC Committee's recommendation that "the State needs to recruit appropriate professionals (working for Industry, State agencies, or other groups) with documented ability and knowledge of management to become involved in CWE analysis" (C7-63-#5) is not clear because there is no apparent reference in the Report about how these management skills would be used in conducting or implementing CWE assessments. In light of the Team's criticisms of the preparation and review of CWE analyses, it would seem more helpful for the Department to 1) provide better training about cumulative impacts for RPFs and agency Review Team personnel, 2) provide direction to take a closer look at submitted CWE assessments, and 3) to hire at least one additional staff member with a background in watershed processes to work directly with Review Teams on improving the quality of approved CWE assessments.

Adversarial Relationships

After describing agency personnel as unable to provide conceptual leadership and guidance, being unaware of developments in the technical literature, and having an insular view of what constitutes the best scientific information, the Committee also criticizes the state and industry for creating an adversarial relationship with scientists (C6-60-2 through 60-4). In addition, the Committee has determined that agency personnel are "perverse" based on events where they have heard only one point of view. At this point, it might have been useful for the Committee members to have given their recommended use of skepticism (C6-60-4) a trial run.

Having aired their opinions and complaints, the Committee then makes a preemptive strike on the possibility of disagreement by stating that "The inability of many people in the resource industries and associated State agencies to use skepticism constructively places serious constraints on transparent investigations of issues such as prediction of cumulative watershed effects. They see all questioning as judgmental, rather than as an approach for improvement of a product, technique, approach, and ultimately of sustainable development of the resource they profess to value" (C6-60-4). In other words, pointing out where scientists are wrong is bad, but criticism by poorly informed scientists is okay. What would be more helpful is for peer review of new research results and proposed models to occur within the scope of scientific publications instead of during the public review process of state and federal permitting agencies that require response to comment.

The Committee's final recommendation to support public debate on CWEs while denouncing "attacks" on participants (C7-64-#9) does not recognize the freedom of expression that is involved in the project review process, and the expectation that scientists who become advocates will be given special status in debates over controversial issues is a viewpoint that agencies can't enforce. Greater perspective on this issue could have been gained by reviewing comments about agency personnel that are received in the course of making decisions on controversial projects.

Consensus

The UC Committee's recommended analysis process assumes that there will be "multi-stakeholder accord on conceptual models" (ES-1-2). However, the process for reaching such agreement on models, data, and decision making depends on a willingness by those involved to reach consensus that past experience would indicate is often hard to find among interest groups with differing and firmly entrenched beliefs. Requiring agreement among people with conflicting interests as a condition of a cumulative impacts assessment (C5-45-1) would turn this analysis into a political exercise. And if the Committee really thinks that global warming is an example of how a modeling based approach will provide consensus (C5-34-4), then the polarized and politicized viewpoints on this topic should serve as a warning about the potential for modeling to reduce controversy in the THP review process.

Without the requirement for consensus, most of the community input that the UC Committee recognizes as necessary for identifying significant issues (C5-45-All, C5-46-3 and 4) can be provided by the CEQA process, where concerns are identified at the start of analysis and their disposition described in the agency's response to comment. However, this should not be expected to result in agreement on the part of individuals who may remain unconvinced.

The UC Committee also anticipates that the recommended CWE Committee would be able to mediate the concerns of various interest groups to determine issues that would be included in the CWE analysis for a given watershed, with assumption that technical knowledge and reputation will allow the Committee to bring the different parties to consensus (C5-47-1). This has been done before, and the result has been the labeling of participants as being for or against the interests of one or the other of the participating groups, which created similar adversarial circumstances of which the UC Committee is so critical.

Research Support

The limitations of current models cited in the Report and pointed out in the comments in this review clearly indicate that the use of models to predict CWEs is a research effort. The UC Committee also emphasizes the need for research as a part of their recommended modeling effort (C7-63-#6). An issue that would come up immediately in any current discussion of new research is the availability of funding at a time when state budgets are being cut. However, CDF could re-evaluate its priorities for coordinating and supporting research activities and seek funds from a variety of state and federal sources.

Documentation and Background Information

The Report states that environmental scientists agree that timber harvesting continues to cause “radical” alterations in water quality, habitat conditions, and flood risk (C1-6-4). However, there is no documentation offered to support this opinion. And it is ironic to note that research underlying current estimates of the effects of timber operations on flood risk in rain-dominated environments came from the CDF supported Caspar Creek study that is discounted by the Committee.

The UC Committee’s statement that there is “almost a complete lack of data on water quality, streamflow, terrestrial biota, aquatic populations, the physical condition of streams, components of the water balance, and the degree to which they are altered by timber harvest in the region” (C6-57-1) either shows a lack of familiarity with or disregards the large amount of information that is available. CDF has been conducting hillslope monitoring, which includes evaluation of watercourse and lake protection zones, for 6 years and has accumulated information on 300 THPs statewide, with the largest proportion from the North Coast (Cafferata and Munn 2002). The Department of Fish and Game has been collecting information about fish populations and channel conditions for decades, and this is now being brought together as part of the North Coast Watershed Assessment Program and other efforts. The forest industry has an extensive program for measuring stream temperatures (Lewis et al. 2000), and individual companies have on-going stream monitoring programs. Studies have been done to evaluate watershed impacts across a range of conditions, including the work described in both the Cited and Related References listed at the end of this review, among others. In particular, CDF has been cooperating with the PSW Research Station on studies of the impacts of timber operations on sediment production and channel conditions in the Caspar Creek watershed since the 1960’s, along with ancillary studies of water quality, stream biology, fish habitat, and others that would require a reference list too long to include here (see list of Caspar Creek references summarized by the Pacific Southwest Research Station at http://www.rsl.psw.fs.fed.us/projects/water/caspubs.html).

The Committee’s finds fault with a lack of “yes” answers in the Pape and CGS surveys to the question of whether a proposed plan would cause significant adverse impacts or contribute to existing impacts (C4-21-5 through 23-3). However, review of Report Table 1 (C4-22-2) shows that about half of the THPs in each of these surveys reported that there were continuing, significant adverse impacts from past projects in the assessment areas of the proposed THPs, about a third stated that significant cumulative impacts would not occur following mitigation, and two-thirds found that there were no significant cumulative impacts without additional mitigation. The absence of “yes” responses has already been explained in the earlier discussion of the THP Process, and the Committee does not present any information demonstrating that the conclusions reported in these THPs are not correct. The presence of features in the Redwood Creek watershed that were not included in THPs covering this area may point to a need for follow-up, but this does not demonstrate that the operations conducted under these plans have contributed to significant adverse cumulative impacts.

In addition, the UC Committee does not present any data or other evidence to support its contention that exceptions and in lieu practices, which must be explained and justified in the THP review process, have resulted in additional impacts (C6-55-4). And this point does not seem to have been related to the issue of cumulative impacts.

The comments of a CDF "reviewer" about mass wasting (C6-58-2) are presented by the Committee without providing any context for these observations, and they do not appear to have evaluated the THPs in question to see if these comments were addressed in the final product. In addition, the question of whether the referenced landowner's map of landslides was used to address the Team's concerns in the actual review of plans was not answered. On most North Coast THPs, and especially where mass wasting is a concern, interpretation of landslide hazards is done by licensed geologists who are employed by the California Geologic Survey, rather than by CDF staff.

Similar criticism of the THP review process, based on a state employee's comment about lack of forestry related landsliding that was not consistent with a map observed by the Committee showing numerous mass failures, (C6-58-3) lacks documentation that the mapped slides were actually related to timber operations, and there is not sufficient description in the Report to check the accuracy of this assumption. Simply put, more information is needed to support the Committee's conclusions.

There is also no foundation for the UC Committee's criticism of cumulative impacts analyses in SYPs (C4-25-3, C6-55-4). Cumulative impact assessment for use with individual THPs is not a required element in SYPs, and CDF determined that the Pacific Lumber Company SYP did not provide an adequate analysis to substitute for plan specific assessments. The only other SYP that had been approved at the time the UC Committee was preparing its Report was the Surdna plan in northeastern California, which had only three miles of class I waters on the entire 70,000 acre plan area.

In addition, CDF is not aware of any studies or other documentation that would support the UC Committee's conclusion that Forest Practice Rules pertaining to landsliding, road wash, skid trails, and non-fish bearing channels have not been based on scientific evidence (C6-56-1). Actually, CDF staff and others involved in the development of Forest Practice Rules have relied heavily on the best available research and have considered the "communal understanding" of both problems and solutions related to the impacts of timber operations, as described in more detail in the comments on "Forest Practice Rule Requirements." The Committee's implication that CDF staff have not responded to concerns about harvesting in the Freshwater Creek watershed because "logging does not cause flooding" (C6-58-1) is also not correct. In fact, CDF has limited the annual harvest in this watershed specifically to address the flooding issue, as described below.

The UC Committee comment that "Other rules, such as limitations on the size of areas that can be harvested within a short period of time, are easily circumvented" (C6-56-1) is both inflammatory and wrong. Circumventing the Rules results in violations or a

citation. If this comment by the UC Committee is supposed to be a judgment about the adequacy of the Rules, then the authors should chose their words to say so. And even the example used by the Committee is misleading. The reference to clearcutting 15 percent in the Freshwater watershed during the same decade that 35 percent has been harvested with alternative (non-clearcut) prescriptions is supposed to somehow justify a comment about circumventing harvest unit size rules. But there is no analysis or discussion about how this circumvented or was an inappropriate application of the Rules. A quick review data available for harvesting on the Pacific Lumber Company's 19,600 acres of timberland in the Freshwater watershed shows that the various types of harvesting removed approximately 3 percent of the canopy per year from 1988 through 1997, which is significantly less that the 5 percent average that the UC Committee numbers imply, and CDF has subsequently reduced this to about 2 percent per year based on more recent information on potential peak flow effects (Munn 2001).

The UC Committee has apparently decided that the rules for Class II and III watercourses are ineffective (A-II-80-4) without feeling the need for any data to support this conclusion. And the UC Committee's statement that the effects of partially harvested buffers on stream temperatures is unknown (A-II-83-2) is surprising since the effects of streamside vegetation removal on stream temperature have been studied for many years and is one of the more easily modeled impacts of timber harvesting (McGurk 1989). In fact, information that was available in CDF's Interim Hillslope Monitoring Report (BOF 1999) showed that high levels of canopy are being retained in Class I or Class II WLPZs under the current Forest Practice Rules, and an additional two years of data collection has provided nearly identical results (Cafferata and Munn 2002). In addition, the Committee makes no case for their concern about Class III watercourses, which only carry water in direct response to storm events. This points out a discrepancy in the Committee's approach to criticism, where not having quantitative data to prove the Forest Practice Rules work is bad, but it is okay to say the Rules don't work without the benefit of supporting data.

The UC Committee also does not provide any indication of the information it is relying on to claim that state agency personnel have adopted a view that prevention of negative CWEs can be accomplished just through enforcement of the existing Rules (C6-56-1 and C6-56-3). CDF watershed staff, in particular, have not made this claim. But it would be correct to say that the Rules have substantially reduced sediment production from roads, landings, and harvested areas; that potential increases in water temperature have been minimized by restricting streamside canopy removal; and that reducing inputs of sediment and heat related to a project will also lessen the potential cumulative impacts of project activities. Where additional measures are needed, the Rules allow the Department to require mitigation measures that are not specifically included in Rule language, and it is on this point that improved CWE assessment would be most useful.

The UC Committee does not provide any indication of what information it is using to support a conclusion that CDF and others are relying on the concept of "threshold of concern" (C6-56-2). One of the major concerns expressed by CDF staff regarding use

of the USFS equivalent roaded area (ERA) procedure is the use of a threshold value, and CDF Sacramento staff have been clear that there is no single threshold that can be used to define what is significant in all watersheds (CDF 1987).

In addition, it is not clear how the UC Committee arrives at the conclusion that mitigation measures used to off-set cumulative impacts have not been tested (C6-56-3). Examples of such “testing” would include literature showing that rocking roads reduces sediment (Coe and MacDonald 2002), and reports from work in Redwood Park describing the benefits of removing unstable crossings and fills (Madej 2001). This list could be continued to include most of the mitigation measures for water quality protection that are included in the Rules and THPs.

Finally, the UC Committee recommendation about monitoring (C7-63-#7) does not appear to recognize the many on-going monitoring efforts related to timber harvesting activities, including the activities of the BOF’s Monitoring Study Group, the Hillslope Monitoring Program, Modified Completion Reporting Program, CDF sponsored research projects, and many timber industry sponsored efforts. If they had been asked, Department staff would have been glad to describe and discuss these, and other, monitoring projects. Before embarking on another monitoring project or program, existing efforts should be evaluated to see what additional work is really needed.

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