DEPARTMENT OF FORESTRY AND FIRE PROTECTION
NORTHERN REGION HEADQUARTERS REDDING
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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: 2-21-00086-SIS

SUBMITTER: FWS Forestry

COUNTY: Siskiyou

END OF PUBLIC COMMENT PERIOD: October 4, 2021

DATE OF OFFICIAL RESPONSE/DATE OF APPROVAL: October 11, 2021

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,

Jonathan Woessner, RPF #2571
Forester II
Cascade Area Review Team Chair

cc: Unit Chief
RPF
Plan Submitter
Dept. of Fish & Wildlife, Reg. 1
Water Quality, Reg. 5
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.

Proposed Silviculture and Alternative Methods Consideration

When deciding which silvicultural method to use within the THP area, the RPF must consider many factors such as:

1. The forest that is currently present onsite.
2. The landowner objectives, both short and long term.
3. The requirements under the Act and Rules to provide for Maximum Sustained Production of High Quality Timber Products (MSP).
4. The available range of silvicultural treatments allowed for in the Rules.

While there may be several ways to achieve the objectives of the landowner and the Rules, the RPF is ultimately responsible for determining what methods to implement:

14 CCR § 897(a) contains the requirements for how an RPF is to develop a THP in order to comply with the Rules and Act:

> ***897 Implementation of Act Intent***
> ***(a)*** *RPFs who prepare plans shall consider the range of feasible silvicultural system, operating methods and procedures provided in these Rules in seeking to avoid or substantially lessen significant adverse effects on the environment from timber harvesting. RPFs shall use these Rules for guidance as to which are the most appropriate feasible silvicultural systems, operating methods and procedures which will carry out the intent of the Act.*
>
> *While giving consideration to measures proposed to reduce or avoid significant adverse Impacts of THPs on lands zoned TPZ, the RPF and Director shall include the following legal consideration regarding feasibility:*
>
> *The Timberland Productivity Act restricts use of lands zoned Timberland Production Zone to growing and harvesting timber and compatible uses and establishes a presumption that timber harvesting is expected to and will occur on such lands.*

The California Government Code § 51104 provides instruction on how Timberland Production Zone (TPZ) is to be designated on a County level. The responsibility for determining areas as within the TPZ lie with the Board of Supervisors for the county where the timberlands are located:

> *(g) "Timberland production zone" or "TPZ" means an area which has been zoned pursuant to Section 51112 or 51113 and is devoted to and used for growing and harvesting timber, or for growing and harvesting timber and compatible uses, as defined in subdivision (h).*
> *With respect to the general plans of cities and counties, "timberland preserve zone" means "timberland production zone."*
> *(h) "Compatible use" is any use which does not significantly detract from the use of the property for, or inhibit, growing and harvesting timber, and shall include, but not be limited to, any of the following, unless in a specific instance such a use would be contrary to the preceding definition of compatible use:*
> *(1) Management for watershed.*
> *(2) Management for fish and wildlife habitat or hunting and fishing.*
> *(3) A use integrally related to the growing, harvesting and processing of forest products, including but not limited to roads, log landings, and log storage areas.*
> *(4) The erection, construction, alteration, or maintenance of gas, electric, water, or communication transmission facilities.*
> *(5) Grazing.*
> *(6) A residence or other structure necessary for the management of land zoned as timberland production.*

In addition to zoning designations, individual counties may also declare additional rights or restrictions on activities that occur within the bounds of the County. Siskiyou County has a "right to farm" ordinance that specifies a priority use for productive agricultural lands such as those within the boundary of this THP:

- ***CHAPTER 11. - RIGHT TO FARM***
  Sec. 10-11.01. Definitions*.*
  (a) "Agricultural land" shall mean all that real property within the boundaries of the County currently used for agricultural operations or upon which agricultural operations may in the future be established.

  (b) "Agricultural operation" shall mean and include, but not be limited to, the cultivation and tillage of the soil, dairying, the production irrigation, frost protection, cultivation, growing, harvesting and processing of any agricultural commodity including viticulture, horticulture, timber or apiculture, the raising of livestock, furbearing animals, fish or poultry, and any commercial agricultural practices performed as incident to or in conjunction with such operations, including preparation for market, delivery to storage or to market, or to carriers for transportation to market.

  (§ I, Ord. 90-28, eff. October 25, 1990)

Sec. 10-11.02. Findings and policy.

(a) It is the declared policy of the County to enhance and encourage agricultural operations within the County. It is the further intent of the County to provide to the residents of the County proper notification of the County's recognition and support through this chapter of those persons' and/or entities right to farm.

(b) Where nonagricultural land uses extend into agricultural areas or exist side-by-side, agricultural operations are frequently the subjects of nuisance complaints and are forced to cease or curtail operations. Such actions discourage investments in farm improvements to the detriment of adjacent agricultural uses and the economic viability of the County's agricultural industry as a whole. It is the purpose and intent of this section to reduce the loss to the County of its agricultural resources by limiting the circumstances under which agricultural operations may be considered a nuisance. This chapter is not to be construed as in any way modifying or abridging State law as set out in the Civil Code, Health and Safety Code, Fish and Game Code, Food and Agricultural Code, Division 7 of the Water Code of the State, or any other applicable provision of State law relative to nuisances; rather it is only to be utilized in the interpretation and enforcement of the provisions of this Code and County regulations.

(c) An additional purpose of this chapter is to promote a good neighbor policy between agricultural and nonagricultural property owners by advising purchasers and users of property adjacent to or near agricultural operations of the inherent potential problems associated with such purchase or residence, including, but not limited to, the noises, odors, dust, chemicals, smoke and hours of operation that may accompany agricultural operations. It is intended that through mandatory disclosures, purchasers and users will better understand the impact of living near agricultural operations and be prepared to accept attendant conditions as the natural result of living in or near rural areas.

(§ I, Ord. 90-28, eff. October 25, 1990)

The Regulations, Statues and Ordinances discussed above, along with the landowner objectives, provide the basis upon which the RPF considered what activities are appropriate for the THP area. Alternatives to the proposed THP, including a “no project” option are discussed on pages 69-73. The different silvicultural methods that could have been chosen for this plan are also discussed, along with a justification of the chosen method on pages 74-80.

When reviewing if the proposed THP conforms to the Rules and Regulations that govern timber harvesting, CAL FIRE has the following requirements:

14 CCR § 897(b)-(d)

(b) *In determining whether a THP conforms to the intent of the Act, the Director shall be guided by the following principles:*

(1) *The goal of forest management on a specific ownership shall be the production or maintenance of forests which are healthy and naturally diverse, with a mixture of trees*

and under-story plants, in which trees are grown primarily for the production of high quality timber products and which meet the following objectives:

(A) *Achieve a balance between growth and harvest over time consistent with the harvesting methods within the Rules of the Board.*

(B) *Maintain functional wildlife habitat in sufficient condition for continued use by the existing wildlife community within the planning watershed.*

(C) *Retain or recruit late and diverse seral stage habitat components for wildlife concentrated in the Watercourse and lake zones and as appropriate to provide for functional connectivity between habitats.*

(D) *Maintain growing stock, genetic diversity, and soil productivity.*

(2) *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.*

(3) *While the responsibility for implementation of the Act and Rules belongs to the Director and the Department, RPFs who prepare plans have the responsibility to provide the Director with information about the plan and resource areas and the nature and purpose of the operations proposed which is sufficiently clear and detailed to permit the Director to exercise the discretion and make the determinations required by the Act and Rules. The information in proposed plans shall also be sufficiently clear and detailed to permit adequate and effective review by responsible agencies and input by the public to assure that significant adverse individual and cumulative Impacts are avoided or reduced to insignificance.*

(c) *The Director shall use the standards provided in these Rules when reviewing plans to determine if they conform to the Rules and regulations of the Board and the provisions of the Act. In specific circumstances provided in these Rules, the Director shall disapprove plans because they conflict with the intent of the Act as interpreted by the Board.*

(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.*

Ultimately, the RPF who writes the plan must consider these and other regulations when deciding on the harvesting methods that will achieve the landowner's goals while meting the objectives of the Forest Practice Rules and the Forest Practice Act. Likewise, CAL FIRE must consider the range of values that must be evaluated while allowing for legally permitted activities on Timberland. These activities are often a tradeoff between competing and

sometimes contradictory objectives(see also “CEQA Analysis” below). CAL FIRE believes that the plan as approved has mitigated any potential significant adverse effects to below the level of significance.

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. <u>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.</u> 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.*

<u>Requirements of Evaluation included in the Rules</u>

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.*
>
> - *Slash to be treated by piling and burning shall be treated as follows:*
> - *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.*
> - *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.*
> - *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*

For this plan, there are no structures requiring hazard reduction near the plan area, and all roads within the area are private and not subject to additional slash treatment required of areas open to the public.

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:

> *943.6 (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.

- Limits on access: New roads within the forest open the potential for unauthorized use by the public, increasing the potential that a fire may occur. The landowner maintains control over access to the plan area using locked gates to discourage trespass.

Maintaining access within the harvest plan area is consistent with the Siskiyou 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 RPF has identified the Wildfire Risk and Hazard assessment area on page 83 as:

> *…the area extending 1.0 mile in all directions from each harvest unit.*

The complete assessment is located on page 144 and correctly discloses that the area is designated as being within a Very 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[1]

> *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 Siskiyou County, most lands are classified as being within the "Very High" category.

Responsibility Area	Percent of Total Acres
Federal	62%
Local	4%
State	34%

	Responsibility Areas		
Hazard Class	Federal	Local	State
Non-Wildland/Non-Urban	5%	65%	0%
Moderate	6%	25%	14%
High	7%	4%	13%
Very High	82%	6%	73%

The Plan discussion of wildfire risks continues:

> *Existing and probable future fuel conditions including vertical and horizontal continuity of live and dead fuels:*

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

A majority of the assessment area is owned by SCT and is primarily managed for timber production. The area has a history of uneven-aged forest management that systematically reduced fuel loading across the ownership by opening the forest canopy with selective harvesting and group openings. Current forest management is primarily even-aged where most of the fuel from a management unit is removed entirely. Slash and other debris accumulation resulting from timber operations is typically removed via burning or chipping operations once harvesting is complete. Both management approaches result in a substantial reduction in horizontal and vertical fuel continuity. Active forest management is expected to continue on SCT lands. These forest management activities, resulting in fuel reduction, reduce wildfire risk and hazard for residential dwellings and communities within the assessment area.

Most of the remainder of the assessment area is owned by a private institutional landowner that manages their timberland under a combination of uneven and even aged silviculture. This owner has an ongoing program of timber harvest and an extensive road system that is maintained. These lands represent a similar situation to that of SCT managed lands with respect to fire hazard. The remainder of the assessment area is owned by the US Forest Service. The Forest Service lands within the assessment area are currently unmanaged and represent hazardous fuel conditions that will likely remain unless the Forest Service engages in active forest management. There are no small private landowner within the assessment area for this plan.

Location of known existing public and private Fuelbreaks and fuel hazard reduction activities:

A ridge top fuel break exists in Sections 28 and 33. Another ridge top fuel break is located in Section 16 and extends into Section 2 1. No other formal fuel reduction activities are known within the assessment area.

Road access for fire suppression resources:

The assessment area is well roaded providing unimpeded access for fire suppression resources.

Timber harvesting inherently decreases fuels on the landscape through mechanical and systematic removal while updating transportation infrastructure. Therefore. no cumulative increase in wildfire risk and hazard is expected to result from the timber operations associated with this THP.

CAL FIRE has determined that the assessment of potential hazards is reasonable based upon the characteristics of the assessment area and the proposed operations. As described above, the Rules have been developed to mitigate risks associated with logging-caused fires.

Evenage Management and Plantations Impact on Fire Hazard

The proposed THP includes a mixture of proposed silviculture, including 217 acres of Alternative Prescription (closest to clearcutting) and 284 acres of Commercial Thinning. After harvesting is completed, the 217 acres of Alternative Prescription will be replanted. Item #14 of the plan describes that this area will be planted with enough tree to meet the minimum stocking standard of 125 point count (which would be at least 125 trees per acre).

Comment letters expressed concern with the potential fire risk associated with plantation management. Several research papers and experts have been cited to support this concern. As one would expect, CAL FIRE has concerns about responsible forest management as well as protecting lives and property. If there is a significant increase in risks associated with plantations, CAL FIRE needs to ensure that those risks are mitigated to protect life and property. Not only must we be concerned with protecting the public, but our employees as well which must go into these forested landscapes to fulfill their mission.

All CAL FIRE employees, no matter where they serve, are available to assist with emergency assignments at any time. For example, the CAL FIRE Inspector for the Dunsmuir area as well as the Siskiyou Unit Forester are also emergency responders who are often some of the first people to arrive on scene to a fire. They fill a variety of roles as part of an emergency response and are well aware that their duties as foresters can impact the safety of other emergency responders. Proposed harvesting plans are reviewed with both natural resources and public safety in mind. But more simply: We are not going to intentionally approve plans that place any of our employees at increased risk.

The public is justified in being concerned about how logging operations can impact fire danger, and it is appropriate that CAL FIRE respond adequately to these concerns. The first concern related to fire hazard is the one posed by tree plantations, and their potential to cause fires to burn hotter and faster.

While there is literature studying the effects that plantations have on fire behavior, a clear cause and effect relationship between plantations and fire danger has not been established. This is primarily because there is a great deal of variability in how plantations are managed. This is especially true with private California timberlands as described below.

CAL FIRE has reviewed many studies on how fires burn within managed and unmanaged landscapes. Often, concerns related to fire behavior and plantations are added as public comment, referring to one of more of these studies. A brief discussion of those studies is provided below for context.

- Wildfire Effects Evaluation Project – Umpqua National Forest (Morrison, Marshall, Minor, & Davis, 2003)
    - *Fire burned most plantation areas with high intensity and spread rapidly through the canopy of these young stands. However, surface-fire intensity was moderated because fuel accumulations on the ground were relatively light. Thus, many plantations experienced moderate-fire severity (high intensity, low heat).*

- *Fifty-five percent of the plantation areas within the 2002 fire perimeter burned as stand-replacement fires (Appendix A). Plantation mortality is disproportionately high compared to the total area that plantations occupied within the fire perimeter. In fact, mortality in plantations accounted for 41 percent of all mortality on the fires, while the plantation area represented only 22 percent of the total area within the fire perimeter. Younger-age plantations were damaged more than the older plantations and the unmanaged forest (Figure 17: Stand Replacement Mortality in Managed (Regen) and Unmanaged Stands). In fact, 74 percent of plantations 20 years old or less experienced stand replacement mortality. By comparison, mortality was only 40 to 50 percent in stand 21 to 50 years old. (Page 19-20)*

- *Research in the moderate-severity fire regime of the mixed-evergreen forest of northern California showed a strong relationship of 1987 fire damage in plantations to fire damage levels in adjacent stands (Skinner and Weatherspoon, 1996). Data suggest that fuel treatments within dispersed locations alone may not reduce fire hazard. (Page 20)*

- *Fuel Model 5 best represents the early-seral vegetation including shrub communities and even-aged young plantations. As noted previously, these early-seral stands cover a greater portion of the landscape today than occurred historically. Crown fire spreads readily through these young stands: rates of fire spread can be high, and significant areas of mortality can occur in and adjacent to these stands. (page 25)*

When CAL FIRE reviewed this study, it was noticed that the plantations were classified under fuel (Anderson, 1982). Anderson described these fuels as follows:

> *"Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify: laurel, vine maple, alder, or even chaparral, manzanita, or chamise."*

An examination of representative photos included in the Morrison study showed conifer plantations with a continuous shrub understory. Fuel loading appeared to be high and there was no apparent break in either the vertical or horizontal continuity of fuels. Under these conditions, it is not surprising that young plantations suffered a high degree of mortality. It must be pointed out, in contrast, that plantations on private timberland in California receive a degree of post- harvest cultural treatments (either via mechanical, fire or herbicide treatment) that prevents the level of shrub and fine fuel buildup noted in the Morrison study. As a result of this important difference, CAL FIRE cannot draw a reasonable cause and effect conclusion between the conditions found in the Morrison report and the THP area.

- Southwest Oregon Biscuit Fire: An Analysis of Forest Resources and Fire Severity (Azuma, Donnegan, & Gedney, 2004)

  In this study of burn severity following the Biscuit Fire, the Forest Service found that the areas with the highest fire severity were most closely correlated with low site (i.e. Poor growing conditions - Site Class IV, V, and VI), and non- stocked areas (areas that are brush dominated). Table 11., from the report appendix shows that 74% of the non stocked (brush) areas burned with high and moderate severity while 100% of the stands classified as seedling/sapling (<5" DBH) burned with low severity. Results of another study in the same area (Thompson, Spies, & Ganio, 2007) on stands logged and planted after a 1987 fire indicated an increase in fire behavior and mortality in logged stands but noted that these stands had lower conifer densities and more brush than typical plantations. Other studies in the area (Raymond & Peterson, 2005) did not have a statistically valid sample of stands necessary upon which to validate the accuracy of fire behavior in stands they had previously harvested. From an examination of these studies, a direct causal link between plantations and increased fire danger could not be established.

  What was apparent from an examination of the literature was the difference between the plantations evaluated in those studies and those that are managed in California. For the most part, plantation density is managed below densities required to sustain independent crown fire (Peterson, et al., 2009). These stands are also managed during the early successional period to remove or restrict the growth of competing vegetation that can carry fire from the fine fuels into the crowns of the trees.

- Effects of Timber Harvest Following Wildfire in Western North America (Peterson, et al., 2009)

  > *The forest developing after wildfire or postfire logging may, over time, also constitute a fire hazard because trees can act as part of the understory fuelbed. As crowns emerge from the shrub layer, the low canopy base height creates torching potential (cf. Scott and Reinhardt 2003). If the stand is dense (e.g., 10-cm d.b.h. trees at a density of >1200 per ha), canopy bulk density may be high enough (>0.12 kg/m3) to carry independent crown fire under severe fire weather. Canopy base height will eventually increase, reducing torching potential. Fuel dynamics can also be affected by site productivity. For example, in the Olympic Mountains (Washington), fine fuel mass following fire at a productive site (Agee and Huff 1987) was higher than short-term fine fuel mass following fire on drier sites (table 2). In southwestern Oregon, sites burned with high-severity fire had lower fine fuel loads than unburned sites, but on the Olympic site, fuel mass in the first year postfire was twice that of unburned forest primarily owing to branch fall caused by a windstorm during the first postfire winter.*

The fire hazard mentioned in the Scott and Reinhardt study appears to be for plantations where competing vegetation has not been treated, thereby providing a ladder of fuels to carry fire into the crowns. When the hazard is reduced (If the competing vegetation was treated and not present) it stands to reason that the early hazard would be mitigated. The study also says that it would require approximately 485 trees per acre of higher density to carry independent crown fire, under severe fire weather conditions. Most plantations are planted at an initial density lower than this, with the new stocking standards allowing for as little as 125 trees per acre. As will be shown below, this results in a significant reduction in both vertical and horizontal continuity. Also, the number of days where severe fire weather would occur is low, relative to the number of days in a year, further lowering the risk.

- Fire-Silviculture Relationships in Sierra Forests (Weatherspoon, 1996)

Weatherspoon, studying the effects of fire damage on managed and unmanaged stands, noted that plantations were damaged at a higher rate than the unmanaged stands, but also noted the shift in management technique that the forest service had used in the recent past, which took the evaluated stands on a trajectory that differs significantly from those on private timberlands:

> ***"In recent years, however, concerns over air pollution from burning and adequate retention of soil cover and large woody debris have led managers to forego site preparation and plant through untreated slash on some units.*** *Depending on the site, clearcut units generally have been planted either with ponderosa pine (Pinus ponderosa Doug. ex Laws.) or Douglas-fir (Pseudotsuga menziesii [Mirb.] Franco) seedlings, or combinations of the two species.* ***Until the early 1980s, plantations routinely were sprayed with herbicides to release conifer seedlings from a wide variety of competing plant species. Since then, restrictions on use of herbicides have led to fewer plantations being released, and those mostly with hand tools. No recorded precommercial thinning was done in plantations affected by the 1987 fires."*** *[Emphasis added]*

In the study area, hazard reduction, site preparation, competing vegetation treatment and precommercial thinning (all common on private forestlands) were not applied. Further in his study, Weatherspoon noted that the increased damage to plantations was more due to the size of the trees and their position in relationship to fine fuels, the primary driver of fire behavior. What Weatherspoon identified as the single biggest indicator of fire danger, as noted above, was the method chosen for site preparation:

> *"****Site preparation method (as represented by dummy variables) was the only factor related to uniformity of damage, and it was highly significant. Untreated plantations burned quite uniformly (and severely), and differed markedly from treated units in terms of uniformity of damage.*** *Broadcast burned units*

> *showed the greatest tendency for fire damage to decrease from the edge of the unit inward-i.e., for the plantation apparently to retard the spread and intensity of the fire. They differed significantly from machine piled units, which tended more towards a spotty burn pattern.* ***No instances were observed in which fire damage increased from the edge of the plantation inward.*** *Further Quantification of results related to uniformity of damage probably is not warranted, given the subjective nature of this variable." [Emphasis Added]*

Also noted above was the observed decrease in damage to plantations the further the observation was made from the adjacent stand, suggesting that damage to the plantation was influenced by the fire behavior of the non-evenage stand. This could be because radiant heat damage from the adjacent stand created an increase in crown scorch near the edge of the plantation, but that as the fire moved into the fine fuels of the plantation, intensity and crown scorch decreased. As has been stated above, CAL FIRE could find no direct nexus between evenage management, in and of itself, and an increase in fire danger.

- Reburn severity in managed and unmanaged vegetation in a large wildfire (Thompson, Spies, & Ganio, 2007)

> *The Biscuit Fire tended to burn at relatively high severity in young naturally regenerated stands and even more severely in young conifer plantations of comparable age and fire history. This suggests that young forests, whether naturally or artificially regenerated, may be vulnerable to positive feedback cycles of high severity fire, creating more early-successional vegetation and delaying or precluding the return of historical mature-forest composition and structure.*
>
> *It should be noted, however, that many of the plantations examined in this analysis had lower conifer densities and a larger component of shrubs and hardwoods than would be found in typical intensively managed plantations of the same age (11–14 years).*

This is consistent with the findings of the Azuma, Donnegan, & Gedney, 2004 report where it disclosed a disproportionate number of low site acres in the fire area (IV and lower). It was these low site acres that burned the hottest, presumedly due to the presence of brush that created a continuous and receptive ladder to carry fire into the tree canopy.

> *Reducing connectivity of surface fuels at landscape scales is likely the only way to decrease the size and severity of reburns until vertical diversification and fire resistance is achieved*

The process of breaking up the horizontal and vertical continuity of fuel within plantations is achieved through the control of competing vegetation (e.g. brush) and controlling the density of trees in the plantation (through precommercial of commercial thinning).

- Severe fire weather and intensive forest management increase fire severity in a multi-ownership landscape (Zald & Dunn, 2018)

  As with other studies reviewed above, there are myriad differences between California and Oregon forestry practices that must be considered. The primary author of the study (Zald) was contacted on April 8, 2019 to inquire about applicability of this study to areas in California. The author was cautious about applying the study results outside of the geographic region and context of the study. The study itself provides numerous caveats that must also be considered when determining how applicable the results are to a particular area. For example, the plantations on the O&C lands mentioned in the study are typically managed on a 30-50 year harvest rotation. The harvest rotation ages in the study area are well below those found in California, by as much as half the minimum age for Site 1 timberland. Also, precommercial and commercial thinning is not a common practice in plantations in the Pacific Northwest. California plantations receive both pre-commercial and commercial thinning treatments in addition to other vegetation management treatments (e.g. site preparation, herbicide treatments) that appear to be lacking in the study area. These practices align with the authors descriptions of measures that would reduce fire severity and further differentiate the study area from California forests. For example, the author provides suggestions on measures that would reduce fire severity, one being, “increasing the age (and therefore size) of trees and promoting spatial heterogeneity of stands and fuels is a likely means to reducing fire severity, as are fuel reduction treatments in plantations.” When compared to the study area, California plantations are grown to an older age and receive fuel reduction treatments in the form of precommercial thinning and commercial thinning.

Visual Comparison of Plantation Density

The differences in management between Oregon and California (and between federal and private lands) cannot be understated. Most of the studies discussed above were from plantations on Federal lands, or on lands in Oregon that were managed much differently in California.

For example, the Shasta Cascade Timberlands LLC, demonstration of Maximum Sustained Production on file with CAL FIRE describes their plantation strategy:

> *The planting density varies by site but, in general, approximately 350 trees per acre (TPA) are planted on an 11-foot by 11 -foot spacing. This may vary slightly and the regimes used in our modeling exercise are given in Table 9. Our goal is to have 300 well established seedlings within two growing seasons 11 after planting. Where survival is expected to be difficult, even with carefully targeted seedlings, we may plant more trees initially. If there is insufficient survival, we will replant or interplant the area to achieve our goal. In the event that we have excessive in-growth, we will use pre-commercial thinning to reduce the stocking to a level which will allow us to carry the stand to either rotation or a commercial thin.*

• Table 9. Planted numbers of trees per acre and species distribution used in modeling future planted forests.

Regime	Tract	Elevation	Site Class	TPA	Species Mix
1	All Tracts	<3,000 ft	I and II	350	80%PP, 20%DF
2	All Tracts	<3,000 ft	III and IV	350	100%PP
3	All Tracts	>=3,000 ft	I and II	350	40%PP, 35%WF, 25%DF
4	All Tracts	>=3,000 ft	III and IV	350	50%PP, 25%WF, 25%DF
5	Miller Mountain	All	all	400	50%PP, 25%WF, 25%DF
6	Yreka	All	all	400	40%PP, 25%WF, 35%DF

This demonstration of MSP was approved before changes were made to the stocking standards for timberlands. At the time of the preparation of this document, planting to at least 300 trees per acre was common, with follow up precommercial thinning to reduce density over time. The new standard is to plant at least 125 trees per acre, and the THP states that this standard is to be used on the proposed evenage stands.

Below is a visual demonstration of the difference in plantation stocking between lands similar to what was described in (Zald & Dunn, 2018) and those that will be planted for this THP. The stands on the left are planted at 400 trees per acre and those on the right are planted at 125 trees per acre. The top picture is the stand at 30 years of age and the bottom is 10 years. Visually you can see the crowns on the left side of the screen are much closer, allowing fire to carry easier from tree to tree.

Figure 1. Top-down view of planting density (400 on the left and 125 on the right). Images on top are the stand at 30 years and the bottom is 10 years of age. Image generated using Visual Stand Designer (https://visualforester.com/)

If trees are planted at a lower density, and competing vegetation is controlled to the point where there is little to no horizontal or vertical continuity, the fire danger within the plantation is minimized until the point where the crowns are well above the surface fuels.

Figure 2. Side view of a 10 year old plantation with 400 trees per acre. Image generated using Visual Stand Designer (https://visualforester.com/)

Figure 3. Side view of a 30 year old plantation with 400 trees per acre. Image generated using Visual Stand Designer (https://visualforester.com/)

Figure 4. Side view of a 10 year old plantation with 125 trees per acre. Image generated using Visual Stand Designer (https://visualforester.com/)

Figure 5. Side view of 30 year old plantation with 125 trees per acre, Image generated using Visual Stand Designer (https://visualforester.com/)

Beyond the stand level one must look to the larger landscape in order to understand the context of individual stands. Concerns relative to fire danger typically do not fully appreciate the diversity of stand conditions that exist across the landscape. Variability in fuel loading, composition and moisture greatly impact fire behavior. It is important to remember that areas proposed for evenage management are small in size, from a landscape perspective (20-30 acres depending on yarding method). As a result, even if a particular stand has a higher fire danger than a surrounding one, the area upon which that stand could impact overall fire hazard is very low. Except for instances where a fire has reached a plume-dominated or wind-driven state, rapid changes in vegetation types have the ability to significantly alter fire behavior. For instance, a fire that is moving through the crowns of a mature timber stand can move into a ground fire, when it reaches a plantation where spacing and competing vegetation is managed (as occurs on private timberlands). The variability of vegetation types can alter and moderate fire behavior. What we see in recent catastrophic fires is the combination of extremely dry fuels, aligned with terrain and driven by winds.

Concerns of Dunsmuir and Mount Shasta as Another “Paradise”:

Several of the concerns mentioned the devastating fires that have occurred recently in California and express the same fears for Dunsmuir and Mount Shasta. The fear of losing homes or lives to wildfire is understandable and, as has been described above, is a prime concern of CAL FIRE.

When it comes to direct cause and effect investigations related to wildfire, there are few available. A scientific analysis of the Camp Fire progression was released earlier this year by the National Institute of Standards and Technology, a department of the US Department of Commerce (Maranghides, 2021). This study examined the fire progression in extreme detail and reached several conclusions on the causation of the fire intensity:

> *The Camp Fire ignited on November 8, 2018 in the foothills of the Sierra Nevada in Butte County, California. The first 24 hours were characterized by a fast-moving fire with initial spread driven by high winds up to 22 m/s (50 mi/h) and long-range spotting up to 6.3 km (3.9 mi) into the community. The fire quickly impacted the communities of Concow, Paradise, and Magalia. The Camp Fire became the most destructive and deadly fire in California history, with over 18 000 destroyed structures, 700 damaged structures, and 85 fatalities. After a preliminary reconnaissance, it was determined that abundant data was available to support an in-depth case study of this devastating wildland-urban interface (WUI) fire to increase our understanding of WUI fire spread, fire behavior, evacuation, and structure response. The methodology guiding the case study and a detailed timeline reconstruction of the fire progression and fire behavior are presented. Over 2200 observations about fire spread and behavior were collected during the case study. Subsequent reports will detail additional aspects of the incident including emergency response and evacuation, and defensive actions and structure response. This study has identified that Butte County and the Town of Paradise were well prepared to respond to a WUI fire, that the Camp Fire grew and spread rapidly and that multiple factors contributed to the rapid growth and spread of the Camp Fire. Additionally, this study identified the importance of the wildland fire ignition location relative to the community, that multiple parcel-level fire spread pathways caused structure ignitions, and that WUI fire spread impacted the affected communities in multiple ways beyond the destruction of residential and commercial properties.*

What were the primary causes of the extensive devastation?
There are many factors that may impact individual structure survivability and the effectiveness of defensive actions at a parcel level. When viewing the Camp Fire in its entirety, four factors were identified that most significantly influenced overall fire losses:
i. Fuel ignition potential,
ii. Density of vegetative and structural fuels,
iii. Wind and terrain, and
iv. Extent/size of fire front reaching the communities.

Fuel Ignition Potential
Fuel receptivity to embers and ignition potential was a result of over 200 days with almost no precipitation. Fuel moisture contents were at or near record low for the time of year. The presence of fine fuels, including but not limited to pine needles and ornamental vegetation stressed by limited precipitation, enabled a number of spot ignitions by embers traveling well ahead of the fire front. Fuel receptivity and ignition from embers was clearly conveyed in multiple first responder statements reporting "100 % ember ignitions." It was this fuel receptiveness that caused the large number of ignitions within the communities. In Paradise, these ignitions started approximately 30 min to 40 min before the arrival of the fire front and rapidly grew in number when the front reached the community.

Density of Vegetative and Structural Fuels
All three communities, Concow, Paradise, and Magalia, are intermix communities that have developed over decades among the local wildland vegetation. Concow can be considered low population density intermix with 10 people/km2 (26 p/mi2), while Paradise and Magalia can be classified as high-density intermix communities with 552 p/km2 and 312 p/km2 (1433 p/mi2 and 808 p/mi2) respectively.

The absence of fire within most of Paradise and Magalia for many decades had resulted in significant vegetative fuel accumulation. The vegetative fuel loading was further increased by diseased vegetation (specifically pines). Seasonal needle dropping, combined with diseased trees and further enhanced by high winds, resulted in extensive needle accumulation before and during the fire. The historic growth of Paradise and surrounding communities, going back over a century, resulted in many structures placed on smaller lots. The short structure separation distances, together with the vegetative fuel loading, enabled rapid structure-to-structure fire spread.

Fuel treatments have been used extensively to compartmentalize the landscape in the area around Paradise, Magalia, and Concow. The intent was to provide access for firefighting operations and reduce the total impact of wildfires by reducing the total acreage burned. Fuel treatments were used not only to influence wildland fire behavior but also to protect critical infrastructure such as the primary pumping station and treatment plant of the Paradise Irrigation District. Together with defensive actions, these specific fuel treatments met their objectives during the Camp Fire, and the critical infrastructure was undamaged. This specific fuel treatment example is included here to highlight the value of pre-fire preparation and vegetative fuel reduction in protecting critical infrastructure. The systematic analysis of the effectiveness of fuel treatments and their impact on fire behavior are beyond the scope of this report.

Wind and Terrain
The terrain of eastern Butte County is defined by the Sierra Nevada foothills and numerous deep river canyons and ravines.

The Feather River Canyon and Jarbo Gap, near the fire's origin, are known for their particularly high winds. Ridgetop gusts over 22 m/s (50 mi/h) are not uncommon, and the downslope north winds bring dry air through the foothills and the Town of Paradise.

The north wind event that occurred in the early morning on November 8 combined with receptive fuels, and the restricted access associated with topography contributed to the rapid growth of the fire, exceeding the ability for initial containment.

It is the confluence of these four factors (fuel ignition potential, high fuel density, wind and terrain, and extent of the fire front reaching the communities) that caused the aggressive fire behavior resulting in dangerous conditions for residents and first responders and in extensive damage and destruction.

Multiple Factors Contributed to the Rapid Growth and Spread of the Camp Fire

F5. Dry winds, with recorded gusts at Jarbo Gap exceeding 22 m/s (50 mi/h) from the northeast, increased fire spread in vegetative and structural fuels.
F6. Steep topographical features including river canyons and creek drainages channeled north winds and accelerated fire spread through vegetative fuels.
F7. Extremely dry vegetative fuels, associated with over 200 days without any significant precipitation, increased the fuel ignition potential around and within Concow, Paradise, and Magalia.
F8. Fire spread toward Paradise from Concow was fueled by heavy conifer forests with brush understory. At lower elevations oak woodlands and savannah grass were primary fuels.

5.2. Fuels Description
Fuels around the point of origin and downwind towards and within Paradise and Magalia consisted of heavy conifer timber with brush understory. At lower elevations, oak woodland and grass savannah were the primary fuels. The area near the fire origin had burned previously in 2008; however, fuels west of the West Branch of the Feather River, in Paradise and Magalia, had not burned in recorded history (see Section 5.4). Timber was characterized by close crown spacing with heavy manzanita and oak cover underneath.

Fuel moisture levels were uncharacteristically low for the time of year due to the protracted dry period and late arrival of rain beginning the wet season. Fuel moisture levels [34] for 1000-hour time lag fuels measured at the Pike County Lookout south east of the fire area were at 5 % on November 1, well below the 17 % average for the Northern Sierras in November. Live fuel moisture in manzanita was 74 %; the critical level, in terms of fire hazard, for manzanita is 80 %. The average for November is 93 % [TD-131].3

The Energy Release Component (ERC) output by the National Fire Danger Rating System (NFDRS), a measure related to the total fuel energy availability per unit area (J/m2, Btu/ft2), which increases as fuels cure/dry, trended slightly above average for the northern Sierras during the summer, but in early October it began trending well above average. On the day of the fire the ERC calculated amongst a grouping of nearby fire weather stations was 80, above the historic record for the date (60) and above the 90th percentile for all dates in the previous 10 years (80). ERC values are presented in ***Figure 4****, developed by Aviva Braun from the National Weather Service. A slideshow by Ms. Braun on the weather conditions during the Camp Fire is presented in Appendix D [35].*

5.3. Weather
Weather before and during the Camp Fire, as for many rapidly spreading fires, was characterized by dry and windy conditions. In California, the windy conditions are often brought by downslope north wind events, bringing warm, dry air through fire prone regions. Jarbo Gap is known for locally high winds, particularly during north wind events which align with the Feather River Canyon. The Big Bend of the Feather River channels and forces winds up and over the ridge at Jarbo Gap. While dry or windy conditions are not unusual in Butte County, the overlap of late season dryness with a north wind event was relatively uncommon. Wetting rains typically begin in September before the frequency of north wind events increases in November and December [TD-003, TD-131].

It was very unusual to have fuel dryness levels so low in November in Butte County. In most years significant rain would have fallen by November, dampening fine fuels and lowering the ignition hazard. However, with the exception of a small amount of rain in early October leading up to the Camp Fire, it had been over 200 days since 13 mm (0.5 in) or more of rain had fallen at the lower elevations of Butte County. The U.S. Drought Monitor [38] reported much of Butte County in the "D0 Abnormally Dry" condition for the 19 weeks leading up to the fire, between June 26 and November 6, moving into "D1 Moderate Drought" on November 13Figure 6 [39].

Gusty winds were measured at the Jarbo Gap Remote Automated Weather Station (RAWS) [37] starting around 19:00 on November 7, becoming very strong by 21:00. Sustained winds of 12 m/s (27 mi/h) continued overnight with gusts over 22 m/s (50 mi/h). At the time of ignition on November 8, the RAWS station reported 8 m/s (18 mi/h) winds gusting to 18 m/s (40 mi/h) with relative humidity of 23 %. Wind direction across the foothills and ridgetops was almost exclusively from the northeast, driving the fire toward Concow and Paradise. Wind gusts during the day on November 8 were around 13 m/s (30 mi/h) with sustained winds of 5 m/s to 9 m/s (12 mi/h to 20 mi/h) from the northeast. Relative humidity dropped to 10 % during the day.

While selective fuel treatments were conducted in and around both communities (see Section 13.2), the lack of fire history throughout Paradise and Magalia was directly connected to the vegetative fuel loading in both communities.

9.4. Impact of Winds, Wildland Fuels, and Terrain on Fire Behavior
Section 5.3 in this report presents an overview of the weather during the Camp Fire. Local observations and video documentation provided additional resolution and information on how the wind affected local fire behavior. Firsthand observations on Rim

Road at 07:20 on November 8 talked of "softball size rocks hitting the engine" [TD-005]. These reports were consistent with the short video from the TD and likely indicated local winds in the range of 22 m/s to 27 m/s (50 mi/h to 60 mi/h). These values agree with the forecasted ridgetop winds.

Figure 25. Strong wind gusts blew dirt and rocks whipping across the ridgetop at Rim Road.

Terrain also directly impacted fire behavior, resulting in dramatic fire behavior as observed around 18:00 on November 8, with flame lengths of 30 m to 60 m (100 ft to 200 ft) breaking out of the Butte Creek Canyon into Wilder Drive [TD-117]. Similar effects of topography, compounded with high fuel loading and possible alignment with local winds, resulted in significant fire activity in other areas within the fire perimeter, including the drainages to the north of Nelson Bar Road where flame lengths of 15 m to 30 m (50 ft to 100 ft) were reported.

The terrain also impacted fire spread indirectly by restricting or slowing down access by first responders. An example is provided here to illustrate the impact of topography on access. A straight line from Rim Road (39° 47' 34.89" N, 121° 28' 24.00" W) to the intersection of Pentz Road and Skyway is 9.3 km (5.75 mi); however, it takes 40 km (25 mi) and 43 minutes of drive time to get there. The fire is thus able to travel much faster than ground suppression forces. Further information on incident response and defensive actions will be presented in NIST Camp Fire Report #5.

The extensive spotting, caused by ember transport and the low ignition threshold of abundant dry vegetative fuels, such as pine needles, discussed below, resulted in multiple ignitions of vegetation and structures that quickly spread and overwhelmed the available firefighting resources. The spot fires then grew and "backfilled," causing severe local fire exposures in many cases. These high intensity exposures might have then generated strong local winds and blackout conditions downwind.

Needle drop associated with drought-stressed vegetation, time of year, and disease resulted in piles of needles throughout town, even though the Town of Paradise had just swept the streets. The same buildup also occurred on properties and roofs that had been recently cleaned. This further accentuated the hazard on properties that might not have been recently maintained.

The extreme fire weather observed during the first day of the Camp Fire played a significant part in the devastation that followed. As described above, sustained winds of 27 MPH with gusts to 60 MPH in the area of the fire created the most extreme of results. By comparison, the Mt. Shasta Remote Automated Weather Station for the same day showed average winds of 2 MPH with gusts to 7 MPH.

It is abundantly clear from reading the report that the factors influencing the devastation caused by the Camp Fire are numerous and complex. Attempting to tie the impacts of the Camp Fire to forest management are not supported by the record and are entirely speculative.

As to the comparison between Paradise and Dunsmuir/Mt. Shasta, it is too speculative to say what would happen if a fire occurred in the plan area. The Forest Practice Rules prescribe hazard reduction measures, as described above, and they are intended to reduce the potential for fire starts, and to reduce excess fuel loads generated by Timber Operations. Additionally, the silvicultural prescriptions used in this plan will result in lower tree densities on the landscape, and less vertical continuity between the surface fuels and the tree canopies. No hazard can be reduced to zero, but the combination of the proposed actions within the plan (both silviculture and road maintenance/construction) along with required hazard reduction activities and planning have allowed CAL FIRE to conclude that the plan will not result in a significant adverse effect on Wildfire Risk and Hazard.

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 BOF, 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 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 forest. 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 decline 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.*

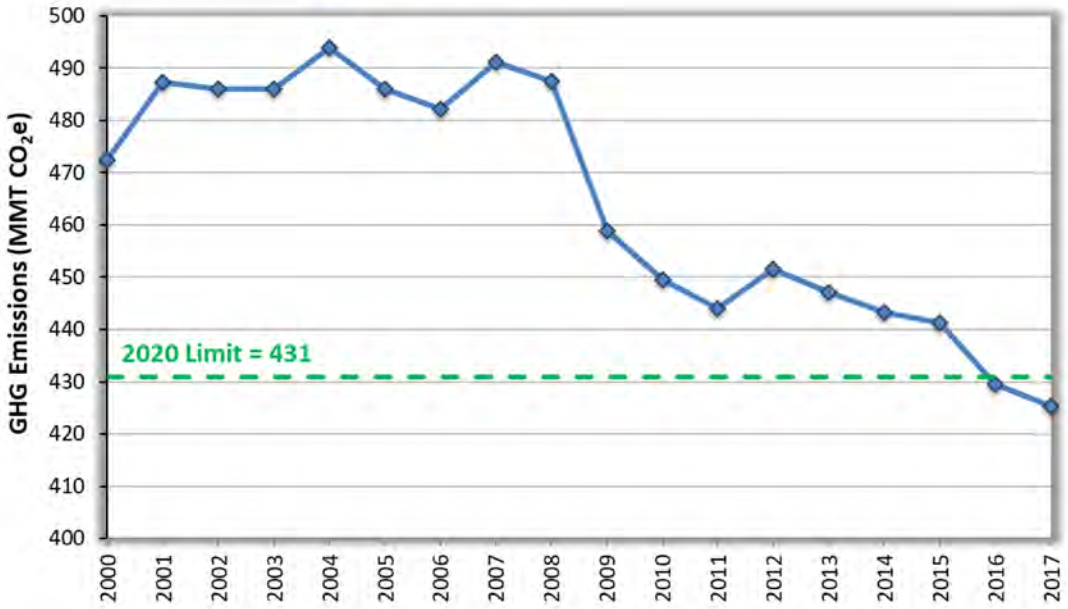

Figure 1. California GHG Emissions Trends. This figure shows the emission trends between 2000 and 2017 as compared to the 2020 statewide GHG limit of 431 $MMTCO_2e$.

- *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 136-143. These calculations are provided by silvicultural category including road construction and predict both emissions from logging and milling operations as well as future sequestration of carbon from the remaining and planted forests.

These calculations estimate that the THP is capable of releasing a total of 787 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 planted in the THP area within 7-24 years. Over the next 120 years, these stands are expected to sequester a total of 114,287 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.

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)[2]. These duties

[2] 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

are further refined in the Z'berg-Nejedly Forest Practice Act (PRC §4512(c)[3]) and PRC §4513(b)[4] 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 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 (i.e. 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[5]" 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:

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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.

[3] (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.

[4] (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.

[5] *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.*

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 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 or resulting 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.

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.

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[6]" and would be open to legal challenge.

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.

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

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.

#1

CalFire

I ask that the Timber Harvest Plans (THPs) in the Redding area include selection logging and not clearcutting. Uneven-aged management will reduce the potential fire hazard. This would help to ensure that the remaining forest retains a diversified forest structure with older, fire-resistant trees that keep it less vulnerable to wildfire than clearcutting would.

Please deny Hedge and East Soda THPs.

Reviewed by:
Dist. by:
Dist. Date:

Response #1:
As described above in the General Discussion, the RPF is permitted to choose any legal silvicultural method, and CAL FIRE is limited in its evaluation to whether or not the proposal is consistent with the applicable Rules and Regulations.

The concerns related to fire hazard are extensively discussed in the General Discussion above. CAL FIRE has concluded that the plan as approved will not result in a significant adverse effect on Wildfire Risk and Hazard. As to the scientific literature on fire hazard presented in the letters, CAL FIRE has reviewed those and other relevant studies to discuss the differences and similarities between that research and the area of proposed operations. CAL FIRE believes that the plan as proposed, along with the required hazard reduction regulations, will not result in an increased fire risk.

The concerns related to the use of Commercial Thinning silviculture were also reviewed. The main purpose of the Commercial Thin prescription is to thin the trees from a stand and leave a forest that has, on average, larger trees left than the original stand:

> *14 CCR §933.3 Intermediate Treatments*
> *(a) Commercial thinning. Commercial thinning is the removal of trees in a young-growth stand to maintain or increase average stand diameter of the residual crop trees, promote timber growth, and/or improve forest health. The residual stand shall consist primarily of healthy and vigorous dominant and codominant trees from the preharvest stand.*

Page 11 of the plan details the trees that are to be retained within these stands, based upon site productivity:

> *For areas of the stand where the preharvest dominant & codominant trees are greater than 14 in. dbh the following stocking by site class shall be left;*
> *2. Site II lands - Minimum of 100 sq. ft. of basal area shall be left.*
> *3. Site III lands - Minimum of 75 sq. ft. of basal area shall be left.*

A sample of a commercial thinning stand can be seen in the example below:

Figure 6. Example of a Commercial Thinning prescription. Source www.visualforester.com

The General Discussion above includes an extensive discussion on the evaluation of Greenhouse Gas release and sequestration. CAL FIRE has reviewed extensive literature related to this topic and notes that the knowledge of the processes involved in climate mitigation are constantly evolving. There are many different opinions even within the scientific community as to how emissions and sequestrations are to be accounted for. CAL FIRE has determined that the Plan Submitter has done an adequate job in assessing how the proposed plan will impact Greenhouse Gas production.

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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Appendices

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Appendix A

21PC-00000507 #1

Japp, Jeannie@CALFIRE

From: Jean King <whjaking@comcast.net>
Sent: Monday, August 2, 2021 1:32 PM
To: Review Team Redding Inbox@CALFIRE
Subject: Hedge and East Soda THPs

2-21-00086 SIS

#1

CalFire

I ask that the Timber Harvest Plans (THPs) in the Redding area include selection logging and not clearcutting. Uneven-aged management will reduce the potential fire hazard. This would help to ensure that the remaining forest retains a diversified forest structure with older, fire-resistant trees that keep it less vulnerable to wildfire than clearcutting would.

Please deny Hedge and East Soda THPs.

Thankyou.

Jean King
4205 Colgate Way
Livermore CA
94550

#2

Japp, Jeannie@CALFIRE 21PC:00000517

From: Wendy Krupnick <wlk@sonic.net>
Sent: Monday, August 2, 2021 9:11 PM
To: Review Team Redding Inbox@CALFIRE
Subject: Hedge & East Soda THPs

2-21-00086 SIS

Reviewed by: JJ 8-9-21
Dist. by:
Dist. Date:
RU ___ PS
FG ___ TO
WQ ___ TLO
ARCH LTO
RPF DMG
INSP BOE
OTHER:
FPS
Status: LO

SKU

FELLER

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

To: CalFire

From: Wendy Krupnick, Santa Rosa, CA

#1 As a native Californian, farmer and educator, I'm writing to request your denial of the Hedge (2-21-00054-SIS), and Soda Timber Harvest Plans.

It is extremely upsetting and frustrating that in spite of an abundance of scientific evidence and common sense, timber plans such as these, which are essentially clear-cuts, have continued to be approved.

The proposed logging is too close to the towns of Dunsmuir and Mt. Shasta City and it would increase wildfire risk for these already vulnerable communities. Clearing of the acreage will result in higher temperatures in the logged microclimate as well as adjacent forest resulting in a dryer understory that is more at risk . It will also eliminate the windbreak in the microclimate of the logged area and wind-driven fires are clearly the most destructive. The young plantation trees planted after the logging will be flammable and, if ignited, will burn faster and hotter than the old-growth trees that they replace.

In addition, the planned logging will disrupt habitats and further exacerbate our climate crisis by removing older, carbon-sequestering trees. Add to this, the aesthetics of an ugly clearcut and resulting plantations which have the potential to cause local tourist economies to suffer.

For these reasons I am requesting that CalFire review the Hedge Timber Harvest Plan and adjust it to require strictly selective logging, whereby at least a 60% tree canopy be maintained.

It is time we end the practice of clearcutting in California altogether and it is time for CalFire to reevaluate its role as the stewards of our state and private forests, beginning with stopping harmful timber harvest plans such as Hedge.

Please notify me of any revisions to the plan. California residents demand and deserve better environmental protection.

RECEIVED
AUG 0 3 2021
REDDING
FOREST PRACTICE

21PC: 00000518 #3

Japp, Jeannie@CALFIRE

Reviewed by: 140
Dist. by: CJ
Dist. Date: 8-4-21
RU PS
FG TO
WQ TLO
ARCH LTO
RPF DMG
INSP BOE
OTHER:
FPS
Status: ca

SKU

FELLER

From:	stormdragon71@netscape.net
Sent:	Tuesday, August 3, 2021 6:12 PM
To:	Review Team Redding Inbox@CALFIRE
Subject:	Hedge and East Soda Timber Harvest Plans

2-21-000865 SIS

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

#1 Dear CalFire leaders,

I am writing to express my concerns about the proposed Hedge and East Soda Timber Harvest Plans. Specifically, I am concerned that the logging practices under consideration for these sites will prove detrimental to the health of the forest, and could actually leave the communities of Dunsmuir and Mount Shasta more vulnerable to wildfire.

Clear-cut logging and plantation-style replanting might seem expeditious and economically profitable in the short term, but there is a growing body of evidence that over time, forests managed in this way are more susceptible to the impacts of pests, diseases-and fire. A better practice would be to log selectively, leaving a forest with trees of different ages and species. Such a forest is likely to be healthier and more fire-resistant in the long term than one where the trees are largely the same age and species. It should be noted, also, that clear-cuts are likely to increase the risk of flooding and landslides during the rainy season.

With all this in mind, I respectfully urge you to withhold your approval from Timber Harvest Plans that call for large-scale clearcutting, and to give your blessing to selective logging practices that enhance the health and diversity of the forest. I urge you, also, to consult with residents of the area, and listen to their concerns. The communities of Dunsmuir and Mount Shasta have a special place in my heart, and I do not wish to see them come to harm because of short-sighted forest management practices. Please support plans that protect the well-being of forests and communities.

Thank you very much for considering my comments.

Sincerely,

Rachael Denny,
2318 Lakeview Drive
Bradley, California
93426
stormdragon71@netscape.net

RECEIVED
AUG 04 2021
REDDING
FOREST PRACTICE

21PC-00000573 #4

Japp, Jeannie@CALFIRE

From:	Perry Metzger <pmetzger2005@yahoo.com>
Sent:	Wednesday, September 15, 2021 9:52 PM
To:	Redding Public Comment@CALFIRE
Cc:	lucchesij8@gmail.com; matthewbryan.ch@gmail.com; arthpeterjr45@gmail.com; brucend75@yahoo.com; bigdave.keisler@yahoo.com
Subject:	Public Comments, Wildfire Risk and Hazard, 2-21-0086-SIS, East Soda THP

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

RECEIVED
SEP 16 2021
REDDING
FOREST PRACTICE

Reviewed by: AD
Dist. by: CJ
Dist. Date: 9-16-21
RD ___ PS
FG ___ TO
WQ ___ TLO
ARCH LTO
RPF DMG
NSP BOE
OTHER: ___
FPS ___
Status: LOC

SKU

Teller

CAL FIRE Review Team
Forest Practice Program Manager
CAL FIRE
6105 Airport Road
Redding, California 96002

Dear Program Manager,

The following comments concern the **Cumulative Effects, Section H, Wildfire Risk and Hazard** regarding the 2-21-00086-SIS, East Soda Timber Harvest Plan (THP).

East Soda THP consists of a 526-acre timber harvest which includes 225 acres of clearcuts and 276 acres of commercial thinning. The post-harvest stocking for clearcut lands consist of and even-aged management with a 125-point count within 5-year post-harvest. The harvest area is located approximately three miles east of Dunsmuir and is in a very high fire hazard severity zone.

#1

A number of recent forest fire studies have shown clearcut harvesting and subsequent even-aged tree plantations lead directly to increase in the intensity and spread of wildfire. Accordingly, we need to protect the "over-story" tree canopy that moderates the "microclimate" of the forest floor. Reduction of the tree canopy which occurs in a clearcut and can occur to a lesser degree in commercial thinning exposes the forest floor to increased sun and wind, causing increased surface temperatures and decreased relative humidity. The temperature increase in turn causes surface fuels to be hotter and drier, resulting in faster rates of fire spread, greater flame lengths and fire line intensities, and more erratic shifts in the speed and direction of fires.

The Western Fire Ecology Center states that small-diameter surface fuels (such as even-aged plantations younger than ten years) are the primary carriers of fire. Current fire spread models do not even consider fuels greater than three inches in diameter because it is mainly the fine-sized surface fuels that allows fire spread. Commercial logging operations remove large-diameter fuels which are naturally fire resistant, and replaces them with even-aged plantations with fire-prone small-diameter fuels. Timber plantations are usually comprised of densely-stocked, even-aged stands of young conifers that are extremely flammable and vulnerable to catastrophic fire

effects. Consideration should be given to using Selective Harvest rather than Clearcuts because of the fire risks associated with those younger even-age tree plantations.

Further concerning is the 276 acres of proposed commercial thinning. If not thinned correctly, a thinned forest can burn at higher intensely in wildland fires (Susan J. Prichard et al., "Fuel Treatment Effectiveness in the Context of Landform, Vegetation, and Large Wind-Driven Wildfires," *Ecological Applications* 30 (July 2020): Article e02104). This is because thinning reduces the windbreak effect of denser forests, allowing winds to sweep through more rapidly, while also reducing the shade of the forest canopy and creating hotter and drier conditions (Miguel G. Cruz, Martin E. Alexander, and Jelmer E. Dam, "Using Modeled Surface and Crown Fire Behavior Characteristics to Evaluate Fuel Treatment Effectiveness (2014)). They found that the impact of commercial thinning on wind speed increases fire intensity in 57 percent of the scenarios. Scientific studies have shown that the most fire-resistant trees are the older, mature trees that provide maximum canopy cover. Accordingly, wording needs to be added to protect these larger mature trees (greater than 18 inches in diameter) in the thinning process.

Satellite mapping of this last month's Caldor Fire show that even with extensive fuel reduction in the burned areas over the last several years, it had minimal effect on slowing the growth and intensity of the fire. In fact, the younger tree plantations may have contributed to the growth of the fire.

In a recent article in the San Francisco Chronicle, it stated "In the wilderness, fire crews couldn't combat the fast-moving flames head-on, instead going in after the fire front moved through to try to save homes and cabins". It is probably time that we starting using our money to home harden communities rather than trying to control wildfires during extreme drought conditions.

Perry Metzger
3001 Tanya Court
Sacramento, California 95826

Copies furnished:
Dunsmuir City Council