9 January, 2018

Board of Forestry and Fire Protection
ATTN: Edith Hannigan, Board Analyst
VTP Draft PEIR Comments
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I have reviewed much of the new VTP PEIR and am submitting comments in my capacity as a fire scientist and published author on numerous scientific studies and reviews pertaining to fire regimes, management and ecology in California.

I reviewed and commented previous versions of the VTP PEIR and am broadly familiar with its evolution over the past several years.

As with the 2013 and 2016 versions, this latest draft suffers from poor scientific documentation. In many cases citations don't support (and sometimes contradict) the statement to which they are attached. These issues render the citation invalid and casts doubt on the scientific credibility of the document. Some of these errors are documented in the attached notes. The review is not an exhaustive list of the documentation issues in the VTP PEIR but illustrates the type of shortcomings.

Other parts of the document state assumptions without any apparent effort to scientifically support them. One of the most problematic issues, from my point of view as a fire scientist, is the dogged and oft repeated assumption than treatment of wildland vegetation will always have a beneficial (reducing) affect on fire size. The document either does not cite any studies, or cites studies with limited applicability, to support this claim. Vegetation treatments can be effective in reducing fire size if 1) it is a fuel and topography (not wind) driven fire, 2) the fire intersects the treated area, and 3) suppression crews have safe access (although fires will stop on their on at fuel breaks this is uncommon) (Syphard et al, 2011).

There are a number of studies conducted in areas of California where large, very expensive fires (in terms of both suppression and asset loss) occur periodically which directly contradict the assumption that fuel treatments universally decrease fire size (e.g., Moritz 1997; Moritz et al. 2004; Keeley and Zedler 2009 and citations therein).

Fuel treatments can also have a negative impact, such as an increase on fire spread rate and fire size when fuel-bed ignitability is altered. This is potentially most critical when fires are wind-driven and rate of spread is determined by firebrands igniting receptive fuel beds far ahead of the fire front. Altering the landscape fuels in a manner that leads to a mosaic of highly flammable flash fuels (e.g. grass and herbaceous species) may increase rate of spread and endanger resources adjacent to these fuels. A configuration of intermixed fuels allows “leapfrogging” of ignitions in patches of flashy fuels which then ignite adjacent heavier fuels creating a shotgun-scatter of fire fronts that out-strips suppression resources, often within the first minutes to hours of a fire.

California has two types of fires: the ones we plan for (fuel and topography driven) and the ones that actually do the vast majority of the damage (wind and firebrand driven). As the largest and most costly fires are wind driven, the affect of fuel manipulation needs to be addressed within the wind-driven fire scenario when justifying of the VTP. It is not. Firebrands are mentioned but the potential of their interaction with treated fuel breaks under wind driven fires is not acknowledged much less addressed and weighed in the design of the plan. This impact of fuel treatments must be addressed if CalFire's goal is to reduce losses from fire rather than just increasing acres treated.

Also of concern is there assertion that fire/fuel management can be used everywhere for restoration purposes. This has only been shown convincingly for coniferous forests where fire exclusion has been effective. Fire exclusion has not been effective in at lower elevations in California. In fact, fire frequency has increased in most shrubland systems that many fire-adapted species face extirpation from too frequent of fires. Coastal sage scrub and desert shrublands are not adapted to large-scale disturbances, fire or otherwise, and are subject to invasions by non-natives following these events.

The vegetation that is the most hazardous and largely responsible for structure loss is that within 100 feet of the house. The majority of the time, this means ornamental vegetation and the debris, which is not addressed in this plan. Southern California was flammable long before urban development but since then we have increased the flammability by planting the most fire prone vegetation from around the world in our neighborhoods. By planting fire-prone species from other Mediterranean regions we magnify our risk. Common fire prone species used as ornamental plants in California include eucalyptus and acacia from Australia, rosemary, Aleppo pine and Canary Island pine from the Mediterranean of Europe, and fountain grass and ice plant from Africa. Frequently these species also acquire large biomass due to irrigation, which results in our urban areas with much greater hazardous fuel loads than the adjacent wildlands.

The VTP also fails to adequately address an important factor in mitigating large fires, which is limiting initial ignition. The majority of fires at lower elevations in California are anthropomorphic in origin and a significant number are ignited accidentally along roadways by car fires, catalytic converter failure, discarding of burning material from vehicles, etc. CalFire misses an opportunity to prevent large fires from starting by not considering the potential in this area. Isolating flammable vegetation from road shoulders either by actual manipulation of vegetation in this area or the construction of barriers such as sound walls could have a significant impact. While the latter is initially expensive it is a more permanent solution, causes fewer environmental impacts (and potentially some benefits) and requires lower future maintenance.

There is a large and growing body of literature addressing issues of firebrands and fuel beds that CalFire needs to review and discuss if the VTP PEIR is going to be considered based on current science. I list a number of studies and documents below that would offer an initial introduction to this area of research.

The authors of the VTP PEIR continue to conflate the terms fire intensity, fire severity and burn severity and they fail to include any definition for these terms in the glossary. This has been problematic and has been addressed in the literature (Keeley, 2009; Jain et al., 2004). Hazard and risk are also not defined and are used interchangeably in varying contexts.

California suppression crews and managers are some of the best in the world and frequently put their lives on the line to protect others. CalFire should respect these heroes by producing a scientifically supported plan that will ease their burden and make their work safer.

Please see detailed comments that follow.

Sincerely,

CJ Fotheringham, BA, Msc, PhD

Comments on review of 2017 version of Draft Program Environmental Impact Report for the Vegetation Treatment Program

Black Italicized are quotes from the VTP PEIR or other sources where indicated. Blue text comprises my comments.

P.1-16

The current VMP reduces the potential for large wildfires and enhances natural resources by treating the following vegetation types primarily on SRA lands where CAL FIRE is responsible for fire protection:

- *Coastal scrub habitat south of San Luis Obispo County*
- *Montane hardwood-conifer habitat north of Monterey County*
- *Mixed chaparral, montane chaparral, chamise-redshank, and valley foothill hardwood habitats throughout their range.*
- *Annual and perennial grasslands intermixed with the above vegetation types*
- *With additional CEQA review, mixed conifer forests and other timber types, such as those found in the Coast Range, Sierra Nevada, and Cascade mountains*

There is no support for the above claim that vegetation treatment in all these vegetation types will reduce potential for large fires and enhance resources.

P.2-2

The VTP must characterize the biodiversity of California in such a way that provides a tractable framework for environmental analysis at the statewide scale. To do so, the Program groups the state's vegetation communities into three major formations: tree-dominated, grass-dominated, and shrub-dominated. These major vegetation formations generally exhibit similar fire behavior and provide a basis for stratifying the state for programmatic assessment (Rothermel, 1983; Scott & Burgan, 2005; Anderson, 1982).

No, these formations don't behave similarly ecologically or in regards to fire regime. These citations document refer to fuel models which treat these systems very differently.

P.2-3

The VTP also stratifies treatments into three basic program treatment types that are defined in Section 2.2.2.2: wildland-urban interface (WUI), fuel breaks, and ecological restoration The treatment type would be selected based on the values at risk, surrounding fuel conditions, strategic necessity for fire suppression activities, and departure from natural fire regime.

As with vegetation formation statement above, the document fails specify where and when any of these treatments are effective (with the notable exception of high elevation coniferous systems). In some environments fuel treatments can lead to long term ecological degradation and habitat loss. Also not addressed are the impacts fuel treatments to fire suppression and spread on other than moderate weather conditions.Neither fuelbreaks nor ecological restoration are supported in this documents with the exception of some coniferous forests.

P.2-5

The primary assumption of the VTP is that appropriate vegetation treatments can affect wildland fire behavior through the manipulation of wildland fuels. Since human activity cannot influence weather or topography, reducing the continuity of wildland fuels would result in lower fuel hazard and more favorable fire behavior.

This fundamental assumption is not supported by any citations. In absence of some meaningful scientific support for these assumptions, the remainder of the document is meaningless.

Ten of the most destructive fires in California have occurred since 2010 (see Figure 2.2-2); through the strategic placement of WUI, fuel break, or ecological restoration treatments, subsequent activities implemented under the VTP will help to reduce losses to life, property, and natural resources.

As there were only four such fires since 2010, what is probably meant is since 2000.

Most, if not all, of the fires on this list were wind-driven, which are not controllable by pre-fire fuel manipulations. In fact, fuel breaks may exacerbate the problem by increasing rate of spread via increased ember ignition in flash fuels that populate fuel breaks after the first growing season post-treatment.

P. 2-6

Focusing vegetation treatments in the WUI is critical, because losses in the WUI are on the rise (Stephens et al., 2009) and are expected to get worse (Mann et al., 2014). This objective only relates to vegetation treatments within the WUI; influences or changes to local land use planning associated with the WUI is outside the scope of this VTP, but is part of a larger strategy being implemented by CAL FIRE and the Board (Board, 2010).

If hazardous, ornamental vegetation should also be addressed (acacia, pine, eucalyptus, etc.).

P.2-7

Strategically placed vegetation treatments can offer a more effective means of perimeter control.

The VTP PEIR does not provide scientific support for this statement. Such treatments,certainly don’t help, and in the wind driven fires that do the most damage, may exacerbate problems.

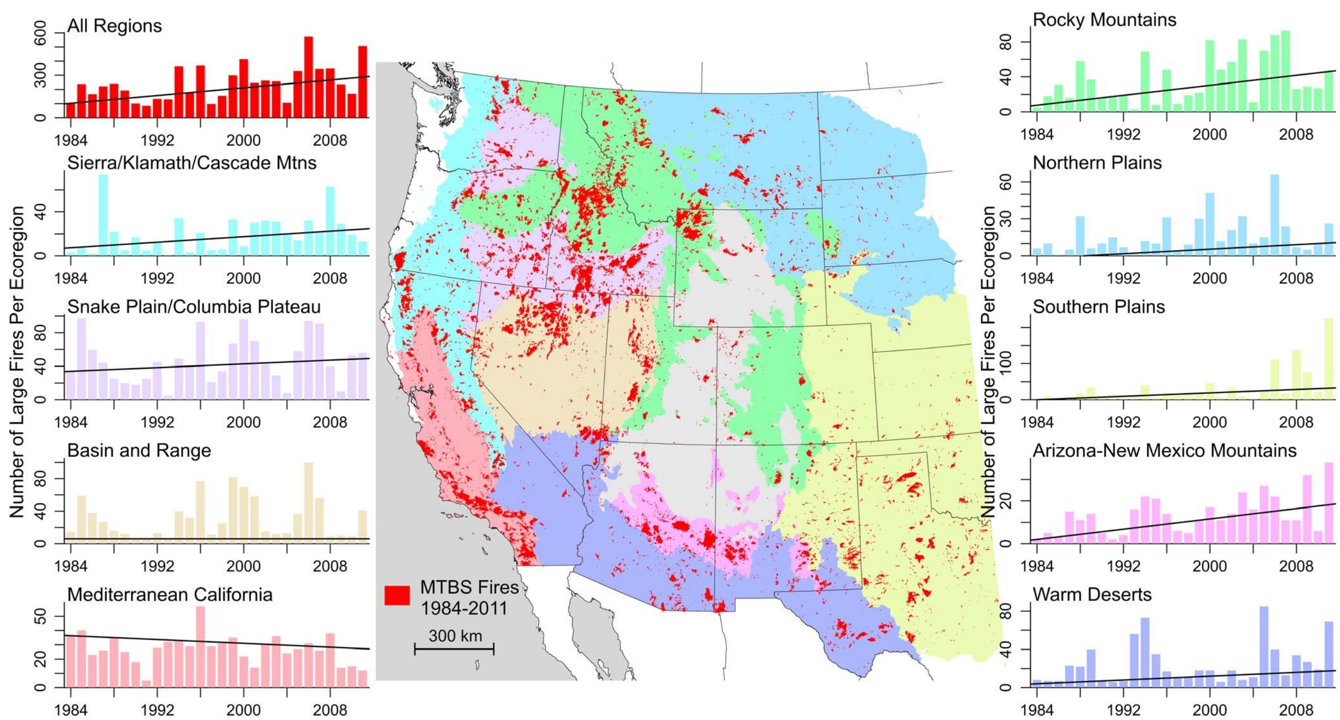
P.2-7 (cont.)

For example, 13 of the 20 largest fires in California have occurred since 2000 (see Figure 2.2-5).

When compared with fig 2.2-2, this is a good illustration that fires size does not track with fire loss.

Trend data is showing that large fires are increasing at a rate of seven fires per year with total fire area increasing approximately 87,000 acres per year (Dennison et al., 2014). ,

This is not supported by med. ca., which in most of the state shows a slight downward trend. Furthermore, the Dennision paper is for a study area far beyond California, and therefore the statement is misleading. We don't know how much of the increase was in California. There are better papers to cite, *e.g.* Keeley et al 2003, looking closely at fire differences in southern California counties.



There is strong scientific agreement that the use of fuel treatments helps to reduce the impact and damage from wildfires (Reinhardt et al., 2008; Safford et al., 2009; Schoennagel and Nelson, 2011).

(*Reinhardt et al., 2008)*

To the contrary, what Reignhardt, et al., actually say is:

> "*....destruction in the WUI is primarily a result of the flammability of the residential areas themselves, rather than the flammability of the adjacent wildlands. It may not be necessary or effective to treat fuels in adjacent areas in order to suppress fires before they reach homes; rather, it is the treatment of the fuels immediately proximate to the residences, and the degree to which the residential structures themselves can ignite that determine if the residences are*

vulnerable."

(Safford et al., 2009)

Yes, but Safford was specifically referring to coniferous forests, not shrublands, woodlands, grasslands, *etc.*.

P.2-7 (cont.)

(Schoennagel and Nelson, 2011)

Again, this reference is specific to coniferous forests and emphasizes that fire for restoration purposes should be limited to high-need conifer forests.

This objective seeks to reduce the size of fires through the use of appropriate vegetation treatments. The assumption is that decreasing fire size will have a resulting decrease on overall fire suppression costs (Figure 2.2-6).

This assumption is not supported. Where the fire occurs is more important than the size. See figure 2.2-2 vs figure 2.2-5, and consider the Tunnel fire, relatively small but the most costly. Figure 2.2-6 shows that larger fires cost less (per acre) than smaller fires.

P.2-9

Individual vegetation treatments within larger fires may be beneficial if the collection and pattern of treatment areas has been developed using landscape level strategies.

(*Finney, 2005)*

This study is in Arizona Ponderosa pine, and it is not clear what, if any, communities in California these findings would apply to.

Benefits from subsequent activities can be realized in the initial attack phase when ignitions and projects intersect and fires can be controlled at smaller sizes. As fires escape initial attack they grow more complex, with many factors contributing to the costs of fire suppression and damage.

There is no support indicating that fuels are always the determining factor in fire early containment or small size; more likely determinants are weather conditions and response time. As such, this reasoning does not support fuel treatments.

P.2-10

Species composition within these forests is also rapidly changing. Plant and animal species that require open conditions or highly patchy edge ecotones are declining and streams are drying as evapotranspiration increases due to increased stocking.

Absent specific citations, the statement is not supported, and is too broad to be accurate.

Additionally, unnaturally severe wildfires have destroyed vast areas of forest, subjecting *streams to sedimentation following high severity fires (Bonnicksen, 2003).*

This is a vague reference, not widely available. It refers only to forests, and is not supported in the scientific literature.

P.2-10 (cont.)

Invasive plants may change fire behavior and fire regimes, often by increasing fuel bed flammability, which increases fire frequency. These changes may also impact habitat loss and small mammal populations. Cheatgrass serves as a classic example of an exotic which has significantly altered the fire ecology in the Western United States and Canada; it is a winter annual which grows rapidly during late winter and early spring and provides a continuous fuel bed of light flashy fuel once cured in early summer.

This is documented in the scientific literature and should be cited here. This is also a good argument for why fuel treatments should not be done, especially at lower elevations. Flash fuels may increase the rate of spread and facilitate fire into areas that might not have burned otherwise. Fuel breaks may have contributed to trend of increased of fire size in recent years.

P.2-11

The restoration of native, fire-adapted plant communities is a critical need across portions of the western United States (Agee and Skinner, 2005). In California, fuel treatments have been shown to reduce fire severity (Skinner et al., 2004; Stephens et al., 2009), although fuel reduction projects within forested settings appear to be more effective in reducing burn severity as compared to some southern California chaparral ecosystems.

This is only applicable to forested (coniferous) systems. Chaparral is a crown fire ecosystem and burns are always high severity (removal of all or most above ground vegetation). Lowering severity or increasing fire frequency is undesirable in these systems, and fuel treatments have not been shown to limit fire size.

P.2-13

A multitude of factors in the wildland fire environment contribute to fire behavior. One of the most important factors that can influence fire behavior is the fuel type. Fuel type represents an identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause resistance to control under specified weather conditions (NWCG, 2014; Anderson, 1982).

This contradicts the statement on p.2-2 that grass, trees, and shrubs are all similar.

P.2-15

Fire in shrub dominated groups is generally carried in the surface fuels comprised of litter cast by the shrubs as well as the grasses or forbs in the understory.

Under natural conditions, dense shrublands (e.g. chaparral) do not have an understory. Other, less dense shrublands (eg, sage scrub) have a large herbaceous component. The statement is not supported with relative citations. (Indeed, there are no citations on this entire page, despite the numerous assertions.)

P.2-15 (cont)

Tree dominated groups are typically characterized as a mixed severity regime with a 0-35-year fire frequency….

Zero frequency seems unlikely; citations should be provided.

P.2-19

Table 2.2-3

It is unclear, and no support is provided, what could justify fuel treatments in desert shrublands. These systems are not adapted to fire return intervals less than centuries and are very sensitive to disturbance. Studies have documented type conversion in these systems as a result of any disturbance. Fuel treatments would likely increase the fire hazard in these systems and lead to potentially cascading ecological loss.

P. 2-23

Potential fuel break treatments must address a clear fire prevention need, identifying assets at risk, and be based on local activity such as ignition patterns and fire spread history.

Fuel breaks should also offer a reasonable return on the investment by offering some protection. Fuel breaks are only effective at preventing fires from reaching assets if there are resources deployed to the fuel break. The vast majority of fires that result in significant resource loss are wind-driven, a condition that is extremely dangerous for deployment along fuel breaks, with ember ignition causing spot fires well ahead of the front. Fuel breaks are ineffectual under these conditions. Under moderate conditions they can be useful, but they can often be created ad hoc in this circumstance, and exactly where they are needed. Why guess ahead of time?

While not controlled experiments, there are case studies that CAL FIRE and other local fire agencies have developed that can point to site specific treatments that helped suppression efforts. The Toro Creek Fire Case Study within this section is a good example, as well as several others in Chapter 4.1.5.2.

Re: Case studies used in this document:

While of interest, case studies are anecdotal and can hardly be applied to other situations/places/times/weather conditions. While they may by the incentive for further research, they are not considered reliable enough to support a large-scale program or action like the VTP. With the abundant scientific literature available on California fire ecology and regimes, it is unclear why the authors would resort to case studies, except in that the literature does not support their goals.

P. 2-24

Table 2.2-4

There is no evidence presented that fire is an effective tool in shrubland restoration. Many shrublands are at risk from burning too frequently and many (e.g. deserts) are not adapted to any fire or disturbance. Any unsupported claims to the contrary should be viewed with extreme skepticism. The authors fail to present any support for this activity.

Suggested, but not comprehensive, literature that should be included in scientific review of the VTP-PEIR

Below are papers that need to be considered within the document and particularly in the planning of the Vegetation Treatment Plan. In some cases these papers are cited within the VTP-PEIR but the citations are erroneous and the significance of the studies in fire management is over-looked or ignored.

This not an exhaustive list but rather a good start for developing Vegetation Treatment Program that will address systems and fire regimes beyond high elevation coniferous forests with frequent surface fire regimes. Papers that are cited by the below papers, or cite the below papers, would also likely offer fertile contributions to the development of a robust plan.

Firebrands and fuel beds

Gollner, Michael J., Raquel Hakes, Sara Canton and Kyle Kohler. 2015. Final Report Pathways for Building Fire Spread at the Wildland Urban Interface. Fire Protection Research Foundation report . P.32- 44.
http://www.nfpa.org/~/media/files/research/research-found ation/research-foundation-reports/for-emergency-responders/rfpathwaysforbuildingfirespreadwui.pdf?la=en

Koo, Eunmo, Patrick J. Pagni, David R. Weise, and John P. Woycheese. Firebrands and Spotting Ignition in Large-Scale Fire. International Journal of Wildland Fire 19 (2010): 818-843.

Viegas, DX, M. Almeida, J. Raposo, R. Oliveira and C. X. Viegas (2014) Ignition of Mediterranean Fuel Beds by Several Types of Firebrands. Fire Technology 50:61–77

Fuel age and fire spread

Halsey, R. W., J.E. Keeley, and K. Wilson 2009. Fuel age and fire spread: Natural conditions versus opportunities for fire suppression. Fire Management Today 69:22-28.

Moritz, M. A. 1997. Analyzing extreme disturbance events: fire in the Los Padres National Forest. Ecological Applications 7:1252–1262.

Moritz, M. A., J. E. Keeley, E. A. Johnson, and A. A. Schaffner. 2004. Testing a basic assumption of shrubland fire management: Does the hazard of burning increase with the age of fuels? Frontiers in Ecology and the Environment 2:67–72.

Keeley JE, Zedler PA 2009 Large, high-intensity fire events in southern California shrublands: debunking the fine-grained age-patch model. Ecological Applications 19, 69–94

Keeley, J.E.; Fotheringham, C. J.; Morais, M. 1999. Reexamining fire suppression impacts on brushland fire regimes. Science. 284: 1829–1832

Keeley, Jon E., Hugh Safford, C.J. Fotheringham, Janet Franklin, and Max Moritz. 2009 The 2007 Southern California Wildfires: Lessons in Complexity. Journal of Forestry 107.6: 287-296.

Terminology issues

Keeley, J.E. 2009. Fire intensity, fire severity and burn severity: A brief review and suggested usage. International Journal of Wildland Fire 18:116-126. doi: 10.1071/WF07049

Jain T, Pilliod D, Graham R. 2004. Tongue-tied. Wildfire 4, 22–36.

Relevant coniferous forest papers not included

Gonzalez, Patrick, John J. Battles, Brandon M. Collins, Timothy Robards and David S. Saah. 2015. Aboveground live carbon stock changes of California wildland ecosystems, 2001–2010 Forest Ecology and Management 348: 68–77

Baker WL. 2015. Are High-Severity Fires Burning at Much Higher Rates Recently than Historically in Dry-Forest Landscapes of the Western USA? PLoS ONE 10(9): e0136147. doi:10.1371/journal.pone.0136147