5 CUMULATIVE EFFECTS ANALYSIS

Contents

5.1 INTRODUCTION

Defining the scope of a cumulative impact analysis is challenging, particularly for a program such as the VTP. Because the VTP is statewide, it can be argued that a large range of non-VTP projects, programs, and activities that occur throughout the state should be incorporated into the cumulative analysis of VTP because they affect resource conditions on a statewide basis. As examples, the resources of the state that are affected by the VTP (e.g., air and water quality, fish and wildlife populations, public safety) are all affected by a wide range of non-VTP programs and actions including regulation of pollution control, water quality, and timber harvesting; city and county land use decisions; land management policies, plans, and on-the-ground projects; funding of resource protection and fire suppression activities; human population growth; and a host of other actions. The relevance of these other actions and the magnitude of their effects, relative to potential effects of the VTP, vary widely.

The strategy for defining an appropriate range of actions and conditions for the VTP cumulative analysis requires consideration of baseline conditions and projection of reasonably foreseeable related future actions. Recognizing that a broad range of activities can affect vegetation conditions, the VTP cumulative effects analysis has attempted to focus on those existing conditions and related programs that are similar to, or have similar effects as, the VTP.

The related programs considered for the VTP analysis for cumulative effects analysis include:

- Vegetation and fuels treatment programs undertaken by federal land management agencies and other jurisdictions outside of the VTP
- Regulated timber harvest on state and private lands
- Livestock grazing on state and private lands
- Timber harvest and other land management activities on federal lands

Other programs and actions related to specific resource conditions are included within the cumulative analysis for those resources, including:

- Water Quality: U.S. EPA and Regional Water Quality Control Boards regulatory programs governing water quality
- Air Quality: Regional California Air Resources Board Districts that set standards and programs governing air quality throughout California
- Biological: Federal Endangered Species Act and California Endangered Species Act

The cumulative effects analysis for the VTP Program EIR assesses effects at the program level. The following cumulative effects analysis evaluates the potential for positive and negative cumulative effects from the Proposed Program and Alternatives

through direct and indirect effects on the individual resources discussed in Chapter 4. It is possible for cumulative effects to occur locally, but not be detected at broader spatial scales, and some effects at the local and regional levels will need to be addressed at the project level. The programmatic cumulative effects analysis requires a project level environmental analysis, including cumulative analysis, for each VTP project. Analysis at the project level will be conducted through the use of a Project Scale Analysis (Chapter 7) to be used as part of the environmental analysis for each VTP project.

This chapter addresses the cumulative effects by the resource topics presented in Chapter 4. Additional information is included that is relevant specifically to cumulative effects to synthesize and clarify, rather than repeat in detail, information that is found in other parts of this Program EIR. Therefore, the following discussion of cumulative effects relies in part on the more detailed descriptions that are included in other sections of this Program EIR. References are provided to lead the reader to appropriate sections in the Program EIR. For resource areas that were identified as areas of substantial public concern during the scoping process and for areas that were identified of substantial concern during the Program EIR analysis process, greater amounts of assessment and summary of information presented earlier are provided here. For resource areas of lesser concern, the presentation is briefer and refers to earlier sections that address cumulative effects issues.

The resource topic areas for which cumulative effects are specifically considered here include the categories of Biological Resources; Geology, Hydrology, and Soils; Hazardous Materials; Water Quality; Archaeological, Cultural, and Historic Resources; Noise; Recreation; Utilities and Energy; Transportation and Traffic; and Population, Employment, Housing, and Socio-economic Wellbeing. The environmental setting for each resource topic is discussed in Chapter 4 and associated appendices, which provide the context and baseline conditions for evaluating cumulative effects.

5.2 FRAMEWORK

5.2.1 REGULATORY FRAMEWORK IN CALIFORNIA

The CEQA Guidelines require that a Program EIR provide a discussion of cumulative effects, which is a change in the environment that results from adding the effect of the project to those effects of closely-related past, present, and probable future projects. CEQA Guidelines define cumulative effects as two or more individual effects which, when considered together, are considerable or which compound or increase other environmental effects (CEQA Guidelines § 15355). The effects may be changes resulting from a single project or a number of separate projects. The cumulative impact from several projects is the change in the environment that results from the incremental impact of the project when added to other closely related past, present, and reasonably

foreseeable probable future projects. Cumulative effects can result from individually minor but collectively significant effects (CEQA Guidelines § 15355). In a CEQA evaluation, the proposed action must be considered with the combined effects of the cumulative actions of other closely related projects in a single analysis. The effects from multiple projects may be additive or synergistic.

5.2.2 REGULATORY AND PLANNING FRAMEWORK ON FEDERAL LANDS

Through the implementation of the National Fire Plan and the Healthy Forests Restoration Act of 2003, federal agencies have been instructed to take more aggressive actions to reduce the risks of severe and catastrophic wildfire on public lands. Their goals and objectives are largely consistent with CAL FIRE's Vegetation Treatment Program: to utilize vegetation management programs as a tool to protect life, property, and natural resources from catastrophic wildfire.

Vegetation management under federal agencies such as the Bureau of Land Management, National Parks Service, and Forest Service represents a similar set of actions as those proposed under the VTP. For example, in 2007 the Bureau of Land Management completed a Programmatic Environmental Impact Statement for their Vegetation Treatments Using Herbicides program. The Programmatic EIS covers 17 western states, including the agency's holdings in California. In bioregions with both private and public lands, actions by federal agencies may occur near or in coordination with projects under this Program EIR.

In addition, other forms of vegetation management will also occur in these same watersheds from activities related to commercial timber production and livestock grazing, both on public and private lands. Pre-commercial thinning, selective harvesting, even-age management, and other related actions all result in alterations of the natural vegetation and have bearing on the Program's cumulative effects and the bioregion's overall wildfire hazard, wildlife habitat, and other resources.

5.2.3 FRAMEWORK FOR EVALUATING CUMULATIVE EFFECTS

The main objectives of the California Statewide Vegetation Treatment Program (VTP), as described in Chapter 2, are to:

Vegetation Treatment Program Objectives
1. Modify wildland fire behavior to help reduce losses to life, property and natural resources.
2. Increase the opportunities for altering or influencing the size, intensity, shape, and direction of wildfires within the wildland urban interface.

3. Reduce the potential size and total associated suppression costs of individual wildland fires by altering the continuity of wildland fuels.
4. Reduce the potential for high severity fires by restoring and maintaining a range of native, fire-adapted plant communities through periodic low intensity treatments within the appropriate vegetation types.
5. Provide a consistent, accountable, and transparent process for vegetation treatment monitoring that is responsive to the objectives, priorities, and concerns of landowners, local, state, and federal governments, and other stakeholders.

The focus of the cumulative effects analysis is the collective action of individual projects under the VTP when combined with related projects (for example, timber harvest) on private, state, and federal lands.

Fuel reduction projects are conducted to reduce the threat of catastrophic wildfires. There is substantial evidence that after decades of effective fire suppression, many of California's forests have high accumulations of fuels and a dense forest stand structure that greatly increase the risk of high severity fires (Ryan, 2010). To address this risk, both state and federal agencies are increasing the number of fuel reduction projects with the objective of reducing the frequency of high severity wildfires. There are many different methods for fuel reduction, as described in the Alternatives (Chapters 2 and 3), but the two most common methods are prescribed fire and mechanical removal of vegetation. Fuel reduction projects represent a relatively low intensity of disturbance, but to remain effective in most cases will require repeated treatments into perpetuity (Ryan, 2010).

5.2.4 TEMPORAL AND SPATIAL DOMAIN

The return interval needed for repeating vegetation treatment can vary from several years to several decades, depending on the vegetation type being treated (grassland, shrub, and tree), site conditions, and the pre-1850 mean fire return interval for the region. For example, the fuel load in white fir-mixed conifer stands returns to about 83 percent of pre-burn levels after 10 years (Husari et al., 2006). The analysis period for the cumulative effects analysis covers 10 years of prior management activity. As much as available data on projects outside of CAL FIRE's control allows, the analysis period extends the planning horizon into the future an additional 10 years. This is consistent with the planning horizon that federal agencies are using for developing vegetation treatments on public lands (USDI and USDA Forest Service, 2006a and 2006b).

The spatial domain for the proposed VTP and Alternatives is limited to State Responsibility Area (SRA) and effects from similar projects on federal lands.

5.3 PAST, CURRENT, AND FUTURE PROJECTS

The CEQA Guidelines § 15130 describes the “list” method of addressing cumulative effects wherein the assessment must include a listing of all relevant past, present, and reasonably foreseeable future projects. The project’s incremental effect must be viewed in combination with the effects of other relevant past, present, and reasonably foreseeable future projects to determine if the incremental effect of the project is cumulatively considerable. An analysis of those past, current, and future projects whose impacts may combine with the proposed Program are included below.

5.3.1 PAST PROJECTS

The following section considers past vegetation management projects funded by CAL FIRE, federal agencies (US Forest Service and Department of Interior agencies, including the National Park Service, Bureau of Land Management, and US Fish and Wildlife Service), and private parties on both private and public lands in California. The categories of actions considered below include: vegetation management, commercial timber harvesting, and wildfire. Table 5.3-1 provides a summary of these activities by bioregion. CEQA Guidelines do not state a timeframe for listing past projects. Unless otherwise stated, this report documents projects within the last 10 years complete data is available, covering the period from 2004 to 2013.

Other agents such as local governments, water districts, conservancies, as well as private landowners outside of the VTP program are also likely to conduct fuel reduction projects. This information is not available on a statewide basis and likely represents a minor contribution to the overall acreage treated and is not included here. Instead, as part of the Project Scale Analysis (Chapter 7), each project will identify any known vegetation management projects that have occurred in the previous ten years in the immediate planning watershed(s) of the proposed project.

Table 5.3-1 Average Annual Summary of Past Projects and Percentage of Disturbed Acres by Bioregion (2004-2013)

Bioregions	Federal Mechanical & Prescribed Fire Projects	Timber Harvest Plans	CFIP Projects	State VMP Projects	Wildfire	Average Total Disturbed Acres	Treatable Vegetation Acres*	% of Current Acres Disturbed
Bay Area/Delta	37,008	3,028	894	2,002	14,216	57,149	3,200,408	1.79%
Central Coast	33,037	2	0	3,864	96,850	133,753	6,949,833	1.92%
Colorado Desert	39,587	0	0	880	7,629	48,096	4,663,190	1.03%
Klamath/North Coast	27,499	138,261	2,407	4,806	121,594	294,566	13,644,543	2.16%
Modoc	22,137	98,038	490	3,673	59,267	183,605	7,176,933	2.56%
Mojave	30,900	263	0	1,116	30,331	62,610	18,719,988	0.33%
Sacramento Valley	23,130	0	0	3,165	5,398	31,694	1,641,127	1.93%
San Joaquin Valley	17,830	0	0	1,903	5,952	25,685	2,658,732	0.97%
Sierra Nevada	16,516	239,529	3,963	3,990	115,116	379,114	15,588,940	2.43%
South Coast	14,126	24	97	1,698	113,094	129,039	4,392,490	2.94%
Average Totals	**261,772**	**479,144**	**7,851**	**27,097**	**569,447**	**1,345,310**	**78,636,184**	**1.71%**

*Treatable Vegetation Acres includes the grass, shrub, and tree vegetative formations in all responsibility areas of California (Local, State, and Federal)

5.3.1.1 Past Projects Undertaken by CAL FIRE

The Vegetation Management Program (VMP) is a cost-sharing program that focuses on the use of prescribed fire, manual, and mechanical means for mitigating wildland fire fuel hazards and other resource management issues on State Responsibility Area (SRA) lands. Implementation of VMP projects is at the discretion of each CAL FIRE administrative unit. Projects undertaken through this program are contained within the Unit's Fire Management Plan and are considered to be of high fire prevention value to the unit. Vegetation management through CAL FIRE's VMP has been limited, averaging approximately 30,000 acres treated annually over the past 10 years, with an average project size of 260 acres. The projects are focused mostly in the Central Coast, Klamath/North Coast, Modoc, and Sierra Nevada bioregions, but have not been locally concentrated within bioregions enough to expect significant effects. Table 5.3-1 provides an average acreage for the past 10 years of VMP projects by bioregion.

CAL FIRE also funds vegetation management projects under the California Forest Improvement Program (CFIP). These projects can involve a range of ground disturbing activities including site preparation, tree planting, release, commercial thinning, fuel reduction and land conservation activities for improving fish and wildlife habitat. Table 5.3-1 provides a summary of the average annual acres of fuel reduction projects funded through CFIP by bioregion for the past 10 years. CFIP projects are most heavily concentrated in the Sierra Nevada and Klamath/North Coast bioregions. CFIP projects tend to be small in size, averaging approximately 40 acres per project over the past 10 years.

Proposition 40, the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002, provided funding for CAL FIRE to enter into cost-share

agreements with private landowners to perform wildfire hazard reduction projects designed to reduce fuel loadings that pose a threat to watershed resources and water quality. Projects were conducted in 15 Sierra Nevada counties: Butte, Plumas, Sierra, Yuba, Nevada, Placer, El Dorado, Amador, Alpine, Calaveras, Tuolumne, Madera, Mariposa, Fresno, and Tulare. The Proposition 40 fuels reduction program ended on March 31, 2014 due to lack of continued funding. Impacts from these projects are included as past CFIP projects in Table 5.3-1.

The history of past VMP projects in combination with other CAL FIRE projects establishes an environmental reference point, or baseline, for the proposed VTP. As a result of a relatively low level of past vegetation management projects, the direct negative effects from past projects are likely to be minor. However, the low level of vegetation management when combined with fire suppression activities has increased the likelihood and risk of more frequent catastrophic wildfires, which may be having a long-term significant indirect negative impact on the environment.

5.3.1.2 Related Past Projects

The following section describes related projects that are not part of the CAL FIRE's proposed VTP, but may produce similar environmental effects and have the potential when combined with activities proposed in this Program EIR to produce a cumulative effect.

Federal agencies conduct vegetation management projects on federal lands that are similar in purpose to the actions described in the proposed VTP. As the Forest Service and other federal natural resource agencies implement the National Fire Plan (USDA and USDI, 2000), the Healthy Forests Restoration Act (GAO, 2003; HFRA, 2003) and the President's Healthy Forest Initiative (Dombeck et al., 2004; Graham et al., 2004; Stephens and Ruth, 2005), a substantial increase in fuel reduction projects and related activities has occurred in recent years and is likely to continue in the foreseeable future. The implementation of these programs has culminated in The National Cohesive Wildland Fire Management Strategy. The Strategy provides a framework for federal land management agencies to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress towards three goals: resilient landscapes, fire adapted communities, and safe and effective wildfire response. Federal agencies report fuel treatment projects through the National Fire Plan Operations and Reporting System (NFPORS). This information has been summarized to show activities by year in California in Table 5.3-2 below. Note that the acreage treated for fuel reduction, especially by use of prescribed fire, by federal land managers in California has been on the decline throughout the period between 2004 through 2013. See the National Fire Plan web site for additional information on federal projects: www.forestsandrangelands.gov/.

Table 5.3-2 Yearly Fuel Reduction Projects by Treatment Type by Federal Agencies in California for 2004 through 2013

	Mechanical Treatment			Prescribed Fire Treatment			All
Year	DOI	USFS	Total	DOI	USFS	Total	Grand Total
2004	26,177	172,968	199,145	90,448	80,487	170,935	370,080
2005	31,294	142,201	173,495	80,487	76,391	156,878	330,373
2006	103,471	145,782	249,253	76,391	70,224	146,615	395,868
2007	31,482	113,232	144,714	70,064	60,215	130,279	274,993
2008	30,061	94,886	124,947	60,215	36,210	96,425	221,372
2009	71,010	156,358	227,368	36,210	45,426	81,636	309,004
2010	20,073	126,886	146,959	45,426	38,918	84,344	231,303
2011	11,620	94,876	106,496	38,918	32,890	71,808	178,304
2012	13,113	85,913	99,026	32,890	33,241	66,131	165,157
2013	9,025	82,226	91,251	29,952	20,060	50,012	141,263
Total	347,326	1,215,328	1,562,654	561,001	494,062	1,055,063	2,617,717
Annual Average	34,733	121,533	156,265	56,100	49,406	105,506	261,772

Both commercial timber harvesting and fuel reduction projects result in the removal of vegetation cover and introduce some degree of site disturbance to the project area. Commercial timber harvesting is considered a more intensive form of vegetation management. Even-aged management systems, such as clearcutting, can result in nearly complete vegetation removal from a site. Timber harvesting that involves thinning or selective harvesting results in partial canopy removal, generally with less site disturbance, less erosion potential, and a lower potential for other immediate water quality effects (Stednick, 2010). Research has shown that observed and predicted erosion rates from timber harvesting or prescribed fire were much lower than erosion rates from wildfires (Elliot and Miller, 2002). Timber harvesting can increase sediment yields from surface erosion of the harvested area, but as vegetation grows back, sediment yields decrease over time at a negative exponential rate (Bunte and MacDonald, 1999). It has been shown that the road network needed to support timber management activities is a more persistent and chronic source of sediment than the harvest area itself (Istanbulluoglu, 2004; Robichaud et al., 2010), suggesting that uneven-aged management requiring roads to be maintained for multiple entries can result in a higher potential for surface erosion compared to even-aged management.

Timber harvesting contributes to the environmental background conditions that projects in the VTP would operate under. Table 5.3-3 provides a summary of the extent of timber harvesting on public and private lands in California. Impacts from commercial timber harvesting mostly occur in the Klamath/North Coast, Modoc, and Sierra Nevada bioregions. No harvesting occurred within the Colorado Desert, Sacramento Valley, San Joaquin Valley, or the South Coast bioregions during this time period.

Table 5.3-3 Average Acres of Commercial Timber Harvesting Activities on Federal and Private Lands, 2003-2014

Bioregions	USFS Even Age	USFS Uneven Age	USFS Yearly Average	Private Even Age	Private Uneven Age	Private Yearly Average	Bioregion Total Yearly Average
Bay Area/Delta	0	0	0	380	2,648	3,028	**3,028**
Central Coast	0	0	0	0	2	2	**2**
Colorado Desert	0	0	0	0	0	0	**0**
Klamath/North Coast	69	44,183	44,253	33,767	60,241	94,008	**138,261**
Modoc	729	32,354	33,083	14,700	50,255	64,955	**98,038**
Mojave	0	0	0	0	263	263	**263**
Sacramento Valley	0	0	0	0	0	0	**0**
San Joaquin Valley	0	0	0	0	0	0	**0**
Sierra Nevada	1,629	180,012	181,641	14,024	43,865	57,889	**239,529**
South Coast	0	0	0	4	20	24	**24**
Grand Totals	**2,427**	**256,549**	**258,976**	**62,875**	**157,293**	**220,168**	**479,144**

High severity wildfires represent one of the greatest forms of disturbance for a watershed. For example, the removal of vegetation, organic material, and changes to soil properties can greatly alter water infiltration rates (Martin, 2001; Neary et al., 2005). Studies have shown that severe wildfires in chaparral areas in southern California can produce water repellent soils (DeBano, 1981). Extensive and severe wildfires, such as those experienced in southern California in 2003, can dramatically alter the timing and distribution of sediment and water from post-fire precipitation events (CAL FIRE, 2003). Generally there is a high degree of variability in burn severity within the footprint of any given wildfire, depending upon weather, fuel, and topographic factors at the time of the burn.

Table 5.3-1 shows the average annual distribution of wildfires by bioregion for the past 10 years. On average, approximately 570,000 acres burn each year across California, but the variability in those numbers is high both spatially and temporally. Those numbers also identify total acres within a fire's perimeter and do not identify the mixture of burn severities within any given wildfire. The contribution of wildfire to cumulative effects is further considered under Section 5.5.4 Cumulative Effects to Water Resources.

HUMAN DEVELOPMENT (PRC 4291 100" DEFENSIBLE SPACE)

Development in California's wildland areas has increased the risk and cost of fighting wildfires. Defensible space ordinances have been developed to reduce the risk of wildfire in the Wildland Urban Interface (WUI). The California State Board of Forestry and Fire Protection (Board) promulgated defensible space regulations necessary to implement Senate Bill (SB) 1369 of 2004. This legislation amended PRC 4291 to,

among other things, require persons in the State Responsibility Area (SRA) to maintain fire protection around a structure by removing brush, flammable vegetation, or combustible growth that is located up to 100 feet from the building or to the property line.

The clearance rule represents a type of vegetation management conducted by individual landowners and concentrated in WUI areas across the state. At the time, the Board estimated the total number of structures within the State Responsibility Area (SRA) that are potentially affected by this regulation at 811,158.

GRAZING ON RANGELAND

Prescribed herbivory by livestock is an activity that will be expected to be utilized to meet the objectives of the VTP. The condition and use of rangelands by livestock is analyzed in this section. Grazing of private lands in California is not an activity requiring a permit from a government agency, and there are no consistent measurements taken of California rangeland productivity and utilization. Due to this data constraint, the analysis below uses proxy data to analyze the impacts of grazing on California's rangelands. The analysis utilizes estimates of rangeland size and distribution, the forage capacity of various California rangeland types, and the number of cattle reported in the US Department of Agriculture's census of agriculture. Much of the information relies on data from the 2003 and 2010 Forest and Range Assessments by FRAP, which provide the most recent comprehensive assessment of the state of California's rangeland resources.

An assessment of livestock grazing on California's rangelands is provided here as the closest similar impact to the use of prescribed herbivory in the VTP. The reader should keep in mind that grazing within prescribed herbivory projects in the VTP are expected to be of shorter duration and higher intensity than is the case in traditional grazing for commodity production or ecological values. The goal of VTP projects will be to achieve specific fuel modification in various fuel types, not all of which are considered traditional grazing lands (ex. fuel break maintenance in forested landscapes). The current use of livestock for these purposes is sporadic over space and time in California, and can be considered a minor part of the overall livestock industry analyzed below. No information on the statewide use of livestock for fuel reduction purposes was available for this analysis.

This section describes those areas of California's rangelands where grazing occurs, the amount of rangeland area available for grazing ("available rangeland"), and an estimate of the area actually grazed by livestock ("grazing area"). These metrics help define who owns rangelands, where rangelands are located, how they are managed, and what portion of all rangelands are actually available and used for grazing livestock.

Ownership of rangeland types is not evenly distributed. A majority of Hardwood Woodland, Grassland, and Wetland habitats are privately owned. In contrast, a majority of Conifer Woodland, Shrub, Desert Shrub, and Desert Woodland habitats are publicly owned. The total amount of rangeland across California has been estimated at between 17.4 and 24.4 million acres on private land, and between 16.7 and 32.7 million acres on federal lands (Table 5.3-4). Rangelands are defined by having appropriate vegetation to support grazing, and not based on actual use by livestock (i.e., grazing area).

Table 5.3-4 Various rangeland area estimates by ownership (Million acres)

	Private	Public	Total
Primary rangelands (FRAP)*	24.4	32.7	57.1
Rangeland (NRI)**	18.3	***	18.3
Available rangeland (FRAP)	21.9	19.8	41.7
Grazing area (ERS and RPA****)	17.4	16.7	33.8

ERS – Economic Research Service; FRAP – Fire and Resource Assessment Program; NRI – National Resource Inventory; RPA – The Forest and Rangeland Renewable Resources Planning Act of 1974
*Excludes conifer forest types
**Excludes any hardwood or conifer forest types
***National Resources Inventory (NRI) measure some non-federal public lands but are included in private in this table
****RPA (Mitchell, 2000) estimates used to derive area on public land
Sources: Mitchell, 2000; FRAP, 1999; FRAP, 2002a; NRCS, 2000; ERS, 2001
Table adopted from 2003 FRAP Report

GRAZING AREA

The area of land in California that is actually utilized for livestock grazing is termed “grazing area.” This area represents grazing use for some portion of the year, but does not quantify the intensity or duration of use. Field sampling conducted by the Natural Resources Conservation Service and allotment use records submitted by the Forest Service and BLM are used to determine the amount of grazing area. Table 5.3-5 summarizes the total grazing area in California.

Table 5.3-5 Total grazing area in range and forest categories in all ownerships, 1997 (million acres)

Type of grazing	Acres
Grassland and other pasture and range*	22.3
Forest land grazed**	11.8
Total grazing area	**34.1**

*Grassland and other non-forested pasture and range in farms plus estimates of open or non-forested grazing land not in farms
**Woodland grazed in farms (ERS, 2001)
Table adopted from 2003 FRAP Report

These tables suggest several findings related to potential cumulative effects from grazing:

- When comparing grazing area (34.1 million acres) with primary rangelands (approximately 57 million acres), it appears that primary rangeland area far exceeds the land base actually grazed. This means that there is a substantial area of rangelands where there is inadequate forage or water to support livestock grazing, grazing is not permitted, or the land is managed for ecological values other than forage production for domestic livestock.
- A large proportion of available rangelands (82 percent, or 34.1 million of 41.7 million acres) are already being grazed. On some of this land base the level of grazing is light, with few animals per acre or animals on the landscape for only short periods of time. Overall, however, this means that there are limited opportunities for new grazing activities, especially when considering the on-going decline in the available rangeland base in California due to development and other pressures (Cameron et.al., 2014).
- On public lands, large areas are not available or used at minimum levels for grazing due to exclusion by administrative designations or relatively poor forage production capabilities. Approximately 17 million acres of the nearly 33 million acres of public primary rangelands are grazed (52 percent). Over half of the 17 million acres is in desert land cover types that produce little forage, making them susceptible to environmental damage due to over-grazing (Table 5.3-4).
- In general, private rangeland is used for grazing at a much higher level than public lands. Seventeen million of the 24 million acres of private primary rangeland is grazed (71 percent).
- Private rangeland is more widely used for grazing, in part, because the lands are often more productive and better watered. To some degree this increased use raises the risk of environmental concerns. Lands held by public agencies are more likely managed as wildlife habitat for species not dependent on grazing. Benefits of fire reduction due to grazing are likely better realized on private lands,

and successional changes are more likely on public lands in the absence of grazing or other periodic disturbance events.

FINDINGS ON FORAGE PRODUCTION, GRAZING CAPACITY AND USE

One method to assess the productive capacity of rangelands includes comparing the amount of vegetation available for grazing (forage production) and the extent to which this vegetation is used (use). However, direct estimates of rangeland forage are not comprehensively collected, unlike counterpart measurements for forests (standing board foot volume of forests and harvest levels). This deficiency limits a direct assessment of sustainable forage production and use.

Proxy methods must be used to assess forage production and use. Forage production estimates are made by estimating grazing capacity, or the maximum stocking rate possible without inducing damage to vegetation or related resources, measured in animal unit months (AUMs) per acre by vegetation, ownership, and region. To measure use, FRAP used the number of livestock (specifically beef cattle grazed on rangelands) to evaluate use from a commodity point of view (Mitchell, 2000). Estimates of forage use are derived by approximating the inventory of animals in California forage types.

FORAGE TYPES

Forest and rangelands provide forage (browse and non-woody plants) used for grazing by livestock and game. Forage varies in its quantity by species, time of year, and other factors such as climate, soils, and topography. Cattle consume a varied diet on rangeland that may include grasses, legumes, forbs, and brush (browse). The major land cover types provide varying amounts of forage and include Grassland, Wetland, Hardwood Woodland and Forest, Desert Shrub, Desert Woodland, Shrub, and to a lesser extent Conifer Woodland and Forest. Grasslands are the most important source of forage for California livestock.

GRAZING CAPACITY ESTIMATES

Landowners rely on forage that exists on both publicly and privately owned lands and in a variety of vegetation types. Forage is measured in the form of AUMs, the amount needed to sustain one mature cow and her calf, five sheep, or six deer for a month. An AUM is approximately 800 to 1,100 pounds of dry biomass, and represents the amount of forage that can be removed annually while still maintaining productivity. FRAP has not updated or designed an information system that evaluates forage production or estimates AUM usage since the 1989 Assessment. Because forage production may not

be the critical limiting factor affecting rangeland productive capacity, it is unlikely that models supporting this dynamic will be extensively developed. Many other trends, particularly the declining land base and the presence of non-native, invasive species, are likely more important factors affecting long-term sustainability of rangeland productivity.

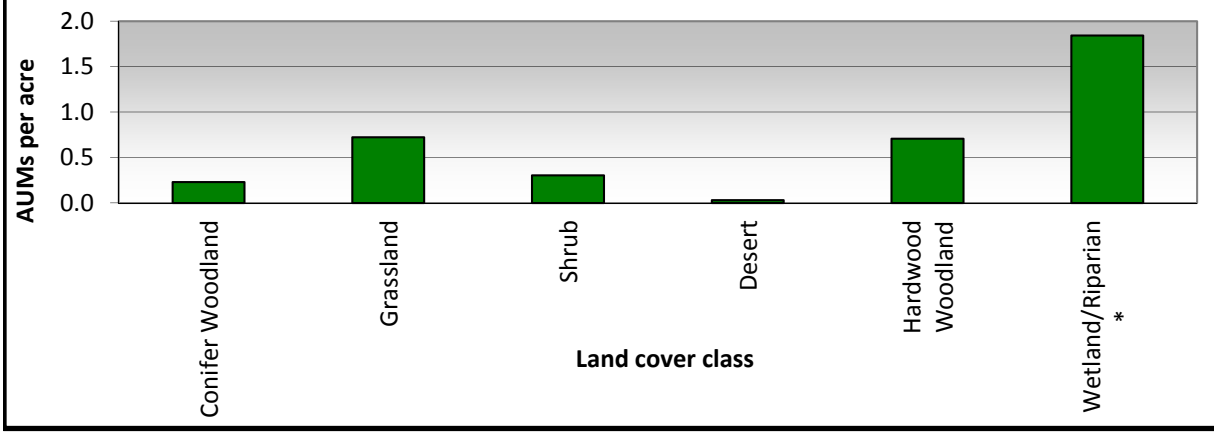

Figure 5.3-1 Average annual grazing capacity (AUM per acre) by primary rangeland cover class

*Includes montane riparian CWHR, valley foothill riparian CWHR, and wet meadow CWHR
Source: FRAP, 2002a; CH2M HILL, 1989
Table adopted from 2003 FRAP Report

Previous assessments (CH2M HILL, 1989) have estimated the forage production for both primary rangelands and secondary lands (conifer forests) producing forage. In this assessment, grazing capacity is used to estimate the sustainable level of grazing which a vegetation type can support, not the actual annual growth of range biomass. Grazing capacity is defined as a stocking rate that is possible without inducing damage to vegetation or other resources. Over 14 million AUMS are produced on California's available primary rangelands (Figure 5.3-1, Tables 5.3-6 and 5.3-7).

Table 5.3-6 Total annual forage production on available primary rangelands by land cover class.

Land cover type	Grazing Capacity in AUMs per acre	Area (millions of acres)	Total AUMs (millions)
Conifer Woodland	0.2	1.6	0.4
Grassland	0.7	9.2	6.6
Shrub	0.3	11.6	3.4
Desert	<0.1	14.3	0.5
Hardwood Woodland	0.7	4.6	3.2
Wetland/Riparian*	1.8	0.4	0.8
Total	**0.4**	**41.7**	**14.8**

AUM – animal unit month
*Includes montane riparian CWHR, valley foothill riparian CWHR, and wet meadow CWHR
Source: FRAP, 2002a; CH2M HILL, 1989; Conner, 2003
Table adopted from 2003 FRAP Report

Table 5.3-7 Total annual forage production on available secondary rangelands by land cover class

Land cover type	Grazing Capacity in AUMs per acre	Area (millions of acres)	Total AUMs (millions)
Conifer Forest and. Montane Hardwood	0.04	19.1	0.8

Source: FRAP, 2002a; CH2M HILL, 1989; Lindstrand, 2003
Table adopted from 2003 FRAP Report

FORAGE USE ON PUBLIC LAND

The use of forage on BLM and USFS lands is reported annually as the number of AUMs permitted in grazing districts or range allotments. As shown in Figures 5.3-2 and 5.3-3, permitted AUMs peaked in the 1980s and have steadily declined. This estimate suggests that less than one million AUMs come from use on federal lands. It also implies that the bulk of the estimated 11.8 million AUMs used in California come from private lands even though the area grazed on public versus private land is nearly equal.

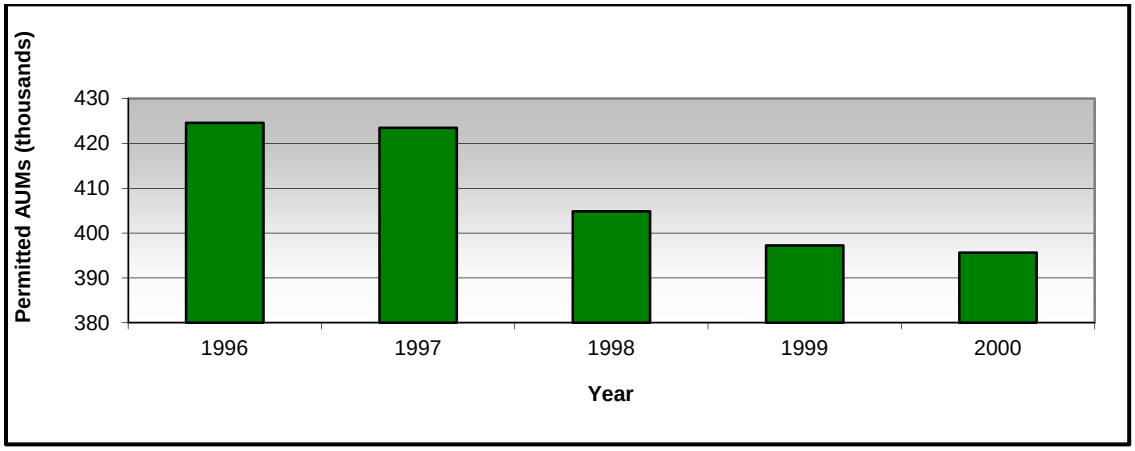

Figure 5.3-2 Number of AUMs on BLM lands with grazing permits and leases, 1996-2000

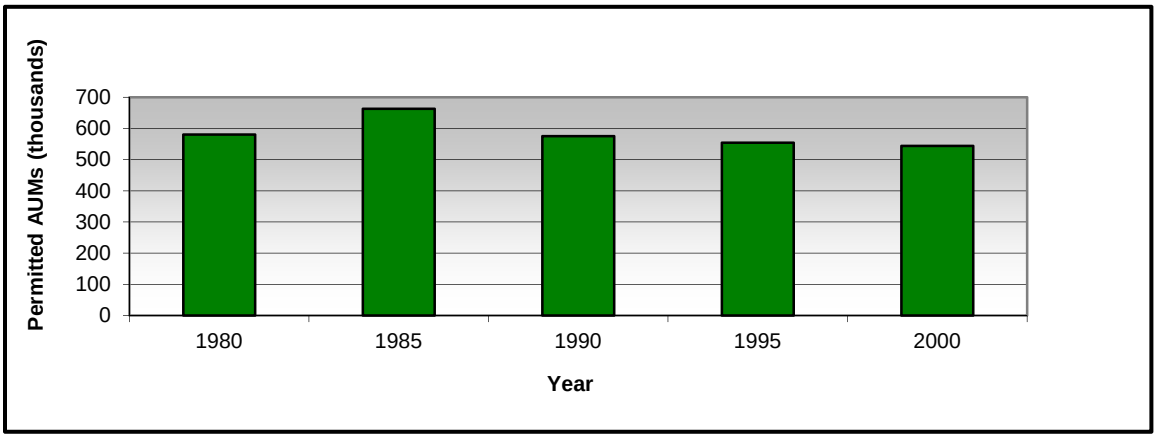

Figure 5.3-3 Number of AUMs on USFS lands with grazing permits, 1980-2000
Source: Compiled by FRAP from USFS, 2002

Tables adopted from 2003 FRAP Report

COMPARISONS OF FORAGE USE AND GRAZING CAPACITY

Grazing capacity on available rangelands in some geographic areas exceeds the amount used for grazing of domestic livestock (Figure 5.3-4). However, excess forage for grazing may not be available because of the seasonal nature of forage availability in relation to the time period that animals are on site to graze. In times of forage shortages or poor nutrition quality, ranchers commonly bring in supplementary feed to meet the animals dietary needs.

This analysis estimates that the grazing capacity on rangelands available for grazing is 14.8 million AUMs. The majority of forage available for grazing exists in the Management Landscape class Working/Private/Sparsely Populated (10.8 million AUMs). Domestic livestock grazing use in all classes is estimated at 11.8 million AUMs

based on the approximately two million head of cattle that periodically graze on private rangelands.

This profile suggests that at a broad statewide level, rangeland productivity is being maintained and lands are currently being grazed at a sustainable level. However, specific factors raise questions on the capability of California's rangelands to sustain grazing activities at this level in the future. These concerns include a declining rangeland area, encroachment of invasive non-native species, and grazing use reductions on public lands resulting in potential increased demand for grazing on private lands.

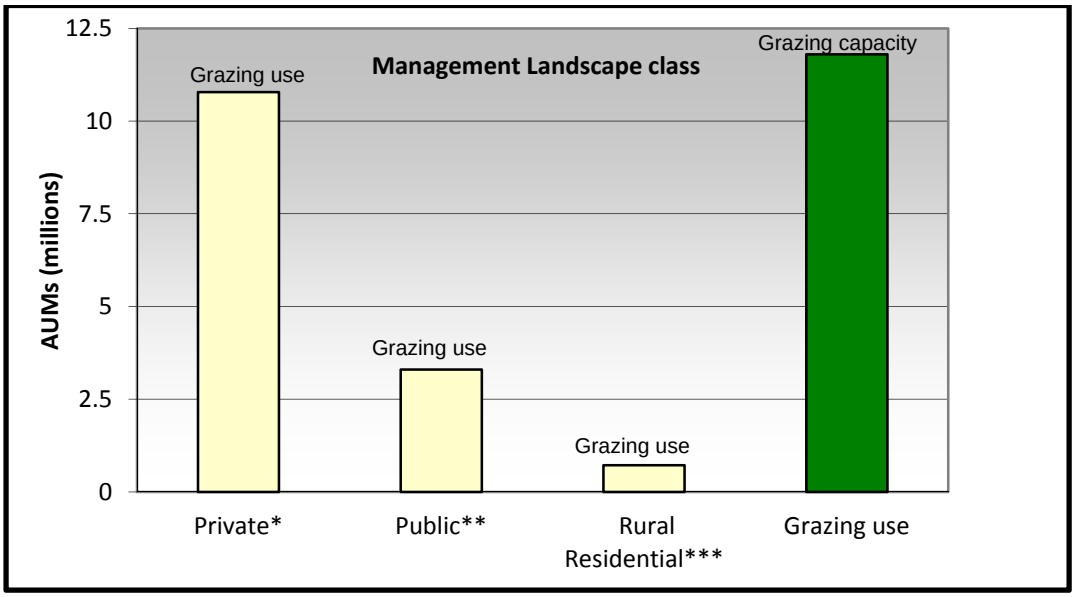

Figure 5.3-4 Grazing capacity by Management Landscape class and total grazing use, available rangelands
Source: FRAP, 2002a; CH2M HILL, 1989; National Agricultural Statistics Service, 2001; Conner, 2003
Table adopted from 2003 FRAP Report

SUMMARY OF PAST PROJECTS

Over the past 10 years (2004 through 2013) CAL FIRE has implemented vegetation management projects on approximately 348,000 acres of land through VMP (270,000 acres) and CFIP (78,000 acres). While there is substantial year to year variation in the amount and geographic distribution of these treatments, the average annual treatment rate is approximately 35,000 acres per year. In general, the projects are broadly distributed across the state, with the greatest concentration in the Central Coast, Klamath/North Coast, Modoc, and the Sierra Nevada bioregions.

Fuel reduction projects on federal lands have been much more extensive over roughly the same time period. Over the past ten years, the USFS has implemented fuel reduction projects on approximately 1.7 million acres. Other federal agencies (BLM, NPS, USFWS, and BIA) have implemented projects on approximately 900,000 acres. The combined total is roughly 2.6 million acres treated from 2004 to 2013. The number of acres treated by federal agencies has been decreasing throughout this time period as indicated by Table 5.3-2. Federal land ownership is heavily concentrated in the Klamath/North Coast, Modoc, Sierra Nevada, and South Coast bioregions. Table 5.3-1 shows federal fuel reduction projects concentrated in these bioregions. The combined average annual rate of fuel reduction projects (CAL FIRE and federal projects) is estimated at approximately 295,000 acres per year over the last 10 years.

Timber harvesting can be considered a related form of vegetation management. Some form of timber harvesting was implemented on over 2.5 million acres of federal lands and on over 2.2 million acres of private lands between 2004 and 2013. A majority of these harvests, approximately 4.1 million acres, were considered uneven aged management. Timber harvest activities on both public and private lands were concentrated in the Klamath/North Coast, Modoc, and Sierra Nevada bioregions (see Table 5.3-3). In addition to the geographic distribution, the amount of timber harvesting also varies from year to year, but the average annual rate of timber harvesting can be estimated at approximately 480,000 acres per year.

When past fuel reduction projects are combined with timber harvesting and other forms of vegetation management, an estimate can be made of the percentage of landscape that is cumulatively disturbed by related activities. In most cases, less than 4 percent of the treatable vegetation in a given bioregion has been disturbed on an annual basis over the past 10 years (see Table 5.3-1). While only a small proportion of a bioregion is treated in a given year, projects that are concentrated in a more localized area (i.e. planning watershed) are much more likely to have cumulative effects that are detectable and potentially significant. Standard Project Requirement (SPR) HYD-16 addresses this issue at the project level by requiring additional analysis prior to project implementation if greater than 20 percent of a planning watershed has been disturbed over a 10 year period (see Section 2.5).

5.3.2 CURRENT PROJECTS

Vegetation management projects funded by CAL FIRE under the VMP and CFIP programs occur on an ongoing basis. CAL FIRE participates in these as funding and staff time is available to do so. The location and extent of these current projects should be roughly proportional to that indicated in Table 5.3-1. The cumulative effects analysis recognizes that similar actions on federal lands are also current and ongoing, but very little information was available on their status. It is assumed that projects continue to be

implemented on an annual basis roughly proportional to how they have in the recent past (Table 5.3-1).

Timber harvesting is also an on-going related activity. Timber harvesting on non-federal lands in California are subject to various permitting mechanisms (Timber Harvest Plans, Nonindustrial Timber Management Plans, Emergencies and Exemptions) under the Forest Practice Rules with CAL FIRE as the lead agency. Many permits allow multiple years to complete the harvesting operations, and, in rare cases, expire with no operations occurring. Timber harvesting on federal lands is subject to permitting through NEPA with many projects also occurring over multiple years. All projects that have been permitted, but have not yet expired or otherwise been completed, are considered to be current projects.

FORAGE USE

Forage use is estimated indirectly by evaluating the inventory of beef cattle in a particular year and then calculating the AUMs needed to support that inventory. In 1997, nearly 1.9 million head of cattle were grazed annually for some period on primary and secondary rangelands (National Agricultural Statistics Service, 2001). To estimate the amount of forage used by these animals, the number of months used for range grazing must be estimated. Using this methodology, it is estimated that over 11.8 million AUMs per year are consumed on California rangelands. For more information on the cattle inventory, see the 2003 Fire and Resource Assessment chapter on the Range Livestock Industry (CAL FIRE, 2003).

5.3.3 FUTURE PROJECTS

Future projects in CEQA are defined in the CEQA Guidelines (Section 15130(b)(1)(B)) as projects for which an application has been received at the time the notice of preparation is released. This would include projects that are planned to occur in the near future, but are not currently implemented.

While individual VTP projects may show little signs of disturbance, collectively fuel reduction projects and related vegetation management activities by state and federal agencies could potentially lead to larger scale environmental effects. As described in Chapter 2, the VTP expects to implement projects on approximately 60,000 acres annually over a 10 year period. The average size of individual VTP projects is anticipated to be approximately 260 acres, and their distribution throughout the state is shown in Table 5.3-8 below. In the absence of permitting and funding constraints being modified on federal lands, future fuel reduction projects are expected to occur at roughly the same pace and scale that has been occurring over the last 10 years, approximately 260,000 acres annually (see Table 5.3-2). The implementation of the VTP would cause

an average of 60,000 acres treated annually through CAL FIRE. The combined disturbance from future vegetation management projects can be expected to be approximately 320,000 acres annually. These projects can occur in locations across the entire state, but are mainly concentrated in landscapes dominated by grass, shrub, and timber vegetation types (i.e. forest and range settings). California supports approximately 31 million acres of forest land and 57 million acres of primary rangelands (CAL FIRE, 2003; 2010). The combined or cumulative actions of fuel reduction projects on private and federal lands statewide would result in 0.34-3.01 percent of any given bioregion treated per year. Table 5.3-8 shows the expected acres treated if the VTP program treated 60,000 acres on average annually over a ten-year period, and federal programs continued to operate at their current rate over the next 10 years. The actual percentage of the landscape that is considered disturbed at any point in time does not reflect recovery rates and is likely to be less than the amount shown.

Table 5.3-8 Average Annual Acres Expected to be Treated on Private and Federal Lands over a 10 Year Time Frame (2016-2025)

Bioregions	Federal Mechanical & Prescribed Fire Projects	Timber Harvest Plans	CFIP Projects	State VTP Projects	Wildfire	Average Total Disturbed Acres	Treatable Vegetation Acres*	% of Future Acres Disturbed
Bay Area/Delta	37,008	3,028	894	5,855	14,216	61,002	3,200,408	1.91%
Central Coast	33,037	2	0	8,904	96,850	138,793	6,949,833	2.00%
Colorado Desert	39,587	0	0	988	7,629	48,204	4,663,190	1.03%
Klamath/North Coast	27,499	138,261	2,407	11,650	121,594	301,410	13,644,543	2.21%
Modoc	22,137	98,038	490	7,175	59,267	187,107	7,176,933	2.61%
Mojave	30,900	263	0	2,573	30,331	64,066	18,719,988	0.34%
Sacramento Valley	23,130	0	0	2,364	5,398	30,893	1,641,127	1.88%
San Joaquin Valley	17,830	0	0	1,877	5,952	25,659	2,658,732	0.97%
Sierra Nevada	16,516	239,529	3,963	13,411	115,116	388,535	15,588,940	2.49%
South Coast	14,126	24	97	5,204	113,094	132,545	4,392,490	3.02%
Average Totals	**261,772**	**479,144**	**7,851**	**60,000**	**569,447**	**1,378,213**	**78,636,184**	**1.75%**

*Treatable Vegetation Acres includes the grass, shrub, and tree vegetative formations in all responsibility areas of California (Local, State, and Federal)

5.4 CUMULATIVE ANALYSIS SUMMARY

For the purposes of this Program EIR, projects implemented under the VTP would have a significant cumulative effect if:

- The cumulative effects of related projects (past, current, and probable future projects) are not significant and the incremental impact of qualifying projects implemented under the proposed VTP is substantial enough, when added to the cumulative effects of related projects, to result in new cumulatively significant impact; or
- The cumulative effects of related projects (past, current, and probable future projects) are already significant and the projects implemented under the

proposed VTP would make a considerable contribution to those effects. In accordance with CEQA Section 21083.3(b)(2),"cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." The California Supreme Court has determined that in certain circumstances, miniscule contributions to a cumulative significant impact can be determined to be less than considerable (Save the Plastic Bag Coalition v. City of Manhattan Beach, 2011).

The potential cumulative effects for each resource area are described in section 5.5 below and outlined in Table 5.4-1 below.

Table 5.4-1 Summary of Potential Significant Cumulative Effects Potential for the Proposed Program*

	Proposed Program		
Resource Area	Yes after mitigation	No after mitigation	No reasonably potential significant impacts
Biological Resources			X
Geology, Hydrology, and Soils			X
Hazardous Materials			X
Water Quality			X
Archeological, Cultural and Historic Resources			X
Noise			
Recreation			X
Utilities and Energy			X
Transportation and Traffic			X
Population, Employment, Housing, & Socio-economic Wellbeing			X
Air Quality		X	
Aesthetics and Visual Resources			X
Climate Change			X

5.5 CUMULATIVE EFFECTS EVALUATION BY RESOURCE TOPIC

The following section discusses the potential for cumulative effects for the following resource topics (see Chapter 4 for additional information on each resource topic):

- Biological Resources
- Geology, Hydrology, and Soils
- Hazardous Materials
- Water Quality
- Archaeological, Cultural and Historic Resources
- Noise

- Recreation
- Utilities and Energy
- Transportation and Traffic
- Population, Employment, Housing, and Socio-economic Wellbeing
- Air Quality
- Aesthetics and Visual Resources
- Climate Change

5.5.1 BIOLOGICAL RESOURCES

This section discusses the types of effects that may occur under the Vegetation Treatment Program (VTP) and related treatments from other vegetation disturbing activities on terrestrial wildlife and plants, aquatic resources, and measures of riparian ecosystem function. These potential impacts are discussed fully in Section 4.2. Included here is additional information that is relevant specifically to cumulative effects and the potential for the proposed VTP or Alternatives to contribute to other land disturbing management practices that may result in a significant cumulative impact to terrestrial wildlife and plants, aquatic resources, and riparian ecosystems.

The environmental setting for biological resources is described in Section 4.2. This cumulative impact analysis specific to biological resources assumes full implementation of the VTP as proposed (i.e. 60,000 acres treated per year distributed as identified in Table 3.3-1). Cumulative effects to biological resources could occur from fire hazard reduction, timber stand improvement and other vegetation treatment efforts included in the VTP when considered in the context of other existing and proposed land uses. The incremental contribution of the VTP to an evaluation of cumulative effects is determined by the number of acres treated annually under that program in combination with the acreage modified or expected to be modified by other land uses.

Plant communities, including the biological resources they support, potentially impacted by VTP activities have for the most part evolved under the influence of periodic fires of varying intensity, frequency, and size, and other agents of change. Changes to these natural disturbance regimes have occurred as a result of changes in settlement patterns, resource extraction, plant species composition, and fire suppression, significantly altering the ecological processes under which these plant and animal communities have evolved. Complicating these relationships is the fact that disturbance effects on biological resources vary depending on species mobility, time of year, and aspects of their natural history.

For several reasons, biological resources and dynamic changes of plant communities present one of the more challenging areas to address with respect to cumulative effects determinations. For example, fire can have two markedly different effects on wildlife habitats. Large fires do not burn evenly and as a result produce a mosaic of vegetation

and post-fire plant community succession. Alternatively, at a smaller scale, an intense stand-replacing fire can reduce habitat heterogeneity and foster a uniformity of food and cover value particularly in areas of similar slope, aspect, and soil type. Both outcomes may either be positive, negative, or exhibit no particular effect depending on the degree of habitat patchiness and the wildlife species of concern. Thus, simple generalization of the effects of post fire or other disturbance induced habitat conditions and their implications for biological resources are not informative. While disturbance-caused modification of one habitat type into another may in many cases be “value-neutral,” in other cases, such as the loss or fragmentation of habitat for a threatened or endangered species, resource managers and the public may be very concerned about conversion of habitat type.

Cumulative positive, neutral, or negative effects may also arise temporally. For example, vegetation treatments may be detrimental for some species in the short-term but lead to long-term improvements in habitat quality, or help prevent other long-term detrimental effects such as habitat loss or change in plant community species composition from wildfire. In addition, impacts can be seasonal in nature depending on habitat use.

Overall, it is impossible to precisely specify at the scale of the state or region both the biophysical and economic ramifications of interaction between disturbance and biological resources. In the case of fire as an agent of disturbance, a number of experts have indicated that when one considers qualitatively the effect of fire (prescribed and otherwise) on biological resources, fire regimes, and wildland habitats at the scale of the state, it is likely that fire, at least over the short term, has had a net neutral if not beneficial effect (Sugihara et al., 2006). On the other hand, specific fires in specific places at specific times can have significant adverse effects on particular species and/or their habitat. Given the dynamic nature of vegetation and population response, these effects are of the greatest concern for species near the lower bound of population viability (i.e., state and federally listed species).

Cumulative effects occurring at the scale of the state or the region may not inform project level cumulative effects analysis. The Project Scale Analysis (Chapter 7) developed as part of this Program EIR is designed to provide guidance to project scale cumulative effects analysis. Cumulative effects, either negative or positive, can potentially impact individual species of concern, the distribution and sustainability of special habitat elements, wildlife, vegetation structures, and other biological resources. Cumulative effects attributable to these kinds of impact mechanisms are generally most reliably assessed at the scale of the individual project and lands immediately adjacent. In some cases, information from larger regional studies is needed to supplement information on the local project area.

The VTP Program EIR cumulative impact analysis, conducted at the scale of the watershed or bioregion, identifies and assesses impact mechanisms that may influence landscape scale biological resource issues such as wildlife movement or habitat capability across broad regions, likelihood of genetic interchange, change in plant community composition as a result of non-native species establishment, or change in species distribution. Recognition of the scalar nature of assessment and management is not a new concept to existing resource management institutions. For example, the federal Endangered Species Act envisions the maintenance and recovery of ecosystems upon which threatened, endangered, or candidate species exist as the preferred approach over individual species management. Similarly, recognition of the interaction of human-altered or working landscapes and wildlands is central to the science of landscape ecology and the sustainability of biological diversity.

Riparian function encompasses a wide variety of processes (hydrologic, geomorphic, biotic) across a range of spatial and temporal scales. These processes interact to ultimately determine the character of the riparian zone and aquatic habitat quality. The metering of sediment, water flow, and structural complexity of the stream environment is a function of the underlying geology, topography, and condition of adjacent vegetation both near the stream and in upland environments. Vegetation management practices have the potential to alter these ecological processes directly within the riparian zone or indirectly through management of uplands. Vegetation management activities may result in or contribute to significant adverse effects to aquatic species through 1) changes in stream temperature, 2) increased sediment and other water quality parameters (e.g. dissolved oxygen, nutrients etc.), 3) altered composition and abundance of fish, amphibians and other aquatic species, 4) unstable stream banks, 5) reduction of in-stream structural complexity, 6) reduction in large woody debris recruitment, and 7) altered peak and base flows. Strategies to address these potential adverse effects will vary regionally and protections or management of riparian zones is ultimately dependent on state and federal regulations in effect, site specific variation in vegetation composition, site-tree height, geology, slope, and other baseline conditions.

The potential for cumulative effects arising from vegetation treatment program practices on water quality (e.g., sediment load, water temperature, and water quality) are addressed in Section 5.5.4. This section considers the recruitment potential of large woody debris, riparian canopy condition, and effects of vegetation management along the continuum of stream classification as a determinant of habitat quality for aquatic species, particularly salmonid and amphibian populations.

5.5.1.1 Significance Criteria

Appendix G of the CEQA Guidelines (the CEQA Environmental Checklist) specifies that the Program and Alternatives would have a significant adverse effect to biological resources if any of them would:

A. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.
B. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.
C. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
D. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
E. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
F. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

For a variety of ecological questions and conservation issues, a regional scale analysis as done for this document can provide guidance to examine trends and spatially explicit landscape design concepts when data is available. For other questions and conservation issues, more detailed analysis is necessary and must be carried out at the scale of the watershed or other planning unit. The regional or program scale disclosure provided within this document is intended to examine the likelihood of a bioregional or statewide cumulative effect, but also to provide context to the determination of cumulative effects at the project scale. Project scale cumulative effects analyses may make findings specific to project level implementation that support or disagree with those made at the program scale.

Bioregions were used to determine percent ground disturbance attributed to both current and future conditions under the proposed VTP and the relative contribution of the proposed VTP to other similar ground disturbing programs. The analysis assumes that historic ground disturbing activities and acreage affected will continue at a similar rate in the future. Vegetation acreage is limited in extent to those types potentially treated. Additionally, no attempt was made to account for the relative differences in the rate of recovery that is specific to the type of vegetation treated. For example, grass

dominated systems frequently attain pre-project conditions in less than five years while other vegetation types may take markedly longer to attain pre-project conditions.

Statewide, annual VTP acres disturbed is about 0.08 percent of the treatable vegetation acres (see Table 5.3-1). At the scale of the bioregion, annual VTP acreage disturbed ranges from 0.01 percent in the Mojave to 0.18 percent in the Bay Area/Delta (Table 5.5-1).

Table 5.5-1 Percent of Total Treatable Vegetation Disturbed by the VTP

Bioregions	VTP Disturbed
Bay Area/Delta	0.18%
Central Coast	0.13%
Colorado Desert	0.02%
Klamath/North Coast	0.09%
Modoc	0.10%
Mojave	0.01%
Sacramento Valley	0.14%
San Joaquin Valley	0.07%
Sierra Nevada	0.09%
South Coast	0.12%
Average Totals	0.08%

Because of the amount of acreage eligible but not receiving treatment under the VTP, the proposed Program would likely result in a less than significant cumulative effect on biological resources at the bioregional scale. Wildfires would continue to occur in California, having both negative and positive effects on biological resources and wildlife habitat condition; the magnitude of effect being dependent on a wide suite of physical, biological, and climatic variables.

It is unlikely that sufficient acreage will be treated under the VTP as proposed to result in a measurable cumulative impact over the no treatment option when assessed at the scale of a bioregion.

There may indeed be the potential for adverse effects on biological resources to occur at a localized scale that will need to be addressed at the project level through the use of the Project Scale Analysis (Chapter 7) and consultation with subject matter experts as needed. In general, VTP-treated acreage will not be extensive enough, or result in significant alteration of treated vegetation types, to result in a negative cumulative effect to biological resources when considered with other land management activities at the bioregion or statewide scale. Implementation of the Standard Project Requirements (Section 2.5) and any Project Specific Requirements identified through the Project Scale Analysis (Chapter 7) will further reduce the likelihood that any project or combination of projects will result in a negative cumulative effect on biological resources either locally or at the bioregional scale. Indirect effects of desired fuel condition and vegetation regeneration diminish over time as treated areas, in the absence of retreatment or wildfire, recover pretreatment vegetation structure. Rate of change is dependent on a large number of environmental variables and short or long term effects on a given species are similarly variable.

VTP projects that result in an extensive, long term, or permanent type conversion are most likely to result in a measurable or significant contribution to negative cumulative effects to the wildlife community. VTP projects implemented in grass and forb dominated plant communities generally return to pretreatment conditions within a few years, although change in species composition is a concern at the scale of the project. Similarly, VTP projects in tree dominated communities typically focus on modification of midstory or understory vegetation structure or alteration of tree overstory canopy closure levels. Long term or permanent type conversion is most likely in shrub dominated plant communities that are not fire adapted and/or are vulnerable to the establishment and expansion of competing non-native species post treatment. Conversion of shrub dominated habitat may, in conjunction with other similar shrub land disturbing land use effects, result in a negative cumulative effect on shrub dwelling fauna. However, the likelihood of multiple projects occurring in the same watershed or otherwise in close proximity temporally and thus contributing to a significant "cumulative effect" is very low given the small number of possible VTP projects in shrub land habitats and implementation of Standard Project Requirements, such as BIO-5 (Chapter 2.5), intended to minimize project level impacts to the bioregion. Cumulative effects identification and development of appropriate mitigation or management measures, including avoidance, is most effectively done at the scale of the project when the spatial and temporal juxtaposition of multiple project effects can be evaluated.

5.5.1.2 Determination of Significance

The following section evaluates potential cumulative effects to biological resources arising from implementation of the Proposed Program or the Alternatives. The potential for a cumulative effect is discussed for each significance criterion listed above.

CRITERION A – CANDIDATE, SENSITIVE, OR SPECIAL STATUS SPECIES

Potential to have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a listed, candidate, sensitive or special status species in local or regional plans, or regulations, or by California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

The California Department of Fish and Wildlife annually documents the status of rare, threatened and endangered species and identifies threats to these species. California is the most biologically diverse state in the contiguous United States and has the largest state human population. As a result, threats to the continued existence of native species and the natural communities on which they rely are also increasing.

Habitat modification, non-native species, and water withdrawals are frequently mentioned threats to these species (CDFW, 2005). When categories of threat were ranked by CDFW, urbanization of the state's wildlands poses the greatest threat to the continued existence of the endangered flora and fauna (CDFW, 1991). Other significant threats to plants include effects associated with livestock grazing, off-road vehicles, conversion of native habitats to agriculture, competition with non-native plants, and road construction/maintenance. Effects from logging were ranked 17th in the 21-category list of threats to state-listed plants (CDFW, 1991). Other significant threats to animals include effects associated with water projects, introduced predators and competitors, conversion of native habitats to agriculture, livestock grazing, environmental contaminants, and flood control activities. Effects from logging were ranked 11th in the 18-category list of threats to state-listed animal species (CDFW, 1991). It is presumed that effects from fuel reduction treatments are generally less intensive then those from commercial timber operations, but there can be exceptions depending on the project objectives and treatment methods.

Wildfires typically influence markedly greater amounts of acreage than that to be treated under the proposed VTP or any of the alternatives. The likelihood of reduction in number or distribution of plant or animal species of concern is potentially markedly higher under large and uncontrolled land disturbance events like those arising from wildfire. Effects of wildfire are varied and include influence on animal movements, direct mortality, seed dispersal, and enhancement of habitat for non-native invasive species. VTP projects are unlikely to reduce the number or distribution of plant or animal species of concern as assessed at the scale of the bioregion. VTP program contributions to cumulative effects of land disturbing events that reduce the number or range of species of concern is negligible and may result in an overall but immeasurable beneficial effect to the degree that wildfire events are reduced in frequency, extent, or intensity.

TERRESTRIAL WILDLIFE

Terrestrial wildlife and plant populations can be extirpated or fall to levels where formal listing is warranted if habitat conditions are degraded to a point that populations are no longer self-sustainable. However, it is unlikely that VTP treatment acreage in conjunction with other similar programs and vegetation treatment efforts will be sufficiently extensive and concentrated in time and space to threaten population sustainability or eliminate a plant or animal community. Statewide, average annual acreage disturbed by the proposed Program (60,000) would represent approximately 0.25 percent of the acreage available for treatment (Table 3.3-1). Significant cumulative direct and indirect effects on listed, sensitive, and common species are not expected to occur for several reasons.

- The potential for cumulative direct and indirect effects is minimal given the relatively small average size of VTP projects (260 acres) and low likelihood of temporal and spatial adjacency to similar effects from non-VTP management efforts.
- Implementation of SPRs, PSRs, and implementation of the PSA, to eliminate direct effects or reduce indirect effects to a negligible or less than significant impact on special status species at the scale of the project. Similar avoidance measures and mitigations are routinely employed by other agencies as required by statute and through environmental review.
- Species considered common and terrestrial plant and animal communities will not experience sufficient cumulative habitat alteration from the VTP and other similar vegetation treatment programs to threaten plant or wildlife population or community sustainability given the spatial and temporal limits described above.
- Duration of cumulative effects is further ameliorated by recovery and re-occupancy rate of populations and habitat structure. Rate of response will vary by species and pre-treatment vegetation structure, condition of untreated or adjacent habitat, and treatment method. Grasslands would again be candidate for treatment in as little as 3 years after the initial treatment. Shrublands and forestlands (given treatment of the shrub component of the latter) may again be suitable for treatment 10 years after the initial treatment, but is highly variable depending on site conditions.

INVASIVE SPECIES

The introduction of exotic species can be a serious threat to native plant and animal communities. Invasive non-native species alter ecosystem structure, composition, and processes and out-compete and exclude native plants and animals. Those non-native species that have successfully established themselves and expanded their range in California’s diverse environments have had far reaching effects. These effects include direct competition or hybridization with and subsequent exclusion of native species, and also as an agent for the change of ecosystem function. Ecosystem effects include alteration of disturbance regimes, such as frequency and intensity of fire and potential changes in soil erosion rates. VTP objectives and those of other similar programs are to reduce fuel accumulations and potential for large scale disturbance events and conditions suitable for establishment of invasive species. Implementation of SPRs BIO-8 and BIO-9 will additionally limit the introduction or movement of invasive species at the project scale (Chapter 2.5).

SNAGS AND LARGE, DOWNED LOGS

Snags (standing dead trees) and downed logs (portions of or entire trees that have fallen to the ground) have been shown to have significant positive habitat value for many plants and animals and are considered “special habitat elements.” This term refers to specific physical and biological attributes of the landscape without which certain species either are not expected to be present or will exist in greatly reduced numbers (Mayer and Laudenslayer, 1988). Snags, downed logs, and the capability of the land to produce these elements over time are of particular concern because adequate numbers, size, and decay classes of these habitat elements are required for the long-term persistence of dependent wildlife species. Significant reductions in the amounts of coarse woody debris and downed logs below desired levels impair habitat value, forest productivity, and biological diversity (Spies and Cline, 1988). Standard Project Requirements HYD-3, HYD-4, and FBE-1 are designed to mitigate the impacts of VTP projects through the retention of core areas of undisturbed vegetation in watercourse buffer zones, and burn intensities below those expected to consume large, downed logs (Chapter 2).

CRITERION A – DETERMINATION OF SIGNIFICANCE

Pre-project scoping at the scale of the project and, if necessary, implementation of surveys to determine species’ presence will assess the likelihood of project level impact to species of concern (BIO-2, BIO-3, and BIO-4). Implementation of SPRs and the PSA will further provide for the protection of plant and animal species of concern. When considered at a bioregion or program scale, the relatively small amount of acreage treated, recovery potential of plant communities treated, and implementation of the PSA (in combination with other land disturbing activities and mitigation measures at the bioregional scale) results in a **less than significant** VTP contribution to cumulative effects. For example, the proposed Program’s ten year treatment acreage compared to the treatable acres within each of California’s bioregions ranges from 0.04 percent in the Colorado Desert Bioregion to 0.59 percent in the Klamath/North Coast Bioregion (Table 3.3-1).

No terrestrial wildlife or plant populations are expected to drop below self-sustaining levels as a result of VTP implementation. Similarly, no terrestrial community will be eliminated. Analysis of the direct and indirect effects associated with the proposed VTP and Alternatives concluded that for representative species of concern, no alternative would result in a significant effect after application of identified PSRs. In general, conditions for terrestrial and aquatic species are expected to show continued improvement over time as plant communities are incrementally protected from the effects of unnaturally large and intense wildfire and as plant communities adapted to periodic disturbance are reintroduced to this important driver of ecosystem processes.

Land disturbance activities resulting from any of the VTP vegetation treatment options and other cumulative action have the potential to create or enhance land conditions that facilitate the establishment or spread of non-native invasive species. Although treated acreage within the proposed Program and Alternatives is low relative to other land disturbing management activities at the bioregional scale, range expansion of non-native invasive species into new areas could, considering difficulty of plant control and area affected, result in a significant cumulative effect. VTP management actions may also decrease the frequency, extent, or severity of wildfire and as a consequence the extent of disturbed landscape available for establishment of non-native invasive species. Similarly, VTP projects can be developed to specifically target non-native invasive weed infestations as part of larger invasive plant control efforts. Project level mitigation and management practices are designed to reduce the probability of introduction, establishment, and spread of non-native invasive species. These practices include minimization of ground disturbance, treatment timing depending on plant composition at the treatment site, pre-project surveys, and post-project monitoring and follow-up action as appropriate. When assessed at the scale of the bioregion, VTP contributions to the cumulative effect of land disturbing events that create conditions favorable to the establishment or expansion in range of invasive non-native species is **less than significant**. The VTP may result in an overall but immeasurable beneficial effect to the degree that infestations are controlled as a project objective or wildfire events are reduced in frequency, extent, or intensity.

Project alternatives that utilize prescribed fire as a vegetation treatment method have the potential to influence the retention of existing snag or downed log densities. Depending on prescribed burn fire intensity, snag or downed log size, location in treatment units, topography, and other site specific conditions, degree of consumption of these forest features by fire would be variable. Cumulative, direct, and indirect effects to the quality and frequency of occurrence of these forest structural elements are determinations made at the scale of the project. With SPRs in place, at the scale of the bioregion the cumulative effects of VTP treatments and related activities on snag and downed log densities are expected to be **less than significant**. It is possible for cumulative effects to occur locally but not be detected at the broader bioregion scale, but with PSRs put into place as a result of a Project Scale Analysis the cumulative effects of VTP treatments and related activities on snag and downed log densities are expected to be less than significant at the project level.

The cumulative impact of the proposed Program, Alternatives, and other related activities on candidate, sensitive, or special status species is considered **less than significant** with implementation of the Standard Project Requirements (Chapter 2.5) and any Project Specific Requirements identified through the Project Scale Analysis (Chapter 7).

CRITERION B – RIPARIAN HABITAT OR OTHER SENSITIVE NATURAL COMMUNITIES

Substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service.

It is highly unlikely that watersheds supporting listed species or water bodies designated as impaired relative to beneficial uses are the product of a single impact associated with one specific land use at a particular time. These watersheds and status of the resource values they support are therefore, by definition, the product of the cumulative effect of a variety of historic and contemporary land use practice effects and the rate of ecosystem recovery. The objective of the VTP Program EIR cumulative effects analysis is to assess the likelihood that effects remaining after implementation of VTP projects and required management and mitigation measures will result in a less than significant impact when assessed at the scale of the bioregion.

A large number of environmental variables influence the structure and function of aquatic and riparian systems. Working landscapes generally exhibit a wide range of conditions and are the result of historical and contemporary practices. Other lands may exhibit minimal disturbance with little or no evident effects to aquatic and riparian resources values. Within forest and rangelands, major concerns vary by watershed and are typically assessed as “limiting factors,” or inputs to aquatic and riparian systems that limit the ability of the ecosystem to function at a level that produces desired values and products. These factors include: sediment input, large woody debris recruitment and delivery, stream bank stability, temperature, condition of headwater environments, and forest canopy nutrient input to stream ecosystems.

Little comparative baseline data is available to address long-term amphibian population trends in the western United States and California. True frog and toad species have exhibited the most significant declines. Forty percent of the toad species (four of ten) and 88 percent of the native frog taxa (seven of eight) have been removed from at least 45 percent of their historic California distribution (CDFW, 2005). It is likely that a number of different factors are contributing to the documented declines. One possible explanation suggests that the long-term cumulative effects of multiple factors, where natural low points in amphibian population cycles synergize with widespread environmental alterations (e.g., extended drought, chemical pollutants, predation by and competition with non-native species, and disease) will create extinction events. Species occurring in aquatic habitat types such as springs, seeps, marshes, and small headwater streams are at the greatest risk for continued population decline. Degradation and reduction of aquatic habitats has occurred statewide but some regions have experienced greater levels of habitat loss.

The status of salmon populations and their habitat can be taken as one measure of change in aquatic and riparian resource health. Annual estimates of salmon population levels exhibit marked variation due to a large number of interacting environmental conditions. These include specific stream habitat availability to accommodate freshwater life history requirements, water quality and availability, rainfall pattern as an influence on stream flow and juvenile migration rate, oceanic conditions during early residence, level of commercial and recreational harvest, and historic and current land use activities (e.g., agriculture, timber management, and urbanization). These and other environmental conditions have resulted in long-term downward trends in population for specific salmon stocks and for some, formal listing under the California and/or federal Endangered Species Act.

Regional Water Quality Control Boards (RWQCBs) are required to identify water bodies with impairments to beneficial uses using a method termed Total Maximum Daily Load (TMDL). This process identifies miles impaired, pollution types, and pollution sources. The RWQCBs then develop implementation plans to improve water quality. A review of the 2010 TMDL impairment lists reveals that California has over 29,000 miles of impaired streams. This represents about 16 percent of the total miles of streams and rivers in California. Impairment information for RWQCB watersheds provides a description of the cause of pollution that result in impairment. Most watercourses have many different potential causes, but do include Silviculture, rangeland grazing, and/or agriculture as at least one of the causes of impairment. A high percentage of watercourses also include impairments identified as unknown, indicating uncertainty in identifying nonpoint pollution sources (US EPA, 2015).

SEDIMENT

Stream bank erosion is a natural process that occurs sporadically in forested and non-forested watersheds (Richards, 1982). Under natural conditions, this process is part of the normal equilibrium of streams. The forces of erosion (water), resistance (root strength and bank material), and sediment transport maintain an important balance. Human activity can accelerate stream bank erosion.

The roots of riparian vegetation help bind soil together, which makes stream banks less susceptible to erosion. Riparian vegetation can also provide hydraulic roughness elements that dissipate stream energy during high or overbank flows, which further reduces bank erosion. In most cases, vegetation immediately adjacent to the stream channel is most important in maintaining bank integrity (FEMAT, 1993); however, in wide valleys with shifting unconfined stream channels, vegetation throughout the floodplain may be important over longer periods.

Riparian vegetation also can provide hydraulic elements that dissipate stream energy during high or overbank flows, which further reduces bank erosion. Although there is limited data quantifying the effective zone of influence relative to root strength, Forest Ecosystem Management Assessment Team (1993) concluded that most of the stabilizing influence of riparian root structure is probably provided by trees within 0.5 potential tree height of the stream channel. Overall, buffer widths for protecting other riparian functions (e.g., large wood recruitment and shading) are likely adequate to maintain bank stability if they are performing most of those functions (see HYD-3 in Chapter 2.6).

Harvesting of trees adjacent to streams can lead to a loss of root strength, thus making stream banks more susceptible to erosion. Important alterations of the system components that may result from timber harvesting activities include: 1) removing trees from or near the stream bank; 2) changing the hydrology of the watershed; and 3) increasing the sediment load, which fills pools and contributes to lateral scour by forcing erosive stream flow against the stream bank (Pfankuch, 1975; Cederholm et al., 1978; Chamberlin et al., 1991). With respect to the northern California coast, it is noteworthy that redwoods, the dominant conifer along many streams, re-sprout following harvesting. As a result, decreases in redwood root strength are typically lower than in other forest types.

VTP management practices which may influence stream bank stability are not readily assessed at the scale of the bioregion. Stream bank erosion is largely a localized process and determining relative contribution of effects that result in a significant cumulative effect contribution and assessed at the scale of a bioregion is not possible. Implementation of HYD-3 (watercourse buffers) is likely to provide adequate protection from VTP projects contributing to stream bank erosion processes.

Wildfire consumption of upland vegetation and post wildfire increases in stream discharge can result in stream bank instability depending on stream size, wildfire impact on streamside vegetation, and other environmental variables. To the degree that VTP projects reduce the frequency, extent, or intensity of wildfire, stream bank stability is likely benefited.

LARGE WOODY DEBRIS

Large woody debris from coniferous trees is an important determinant of stream structural complexity particularly in areas where geology and topography do not provide for other instream structural elements such as boulders. Numerous studies have shown that large wood is an important component of fish habitat (Swanson et al., 1976; Bisson et al., 1987). Trees entering stream channels are critical for sediment retention (Keller and Swanson, 1979; Sedell et al., 1988), gradient modification (Bilby, 1979), structural

diversity (Ralph et al., 1994), nutrient production (Cummins, 1974), and protective cover from predators.

The potential for trees to enter a stream channel from tree mortality, windthrow, and bank undercutting in the riparian zone is mainly a function of slope distance from the stream channel in relationship to tree height. As a result, the zone of influence for large wood recruitment is determined by specific stand characteristics rather than an absolute distance from the stream channel or floodplain. Slope and prevailing wind direction are other factors that can affect the amount of large wood recruited to a stream (Spence et al., 1996).

May and Gresswell (2003a) examined the relative contribution of processes that recruit and redistribute large wood in headwater streams. Stream size and topographic setting strongly influenced processes that delivered wood to the channel network. In small colluvial channels draining steep hillslopes, processes associated with slope instability and windthrow were the dominant means of large wood recruitment.

Reid and Hilton (1998) documented wood recruitment source distances for a steep headwater second growth redwood watershed. They reported that about 90 percent of the instances of large wood input occurred from tree falls within 35 meters (115 feet) of the channel in un-reentered second growth redwood/Douglas-fir forests in the North Fork of Caspar Creek, located in western Mendocino County.

FEMAT (FEMAT, 1993) concluded that the probability of wood entering the active stream channel from greater than one tree height is generally low. Two widely used models of large wood recruitment also assume that large wood from areas outside one tree height seldom reaches the stream channel (Van Sickle and Gregory, 1990; Robison and Beschta, 1990). Additional studies support the contention that most large wood is recruited from within 20 meters (66 feet) to 40 meters (130 feet) of the channel bank. For example, Benda et al (2002) reported that in the absence of landslides, wood recruitment in both old-growth and second-growth forests in Humboldt County study sites originated from within 20 to 40 meters of the stream. The four main input mechanisms for their second-growth forest sites in the Van Duzen River watershed included bank erosion, mortality, landslides, and anthropogenic (or logging related), and averaged 18, 21, 13, and 50 percent, respectively.

The potential size distribution of large wood is also an important factor when considering the appropriate activities in buffer strips relative to large wood potential recruitment. Larger pieces of wood form key structural elements in streams, which serve to retain smaller debris that would otherwise be transported downstream during high flows (Murphy, 1995). The size of these key pieces is approximately 12 inches or more in diameter and 16 feet in length for streams less than 16 feet wide and 24 inches or

more in diameter and 39 feet in length for streams greater than 66 feet wide (Bisson et al., 1987). As a result, riparian management zones must ensure not only an appropriate amount or volume of wood, but wood of sufficient size to serve as “key pieces.”

Coniferous large wood significantly outlasts deciduous large wood in the stream system (Harmon et al., 1986; Grette, 1985). Simply setting aside buffers of second-growth hardwoods does not provide optimal large wood input over the short term, because unassisted recovery of these areas to pre-logging coniferous large wood recruitment levels may take 100 to 200 years.

Land management and VTP activities that influence tree growth rate, stand density, and mortality rate will determine recruitment of aquatic large woody debris (greater than 10cm in diameter and greater than 1 meter in length) (Naiman et al., 2002). Ultimately, a sustained balance must be established between forest stand development through phases of stem exclusion (natural tree mortality and adjustment of stand tree density) or periodic pre-commercial/commercial thinning and the rate at which other means of tree mortality, such as windthrow, fire, and lateral bank undercutting (among others) recruits trees of a desired species and size to the aquatic environment. These riparian forest stand composition variables are further influenced by site specific variables such as existing forest stand structure and composition, soil productivity, influence of competing vegetation, stream size and ability to transport large woody debris material, and current large woody debris loads and residence time.

VTP thinning in conjunction with other land management actions conducted in the riparian zone have the potential to either enhance or diminish development and recruitment of large woody debris to the aquatic environment depending on silvicultural prescription applied, degree of impact to existing trees, and the ecological variables previously described. VTP management practices which may influence aquatic large woody debris development and recruitment potential are not readily assessed at the scale of the bioregion. Projects with that potential are expected to be uncommon, small in extent, and distributed over a wide area.

Wildfire consumes debris jams and reduces overall wood volume, and post wildfire increases in stream discharge increases the transport and accumulation of existing large woody debris (Berg et al., 2002). To the degree that VTP projects reduce the frequency, extent, or intensity of wildfire, aquatic large woody debris presence is likely benefited.

HEADWATER ENVIRONMENTS

Headwater streams and drainages (Forest Practice Rule Class II and III) are areas that contribute to stream ecosystem function. These areas can represent 60-80 percent of

total channel length in mountainous terrain (May and Gresswell, 2003a). These small streams contribute structural components such as large woody debris, spawning gravels and stream substrate, and invertebrate and detritus inputs. These sites also contribute to water quality and provide for storage of potentially deleterious fine sediment. Similarly, they can have a strong influence on the rates of sediment and wood delivery to larger watercourses, and consequently, habitat value for a variety of aquatic and semi-aquatic vertebrates and other biota (Welsh and Ollivier, 1998). Management approaches aimed at restoration and management of watershed processes, rather than individual habitat characteristics, may be more effective in developing complex stream channel structure (May and Gresswell, 2003b). The underlying assumption is that movement toward restoration of natural processes and levels of sediment production, large woody debris recruitment, and other stream function processes will be positive for stream biota.

The structure and function of stream ecosystems has been extensively studied and reinforces the concept of the “river continuum” (Vannote et al., 1980) – that energy and organic material inputs to stream processes change in a predictable way along the stream course from headwaters to downstream reaches. A variety of land uses, including timber harvest and forest management, can influence background erosion and sedimentation regimes, recruitment of large woody debris and other ecological processes. The delivery, residence time, and transport of these additional sediments and woody debris influence stream channel conditions and associated biota. Change in vegetation in the vicinity of headwater streams can markedly alter the function of these stream types and those larger stream systems supported. Change in the efficiency of the channel to recharge groundwater, meter trapped sediments and water flow, and process organic material and other nutrients for use by aquatic biota downstream can be expected. Past management practices that reduced local sources of wood and rate of wood recruitment increase the relative importance of wood contributed by debris flows in colluvial tributaries where this means of recruitment occurs. Most debris flows in the northern California Coast Ranges originate from zero-order colluvial-filled hollows. The principle influence of vegetation along Class III channels on the mobilization of debris is the presence of in-channel large trees that could slow or stop mobilized sediment and debris under some circumstances or contribute large wood at other times. Because debris flow potential is not universal, watercourse and lake protection zone (WLPZ) boundaries cannot be used as a surrogate to actual site inspection for potential zones of failure.

Type disturbance has markedly different results on the structure and function of stream and associated riparian ecosystem processes. For example, floods, fire, and mass wasting events are generally less frequent and result in large localized changes to stream system processes, whereas timber harvest, land conversion, and agricultural

and urban development are more frequent and large scale in effects. Treatment methods associated with the VTP and other similar land management activities can alter headwater stream system function and habitat quality. Significant vegetation removal by any means can release perched sediment deposits, alter habitat quality by filling interstitial spaces in the streambed, and reduce large woody debris and consequently volume of sediment storage capacity. In general, the topographic placement of many headwater stream and seep environments prevent or make impractical vegetation treatment by mechanical means. Similarly, where these environments are accessible to other VTP methods they are effectively avoided or excluded from treatment during project level planning and implementation. Prescribed fire as a vegetation treatment method has the greatest potential to negatively impact these stream environments by removing woody debris, releasing stored sediments and altering vegetation cover, habitat conditions, and microclimate.

Because of the small size of headwaters and close connection with uplands, these areas are readily influenced by adjacent land uses. Species that inhabit headwater environments can be especially vulnerable to habitat alteration. These species, such as amphibians and other taxa, generally achieve higher population densities in headwater habitats. In addition, individual species inhabiting headwater habitats generally exhibit low levels of vagility (mobility) sometimes spending their entire life cycle in a few square meters of habitat (Sheridan and Olson, 2003). Recolonization of suitable vacant habitat may require extensive periods of time or, lacking movement into vacant habitat, result in local population extirpation.

Headwater stream reaches, lacking fish populations, provide areas with little or no fish predation pressure to the benefit of several aquatic and semi-aquatic amphibians. Amphibians that breed primarily in stream habitats represent a large component of stream biomass and in the Pacific Northwest may exceed fish in both numbers and biomass (Hawkins et al., 1983). Welsh and Ollivier (1998) examined the effect of sediments on aquatic amphibian densities in coast redwood. Three species were sampled in numbers sufficient to be informative: tailed frog (*Ascaphus truei*, larvae), Pacific giant salamander (*Dicamptodon tenebrosus*, paedomorphs and larvae), and southern torrent salamander (*Rhyacotriton variegatus*, adults and larvae). Densities of amphibians were significantly lower in the streams impacted by sediment. While sediment effects were species-specific, reflecting differential use of stream microhabitats, the shared vulnerability of these species to infusions of fine sediments was probably the result of their common reliance on interstitial spaces in the streambed matrix for critical life requisites, such as cover and foraging. Studies by Diller and Wallace (1996) and Wilkins and Peterson (2000) indicate persistence of headwater amphibians in managed forests and demonstrate the need to focus on importance of

abiotic features such as parent geology, topography and channel characteristics to predict species distribution and responses to disturbance.

FOREST CANOPY NUTRIENT INPUT

Vegetation management practices can lead to changes in leaf litter distribution and dynamics in upland and riparian areas, which in turn affect availability in streams. Harvest intensity (i.e., the proportion of forest canopy removed) and cutting frequency affect the rate of nutrient removal from the system (Beschta et al., 1995).

Detritus enters a stream primarily by direct leaf or debris fall, although organic material may also enter the stream channel by overland flow of water, mass soil movements, or shifting of stream channels. Few studies have been done relating litter contributions to streams as a function of distance from the stream channel; however, it is assumed that most fine organic litter originates within 100 feet or approximately 0.5 tree height from the channel (FEMAT, 1993). In most cases, however, buffers designed to protect most large wood recruitment would likely ensure nearly 100 percent of detrital input. A buffer width of 0.75 of a site-potential tree height is needed to provide full protection for litter inputs (Spence et al., 1996).

Stand age significantly influences detrital input to a stream system. Detrital input from outside the stream channel was estimated to be two times as high in old-growth forests as in either 30- or 60-year-old forests (Richardson, 1992) and could be as much as five times as high in old-growth forests as in recently clearcut forests (Bilby and Bisson, 1992). However, reduced levels of detrital input into streams attributable to streamside timber harvesting is somewhat offset by concomitant increases in detritus production within stream channels (primarily dead algae and other aquatic plant debris). Reduced riparian forest canopy increases light levels and, therefore, the production of algae. The abundance and composition of detritivore (macro-invertebrates that process detritus) assemblages in streams are determined largely by the plant composition of riparian zones (Gregory et al., 1991). Therefore, changing the stand composition may alter the macro-invertebrate composition.

In the North Fork of Caspar Creek within California’s redwood region, most macro-invertebrate and algal variables increased significantly after logging. Macro-invertebrates increased because of increased stream algae. Algae increased because of increased light, water temperature, and nutrients. Logging effects on the North Fork of Caspar Creek biota were often not dramatic because forest practices minimized the effects. The three most important practices that ameliorated the effects were the presence of riparian buffer zones, absence of roads near the stream, and use of cable yarding which minimized soil disturbance (Bottroff and Knight, 1996).

CRITERION B – DETERMINATION OF SIGNIFICANCE

The statewide ten-year average acreage proposed for treatment within the VTP is 600,000 acres, which is 2.4 percent of the approximately 25 million acres available for treatment (Table 3.3-1). This means that there will be very few projects spread over many acres, and the probability of numerous projects occurring in a single watershed is very low, even over 10 years.

Landscape constraints, Standard Project Requirements, and Project Specific Requirements developed as a result of the Project Scale Analysis will, in the aggregate, reduce cumulative impacts to aquatic resources and riparian function to a **less than significant** level as assessed at the scale of the bioregion. Reduction in the occurrence of high severity wildfire as a result of vegetation treatment technique application is expected to provide additional benefits to aquatic resources although to a degree not presently determinable.

The cumulative effects of VTP treatments and related activities on aquatic large woody debris recruitment and delivery mechanisms are expected to be negligible or immeasurable. VTP projects with the potential to make a cumulative effect contribution to existing areas of stream bank instability are expected to be uncommon, small in extent, and distributed over a wide area. With project level management and mitigation measures such as HYD-3, HYD-4, and FBE-1 in place, and as assessed at the scale of the bioregion, the cumulative effects of VTP treatments and related activities on watercourse sediment levels are expected to be **less than significant**.

Headwater stream ecosystems vary greatly in terms of how they function both locally and at a basin scale. This variability manifests itself in differences in channel morphology, hydrologic regime, and riparian and biological characteristics. The variability of these small headwater streams therefore challenges the manager’s ability to predict process and management effects at a large scale (Headwaters Research Cooperative, 2001). Several headwater stream protection measures are described in the Project Scale Analysis (Chapter 7) and include equipment limitation and exclusion zones (HYD-3) and stipulations on the use of prescribed fire (HYD-4 and FBE-1). With project level management and mitigation measures in place, and as assessed at the scale of the bioregion the cumulative effects of VTP treatments and related activities on headwater stream and seep environments, ecological processes, and associated biota are considered **less than significant** and no further mitigation additional to that implemented at the scale of the project is required.

Substantial reduction in forest canopy nutrient input to stream systems is not expected to occur during VTP projects with project level management and mitigation measures in place. Assessed at the scale of the bioregion, the cumulative effects of VTP treatments

and related activities on forest canopy nutrient input to stream systems is considered **less than significant** and no further mitigations additional to these implemented at the scale of the project are required.

The cumulative impact of VTP with other related actions is considered **less than significant** at the scale of the Bioregion with implementation of the Standard Project Requirements (Chapter 2) and any Project Specific Requirements identified through the Project Scale Analysis (See Chapter 7).

CRITERION C – FEDERALLY PROTECTED WETLANDS

Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Wetlands are part of the foundation of our nation's water resources and are vital to the health of waterways and communities that are downstream. Wetlands feed downstream waters, trap floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetlands include swamps, marshes and bogs. Wetlands are often found alongside waterways and in flood plains. However, some wetlands have no apparent connection to surface water like rivers, lakes or the ocean, but have critical groundwater connections (US EPA, 2015).

The government achieves the restoration of former or degraded wetlands under the Clean Water Act Section 404 program as well as through watershed protection initiatives. For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas” (40 CFR 230.3(t)).

The US EPA has identified hydrologic alterations, pollution inputs, and vegetation damage as the primary threats affecting the health and functionality of the nation’s wetlands (US EPA, 2001). Specific actions proposed by the VTP with the ability to impact wetlands are: water diversions (drafting); runoff including sediment, animal waste, nutrients, or pesticides; and vegetation damage by equipment, prescribed fire, or herbivores.

CRITERION C – DETERMINATION OF SIGNIFICANCE

The VTP proposes a number of Standard Project Requirements to reduce the likelihood of substantial adverse effects on federally protected wetlands as defined by Section 404 of the Clean Water Act. Most are associated with activity setback from waterbodies adjacent to the project area, including FBE-1, BIO-10, BIO-11, HAZ-8, HYD-3, HYD-4, HYD-5, HYD-6, and HYD-17 (see Chapter 2.5). With implementation of the Standard Project Requirements, no impacts from the proposed Program or Alternatives are expected. Land management practices, such as Silviculture, that may combine with the impacts of the VTP to create a significant impact follow similar mitigation measures to those proposed by the VTP. No further mitigations additional to those implemented at the scale of the project are required.

The cumulative impact of the proposed Project or Alternatives with other related actions is considered **less than significant** at the scale of the Bioregion with implementation of the Standard Project Requirements (Chapter 2.5) and any Project Specific Requirements identified through the Project Scale Analysis (Chapter 7).

CRITERION D – NATIVE RESIDENT OR MIGRATORY FISH OR WILDLIFE SPECIES

Interfere substantially with the movement of any native resident or migratory species or with established native resident or migratory species corridors, or impede the use of native species nursery areas.

The ability of wildlife to move across the landscape is essential to long-term sustainability of populations and the maintenance of regional biological diversity. In environments that are heavily impacted by urbanization or agricultural land uses, the pattern of habitat loss, associated habitat fragmentation, and disruption of movement patterns has a marked influence on ecosystem processes (Forman, 1997). Conserving well-connected networks of large wildland areas where ecological and evolutionary processes function over large spatial and temporal scales requires adequate landscape connections. Establishing or maintaining linkages between areas of wildland is a well-recognized tenet of conservation biology and positively influences the ability of wildlife populations to respond to stochastic environmental influences such as fire, flood, or non-native species as well as longer term directional effects such as climate change, and maintains long term population viability above that of otherwise isolated wildlife populations.

Countering the effects associated with habitat loss and fragmentation at the landscape scale requires a systematic approach for identifying, protecting, and restoring functional connections. For example, early regional conservation planning for the Northern Spotted Owl identified landscape scale linkages and hypothesized habitat conditions between population centers necessary for successful movement and subspecies

interaction (Thomas et al., 1990). Similarly, the South Coast Missing Linkages Project (Penrod et al., 2003) identified 15 areas where habitat retention was necessary to maintain movement patterns of focal wildlife species across the landscape.

Landscape scale corridor identification or other areas of reproductive importance (nursery areas) are typically an element described in species conservation planning documents such as Habitat Conservation Plans, Recovery Plans and Natural Community Conservation Plans (Criterion F).

CRITERION D – DETERMINATION OF SIGNIFICANCE

Land disturbance activities resulting from any of the vegetation treatment options have the potential to alter the habitat suitability of identified landscape linkages making them unsuitable for movement of certain focal species. Cumulative direct and indirect effects to landscape linkages are a determination made at the scale of the project as described in the Project Scale Analysis (Chapter 7). Alternatively, these same practices have the potential to protect linkages from catastrophic loss or enhance habitat value within those landscape scale features. As assessed at the scale of the bioregion, VTP effects are expected to be negligible or immeasurable. VTP program contributions to cumulative effects of land disturbing activities that interfere substantially with the movement of any native resident or migratory species, or with established native resident or migratory species corridors, or impede the use of native species nursery areas, is **less than significant**. The VTP may result in an overall but immeasurable beneficial effect to the degree that wildfire events are reduced in frequency, extent or intensity. Based on the average size of VTP projects (260 acres), frequency of occurrence, and expected spatial distribution, the cumulative impact of VTP with other related actions is considered **less than significant** at the scale of the Bioregion with implementation of the Standard Project Requirements (Chapter 2.5) and any Project Specific Requirements identified through the Project Scale Analysis (Chapter 7).

CRITERION E – CONFLICT WITH LOCAL POLICIES OR ORDINANCES

Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

County and local governments may have specific policies or ordinances for resources that are not addressed at the state or federal level. Common examples of these are oak retention during development and the time-of-day restrictions on noise generating activities. VTP projects in the proposed Program and Alternatives including mechanical and manual treatments, especially in the WUI, may include activities that would be subject to these ordinances. Standard Project Requirements BIO-5, BIO-6 and NSE-1

would reduce the likelihood that VTP projects would violate these local policies or ordinances. Additional mitigation measures would be developed through the Project Scale Analysis (Chapter 7) as necessary.

CRITERION E – DETERMINATION OF SIGNIFICANCE

The cumulative impact of the proposed Program or Alternatives with other related actions is considered **less than significant** at the scale of the Bioregion with implementation of the Standard Project Requirements and any Project Specific Requirements identified through the Project Scale Analysis (See Chapter 7).

CRITERION F – LOCAL, REGIONAL, OR STATE HABITAT CONSERVATION PLANS

Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan or other approved local, regional or State habitat conservation plan.

Natural Community Conservation Plans (NCCP), authorized under California's Natural Community Conservation Planning Act and Endangered Species Act, as well as Habitat Conservation Plans and other planning vehicles provided for under the federal Endangered Species Act are increasingly being used in California as a means to conserve species of concern. As additional acreage of wildland and wildland-urban interface lands are enrolled under these planning efforts, the potential for off-site and indirect cumulative effects also increases. As of August 2014, 23 active NCCPs covering more than 11 million acres have been issued by the California Department of Fish and Wildlife (CDFW, 2014). As of February 17, 2015 a total of 156 HCPs had been issued within California and Nevada by the US Fish and Wildlife Service according to the Environmental Conservation Online System (ECOS, 2015). Several other types of conservation agreements are also available to address species listed under the federal ESA. There have been 26 Safe Harbor Agreements, 16 Candidate Species Conservation Agreements, and two Candidate Species Conservation Agreements with Assurances issued by the USFWS in California and Nevada (ECOS, 2015).

The NCCP program of the CDFW is an unprecedented effort by the State of California and numerous private and public partners that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. A NCCP identifies and provides for the regional or area wide protection of plants, animals, and their habitats. The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land use. The program seeks to anticipate and prevent the controversies and gridlock caused by

species' listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

The NCCP program is a cooperative effort to protect habitats and species. The program, which began in 1991 under the State's Natural Community Conservation Planning Act, is broader in its orientation and objectives than the California and Federal Endangered Species Acts. These laws are designed to identify and protect individual species that have already declined in number significantly.

Habitat Conservation Plans (HCP) are long-term agreements between an applicant and the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service. They are designed to offset any harmful effects that a proposed activity might have on federally-listed threatened and endangered species. The HCP process allows projects to proceed while providing a conservation basis to conserve the species and provide for incidental take. The purpose of the habitat conservation planning process and subsequent issuance of incidental take permits is to authorize the incidental take of threatened or endangered species, not to authorize the underlying activities that result in take. This process ensures that the effects of the authorized incidental take will be adequately minimized and mitigated to the maximum extent practicable.

CRITERION F – DETERMINATION OF SIGNIFICANCE

VTP projects under the proposed Program will, as part of project planning and completion of the Project Scale Analysis, review applicable local and regional habitat conservation plans. Conflicting objectives will be identified at the project level and resolved through coordination with appropriate State or federal fish and wildlife agencies. In addition, opportunities to further the objectives of local and regional conservation plans through vegetation treatments conducted under the VTP will also be identified and implementation coordinated through appropriate State or federal fish and wildlife agencies (BIO-4, Section 2.5). Therefore, the cumulative effect of the proposed Program and Alternatives, with related programs, will not significantly conflict with established conservation programs or plans. The cumulative impact of proposed Program and Alternatives with other related actions is considered **less than significant** at the scale of the Bioregion with implementation of the Standard Project Requirements (Chapter 2.5) and any Project Specific Requirements identified through the Project Scale Analysis (Chapter 7).

CUMULATIVE IMPACT ANALYSIS FOR ALTERNATIVES CONSIDERED

The scale of the No Project alternative is the same as the proposed Program, but due to implementation barriers, it is expected that the treated acres will be fewer. It is likely the

No Project alternative will have similar impacts on biological resources as the proposed Program, due to the overall lower treated acreage and the use of environmental review procedures.

Because the scale of Alternatives A, B, and C would be the same as the proposed VTP at 60,000 acres treated annually for ten years, with the same vegetation treatment activities by vegetation type expected to occur, Alternatives A, B, and C would have similar impacts as the proposed VTP. These alternatives have fewer acres available for treatment which may increase the likelihood that treatment impacts to biological resources would be condensed in a localized area. Through implementation of the PSA (Chapter 7) and SPRs such as HYD-16 (Section 2.5) the likelihood of impacts at the planning watershed level would be minimized. Therefore, the increases in risk to biological resources attributable to Alternatives A, B, and C would not be cumulatively considerable and the cumulative impact would be less than significant.

Alternative D would treat fewer acres with the same landscape constraints on the placement of treatments (i.e. the same treatable area) as the proposed VTP. This would serve to dilute the impacts on biological resources as a lower percentage of the acres available for treatment would receive treatment in any given year relative to the proposed VTP and Alternatives A, B, and C. Alternative D would also use less prescribed fire than the proposed VTP or any of the alternatives. Relative to biological resources, introducing less fire into ecosystems that have significantly deviated from their natural fire regimes may reduce some of the benefits of the program. However, the other treatment alternatives (manual, mechanical, herbivory, and herbicide) can introduce similar ecosystem impacts and can more finely target vegetation to manipulate, potentially offering greater protection to vegetation desired for retention than prescribed fire would. Therefore, the increases in risk to biological resources attributable to Alternative D would not be cumulatively considerable and the cumulative impact would be less than significant.

5.5.1.3 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that avoids significant impacts to biological resources.

5.5.2 GEOLOGY, HYDROLOGY, AND SOILS

This section summarizes the potential cumulative effects to geologic, hydrologic, and soil resources due to implementing vegetation treatment activities under the VTP and alternatives. Geology, hydrology and soils are also analyzed in Chapter 4.3.

5.5.2.1 Significance Criteria

The significance criteria identified in Chapter 4.3 are used here to evaluate potential cumulative effects. Significance criteria are based on the checklist presented in Appendix G of the State CEQA Guidelines and are the following:

a) Be located on unstable geologic units or soils, including expansive soils; or located on geologic units or soils that could become unstable as a result of the project; resulting in ground failures.
b) Exposure of people or structures to the risk of loss, injury, or death involving landslides.
c) Result in substantial soil erosion or loss of topsoil.
d) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.
e) Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, in a manner that would result in substantial erosion or sedimentation on- or off-site.
f) Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.
g) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map, or other flood hazard delineation map.
h) Place structures within a 100-year flood hazard area that would impede or redirect flood flows.
i) Expose people or structures to a significant risk of loss, injury, or death from flooding, including flooding resulting from the failure of a levee or dam.
j) Inundation by seiche, tsunami, or mudflow.

5.5.2.2 Determination of Significance

5.5.2.2.1 Cumulative Impact Analysis for Program

The following section evaluates potential cumulative effects to geologic, hydrologic, and soil resources arising from implementation of the Proposed Program or the Alternatives. The potential for a cumulative effect is discussed for each significance criterion listed above.

When properly implemented, the majority of SPRs and PSRs result in the implementation of onsite controls that prevent significant cumulative impacts to geologic, hydrologic, and soil resources at the local scale. However, a mechanism in which multiple projects over time and space can potentially lead to significant cumulative impacts to these resources is through the cumulative increase in runoff due to vegetation removal and subsequent decreases in evapotranspiration. Increased runoff from multiple projects over time and space has the potential to trigger several of the significance criteria listed above. Given that the cumulative increase in flow is a

concern for many of these criteria, the potential for these significant increases will be evaluated first and used to evaluate significant cumulative impacts for criterion A through K.

SPR HYD-16 was created to help minimize cumulative vegetation removal-induced increases in flow at the planning watershed scale to non-significance. HYD-16 assumes that flow increases will be kept to a non-significant level if no more than 20 percent of a planning watershed is treated through fuel treatments or logging within a 10-year timespan. The 20 percent vegetation removal threshold is established using information from Grant et al. (2008), which shows that flow increases in small watersheds (less than 3.9 mi^2) are not detectable if vegetation removal is below 29 to 15 percent for rain-dominated watersheds and rain-snow mixed watersheds, respectively. Twenty percent is chosen because it is within the range stated by Grant et al. (2008).

Accurate and recent data on cumulative land use activities at the planning watershed scale was not available at the statewide scale. However, bioregion lumped data on past, present, and foreseeable activities is available from Section 5.3. Table 5.3-8 shows the annual average acreage of federal vegetation treatments, private logging and fuel reduction treatments, and wildfire, along with the projected VTP acreage by bioregion. By removing wildfire, the potential for significant impacts can be evaluated for the VTP along with past, present, and foreseeable projects (Table 5.5-2). Multiplying the annual average acreage by 10 and dividing by the total treatable area within each bioregion provides an estimate of bioregion-averaged percent disturbance across a 10-year time span. Table 5.5-2 indicates that the 20 percent disturbance threshold is not exceeded for any bioregion over a 10-year timespan. The bioregions with the highest potential for exceeding the 20 percent threshold over a 10-year timespan are the Modoc, Sierra Nevada, Sacramento Valley, and Klamath/North Coast (Table 5.5-2). Of these bioregions, only the Sierra Nevada and Klamath/North Coast overlap with geomorphic provinces that have a higher potential for hydrogeomorphic impacts (i.e., the Sierra Nevada, northern portion of the Coast Ranges, and the Klamath Mountains).

Table 5.5-2 Cumulative Disturbance Projections

Bioregions	Federal Projects	Projected VTP Projects	Combined Projects	Treatable Vegetation Acres*	% of Area Annually Distrubed	% of Area Annually Distrubed
Bay Area/Delta	37,008	5,855	3,922	3,200,408	1.46%	14.62%
Central Coast	33,037	8,904	2	6,949,833	0.60%	6.04%
Colorado Desert	39,587	988	0	4,663,190	0.87%	8.70%
Klamath/North Coast	27,499	11,650	140,667	13,644,543	1.32%	13.18%
Modoc	22,137	7,175	98,528	7,176,933	1.78%	17.81%
Mojave	30,900	2,573	263	18,719,988	0.18%	1.80%
Sacramento Valley	23,130	2,364	0	1,641,127	1.55%	15.53%
San Joaquin Valley	17,830	1,877	0	2,658,732	0.74%	7.41%
Sierra Nevada	16,516	13,411	243,492	15,588,940	1.75%	17.54%
South Coast	14,126	5,204	121	4,392,490	0.44%	4.43%
Average Totals	**261,772**	**60,000**	**486,994**	**78,636,184**	**1.03%**	**10.28%**

To assess the potential for the Proposed Program to increase the percent of treated area above 20 percent threshold across the range of planning watersheds, generalized information about Calwater planning watersheds is used. There are 7,035 Calwater planning watersheds in California, of which 5,600 Calwater planning watershed contain more than 2 percent of its area in SRA. Calwater planning watersheds range in size from 3,000 to 10,000 acres. The VTP proposes to treat 60,000 acres per year. With an average project size of 260 acres, this comes to approximately 230 projects per year. The small number of projects relative to the number of planning watersheds available for project activities indicates a small percentage of watersheds will be disturbed in any given year by the proposed VTP.

Given the range of acreage for planning watersheds, and assuming an even distribution of all other types of past, present, and foreseeable activities across all 7,035 planning watershed, it would be expected that between zero to three projects could be implemented in a planning watershed over a ten year period before the 20 percent disturbance threshold is reached. The highest likelihood for exceeding the threshold is in the smallest planning watersheds with the highest levels of past, present, and foreseeable activities. Exceeding the 20 percent threshold doesn't automatically trigger a significant cumulative impact; rather it requires additional analysis at a more appropriate scale and with a higher level of rigor than can be accomplished at the Program scale.

CRITERION A – BE LOCATED ON UNSTABLE GEOLOGIC UNITS OR SOILS

Be located on unstable geologic units or soils, including expansive soils; or located on geologic units or soils that could become unstable as a result of the project; resulting in ground failures.

Project scale unstable geologic units or unstable soils are mitigated through the use of SPR GEO-1 (see Section 2.5). GEO-1 reduces significant impacts to unstable geologic units and unstable soils by requiring either a Registered Professional Forester (RPF) or Professional Geologist (PG or CEG) to identify unstable areas or soils during the project planning phase, and avoiding the features during project implementation. Avoidance measures will prevent significant impacts by avoiding ground disturbance within the unstable features, avoiding the removal of vegetation that provides rooting strength to the unstable area, and avoiding hydrologic changes that can increase the susceptibility of failure for the unstable feature.

Under the proposed VTP, unstable geologic units or unstable soils can only be included within the project area if a Certified Engineering Geologist provides a geologic report stating that the proposed activities will not result in an adverse significant impact to unstable features. Additional SPRs that help reduce the significance of project activities to unstable geologic units and unstable soils within a project area include FBE-1, HYD-3, HYD-4, HYD-5, and HYD-7.

A mechanism in which multiple activities over time and space can potentially lead to significant impacts to unstable geologic units and/or soils is through the cumulative increase in runoff due to vegetation removal and subsequent decreases in evapotranspiration. If the increased runoff is delivered to the watercourse network, there is the potential that flow can undercut steep, watercourse-adjacent hillslopes; triggering debris sliding (Reid, 2010). This phenomenon is typically associated with inner-gorges – a landform common in tectonically active areas (Reid, 2010). Under GEO-1, inner gorges within the project area will be avoided or will be assessed and mitigated using PSRs designed by a CEG. Despite this, inner gorges within the project area and downstream of the project areas are potentially susceptible to failure by fluvial undercutting. By implementing SPRs FBE-1, HYD-3, HYD-4, HYD-5, HYD-7, and HYD-16 the cumulative impacts of the Program to Criterion A would be reduced to **less than significant.**

CRITERION B – EXPOSURE OF PEOPLE OR STRUCTURES TO THE RISK OF LANDSLIDING

Exposure of people or structures to the risk of loss, injury, or death involving landslides.

The SPRs mentioned in Criterion A are used to prevent the triggering of landslides on unstable areas or soils. By incorporating the SPRs mentioned for Criterion A, the

Program will prevent significant cumulative impacts of landsliding to people or structures. The cumulative impacts of the Program to Criterion B would be considered **less than significant.**

CRITERION C – SOIL EROSION OR LOSS OF TOPSOIL

Result in substantial soil erosion or loss of topsoil.

Project scale soil erosion or loss of topsoil is mitigated by SPRs that control fire burn severity (FBE-1, HYD-15) and the location of ignitions relative to watercourses (HYD-4), minimize soil compaction and prevent erosion (HYD-5, HYD-7, HYD-9 and HYD-13), and limits equipment use on steep slopes (HYD-14)

While HYD-16 is primarily an SPR that minimizes vegetation removal-induced changes in hydrology, disturbed area also relates to the degree of ground disturbance and potential erosion in a planning watershed (MacDonald et al., 2004). As such, the implementation of HYD-16 will require project proponents to determine if cumulative significant impacts related to erosion are or will occur as a result of project activities. If non-mitigatable cumulative significant impacts are determined through project scale hydrologic analysis, then the project will not fall under the scope of the VTP PEIR. As such**, no significant cumulative impacts** to erosion and/or topsoil erosion are expected as a result of this Program.

CRITERION D – DEPLETE GROUNDWATER OR INTERFERE WITH GROUNDWATER RECHARGE

Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.

Vegetation removal increases annual water yield (Bosch and Hewlett, 1982) through the mechanism of decreased evapotranspiration and subsequent increased water inputs to soils. This increases groundwater levels and increases groundwater recharge. The Program will result in **no significant cumulative impacts** that will result in groundwater depletion or groundwater recharge.

CRITERION E – ALTERING THE DRAINAGE PATTERN OR COURSE OF A STREAM OR RIVER.

Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, in a manner that would result in substantial erosion or sedimentation on- or off-site.

Standard Program Requirements FBE-1, HYD-4, HYD-5, HYD-7, HYD-13, HYD-14, and HYD-15 are used to minimize drainage alteration at the hillslope scale. Several SPRs help to prevent the alteration of the course of a stream or river (i.e., channel migration). Most wildland streams or rivers downstream of VTP projects will generally be confined by narrow valley walls, which will limit the potential for channel migration (Beechie et al., 2005). Channel migration may occur on alluvial fans, when sediment-laden streams emerge from confined valleys. Channel migration may also occur if sufficient flow, sediment, or debris is delivered to channels prone to meandering or avulsing. HYD-16, along with any identified PSRs, will help to minimize flow increases to non-significance in the downstream direction, and onsite controls (see Criterions A and C) will prevent excess downstream accumulations of sediment and/or debris. As a result, the Program will result in **no significant cumulative impacts** to existing drainage patterns or to the course or location of streams and rivers inside or outside the project areas.

CRITERION F – CREATE RUNOFF THAT WILL EXCEED THE CAPACITY OF DRAINAGE SYSTEMS OR PROVIDE POLLUTED RUNOFF

Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

Sections 4.3 and 5.5.2 provides a process-based rationale for why onsite controls and the implementation of HYD-16 will minimize significant cumulative impacts to flow increases to non-significance. These SPRs will prevent overwhelming the capacity of existing drainage systems. The SPRs discussed for Criterion C will minimize onsite and offsite pollution of runoff. As a result, the Program will result in **no significant cumulative impacts** to the conveyance of drainage systems or to runoff pollution.

CRITERION G – PLACE HOUSING WITHIN A FLOOD HAZARD AREA

Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map, or other flood hazard delineation map.

The Program does not propose to place housing within flood hazard areas, and will have **no significant cumulative impact** for this criterion.

CRITERION H – PLACE STRUCTURES WITHIN FLOOD HAZARD AREAS THAT WOULD MODIFY FLOOD FLOWS

Place structures within a 100-year flood hazard area that would impede or redirect flood flows.

The Program does not propose to place structures within flood hazard areas, and will have **no significant cumulative impact** for this criterion.

CRITERION I – EXPOSE PEOPLE OR STRUCTURES TO FLOODING, INCLUDING FAILURE OF A LEVEE OR DAM

Expose people or structures to a significant risk of loss, injury, or death from flooding, including flooding resulting from the failure of a levee or dam.

Sections 4.3 Section 5.5.2 provides a process-based rationale for why onsite controls and the implementation of HYD-16 will minimize significant cumulative impacts to flow increases to non-significance. Properly implementing these SPRs will prevent the downstream flooding. As a result, the Program will result in **no significant cumulative impacts** to downstream flood damage to life or property, or the likelihood of failure of a levee or dam.

CRITERION J – INUNDATION BY SEICHE, TSUNAMI, OR MUDFLOW

Inundation by seiche, tsunami, or mudflow.

The Program does not involve the construction of housing or structures within areas subject to seiche, tsunami, or landslide hazards. Landslide initiation is the only Program-related mechanism that can affect the occurrence of seiches, tsunamis, or mudflows. Landslide initiation by Program activities are minimized by the SPRs discussed for Criterions A and B. As a result, **the Program will not result in significant cumulative impacts** that will affect inundation by seiche, tsunami or mudflows.

5.5.2.2.2 Cumulative Impact Analysis for Alternatives Considered

The scale of the No Project alternative is the same as the proposed Program, but due to implementation barriers, it is expected that the treated acres will be fewer. It is likely the No Project alternative will have similar impacts on hydrology, geology, and soils as the proposed Program, due to the overall lower treated acreage and the use of environmental review procedures.

Because the scale of Alternatives A, B, and C would be the same as the proposed VTP at 60,000 acres treated annually for ten years, with generally the same vegetation treatment activities by vegetation type expected to occur, Alternatives A, B and C would have similar impacts as the proposed VTP. These alternatives have fewer acres

available for treatment which may increase the likelihood that treatment impacts to geologic, hydrologic, and soil resources would be concentrated in a localized area. Alternative A would concentrate activities within the WUI, which generally has less inherent risk to geologic, hydrologic, and soil resources (i.e., flatter topography). Alternative B spreads treatments between the WUI and fuel breaks. Many fuel breaks are located on ridge tops which are an area of low inherent risk for runoff production and/or erosion. Alternative C disperses treatments more than the proposed VTP, Alternatives A, or Alternative B. Through implementation of onsite controls that limit runoff production and erosion, and SPRs such as HYD-16 (Section 2.5) the likelihood of concentrating impacts at the planning watershed level would be minimized. Therefore, the increases in risk to geologic, hydrologic, and soil resources attributable to Alternatives A, B, and C would not be cumulatively considerable and the cumulative impact would be less than significant.

Alternative D would treat fewer acres with the same landscape constraints on the placement of treatments (i.e. the same treatable area) as the proposed VTP. This would serve to dilute the impacts on geologic, hydrologic, and soil resources as a lower percentage of the acres available for treatment would receive treatment in any given year relative to the proposed VTP and Alternatives A, B, and C. Alternative D would also use less prescribed fire than the proposed VTP or any of the alternatives, and prescribed fire has a higher likelihood of triggering cumulative impacts than most other types of activities. The other treatment alternatives (manual, mechanical, herbivory, and herbicide) can more finely target vegetation to manipulate, potentially offering greater protection against runoff and/or erosional increases. Therefore, the increases in risk to biological resources attributable to Alternative D would not be cumulatively considerable and the cumulative impact would be less than significant.

5.5.2.3 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that avoids significant impacts to geologic, hydrologic and soil resources.

5.5.3 HAZARDOUS MATERIALS

This section summarizes potential cumulative effects of hazardous materials and public health impacts due to implementing vegetation treatment activities under the VTP and alternatives. Hazardous material impacts and impacts to public health are analyzed in Chapter 4.4.

5.5.3.1 Significance Criteria

The significance criteria identified in Chapter 4.4 are used here to evaluate potential cumulative effects. Significance criteria are based on the checklist presented in

Appendix G of the State CEQA Guidelines. Refer to Chapter 4.4.2 for the significance criteria used in this cumulative impacts analysis.

5.5.3.2 Determination of Significance

As described in Section 4.4 Hazardous Materials, projects approved under the proposed Program would result in less-than-significant impacts related to the creation of hazards through the use, transport, or disposal of hazardous materials. Projects approved under the proposed Program or any of the Alternatives would comply with hazardous materials SPRs, including relevant federal and State regulations. Hazardous material exposure is typically site-specific and does not combine with other projects to result in significant adverse cumulative impacts. Further, herbicides used under the proposed Program or Alternatives would not be persistent compounds (Appendix D) and would degrade within a few hours to few weeks when exposed to sunlight, moisture, and soil. These substances do not accumulate to produce known long-term impacts. Thus, because exposure of the public or environment to hazardous materials would be site-specific, would be limited in duration (would occur once per year at a maximum), there would be no cumulative effect. This would be a **less than significant cumulative impact**.

VTP projects under the proposed Program or Alternatives would be located throughout wildlands in the State and in areas of moderate to very high fire hazard severity. Therefore, cumulative wildfire hazards are considered significant. While VTP projects would result in activities that would require the transport and use of flammable materials (e.g., fuels) and use of equipment that could ignite dry vegetation and cause fire, CAL FIRE implements strict practices for operation of its equipment and would have appropriately trained personnel to properly suppress fires in the event of an inadvertent ignition. Further, VTP projects would be subject to SPRs that would reduce risk of ignition associated with VTP activities (ADM-1, ADM-5, FBE-2, and HAZ-14). Therefore, the proposed Program or any of the Alternatives would result in **less than significant cumulative impacts** to wildland fire risks.

5.5.3.3 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that avoids significant impacts from hazardous materials.

5.5.4 WATER QUALITY

This section summarizes the potential cumulative effects to water quality due to implementing vegetation treatment activities under the VTP and alternatives. Water quality is also analyzed in Chapter 4.5.

5.5.4.1 Significance Criteria

The following significance criteria have been developed based on the “Hydrology and Water Quality” sections of CEQA Appendix G: Environmental Checklist Form of the State CEQA Guidelines. The impact of the Program on water quality would be considered significant if projects that qualify for implementation under the proposed Process would:

a) Violate any water quality standards or waste discharge requirements
b) Would substantially degrade water quality

The significance criteria related to cumulative effects for hydrology, that typically fall under “Hydrology and Water Quality” in CEQA Appendix G, are covered in Section 5.5.2.

5.5.4.2 Determination of Significance

5.5.4.2.1 Cumulative Impact Analysis for Program

This section uses water quality objectives to determine the potential for significant cumulative effects due to Program activities. Section 5.3 addresses significant impacts related to water quality objectives such as sediment, settleable material, and turbidity, as these are primarily sedimentary cumulative effects. Proper implementation of the SPRs and PSRs described in section 4.3 and 4.5, and discussed in section 5.3, will prevent significant cumulative impacts for these water quality objectives and for sediment-bound nutrients. In addition, HYD-17 will minimize sedimentary and nutrient-related impacts from herbivory by the requirement of targeted grazing (i.e., no grazing within stream-adjacent areas) in project areas.

Significant cumulative impacts to water quality from these constituents are also minimized by the implementation of HYD-3, which requires the use of WLPZs and/or ELZs during project activities. Buffer zones will not be subject to VTP activities, except by low intensity backing fires during prescribed fire (i.e., HYD-4). These buffer zones will provide additional infiltration capacity and surface roughness, which will minimize the water quality impacts if there are project-related increases in runoff and erosion. HYD-3 will also minimize temperature impacts in the downstream direction, as it will protect shade adjacent to watercourses. Water Board jurisdictions with an abundance of 303(d) listings for temperature in forested areas (e.g., the North Coast Water Board) will not be subject to cumulative temperature increases due to the low intensity of activities outside the protected buffers (i.e., ladder fuel removal rather than dominant or co-dominant crown removal).

SPRs and PSRs related to pesticides and other hazardous material are addressed in Chapter 4.4. The short residence time of herbicides, the dispersed pattern of treatment, and dilution in the downstream direction means that herbicides will not significantly accumulate over time and space. Impacts associated with other hazardous materials will be mitigated through avoidance or the implementation of onsite controls described in Chapter 4.4.

Ultimately, watersheds that are impaired will go through a consultation process with the appropriate Regional Water Quality Control Board to ensure that cumulative significant impacts are avoided for 303(d) listed watersheds. This consultation, along with the requirements of HYD-16 (i.e., additional analysis for watersheds exceeding disturbance thresholds) and proper implementation of Program SPRs and PSRs will result in **no significant cumulative impacts** to water quality from Program activities.

5.5.4.2.2 Cumulative Impact Analysis for Alternatives Considered

The scale of the No Project alternative is the same as the proposed Program, but due to implementation barriers, it is expected that the treated acres will be fewer. It is likely the No Project alternative will have similar impacts on water quality as the proposed Program, due to the overall lower treated acreage and the use of environmental review procedures.

Because the scale of Alternatives A, B, and C would be the same as the proposed VTP at 60,000 acres treated annually for ten years, with generally the same vegetation treatment activities by vegetation type expected to occur, Alternatives A, B and C would have similar impacts as the proposed VTP. All require the inclusion of WLPZs and ELZs. These alternatives have fewer acres available for treatment which may increase the likelihood that treatment impacts to water quality would be concentrated in a localized area. Alternative A would concentrate activities within the WUI, which generally has less inherent risk to water quality (i.e., flatter topography). Alternative B spreads treatments between the WUI and fuel breaks. Many fuel breaks are located on ridgetops which are an area of low inherent risk for runoff production and/or erosion. Alternative C disperses treatments more than the proposed VTP, Alternative A, or Alternative B. Through implementation of onsite controls that limit runoff production and erosion, and SPRs such as HYD-16 (Section 2.5) the likelihood of concentrating impacts at the planning watershed level would be minimized. Therefore, the increases in risk to water quality attributable to Alternatives A, B, and C would not be cumulatively considerable and the cumulative impact would be less than significant.

Alternative D would treat fewer acres with the same landscape constraints on the placement of treatments (i.e. the same treatable area) as the proposed VTP. This would serve to dilute the impacts on water quality as a lower percentage of the acres available

for treatment would receive treatment in any given year relative to the proposed VTP and Alternatives A, B, and C. Alternative D would use less prescribed fire than the proposed VTP or any of the alternatives, but this might trigger more use of other activity types with different types of water quality impacts (e.g., herbivory for pathogens; mechanical for oil or grease; herbicides for hazardous materials) . However, the other treatment alternatives (manual, mechanical, herbivory, and herbicide) can more finely target vegetation to manipulate, potentially offering greater protection against runoff and/or erosional increases. Therefore, the increases in risk to water quality attributable to Alternative D would not be cumulatively considerable and the cumulative impact would be less than significant.

5.5.4.3 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that avoids significant impacts to water quality.

5.5.5 ARCHAEOLOGICAL, CULTURAL, AND HISTORIC RESOURCES

This section evaluates potential cumulative effects to archeological and cultural resources that may result from implementing the Proposed Program or any of the Alternatives.

5.5.5.1 Significance Criteria

The significance criteria and thresholds used for evaluating archeological and cultural resources in Section 4.6 are appropriate for addressing cumulative effects as well.

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

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

In addition to prehistoric and historic archaeological sites, cultural resources also include those used for traditional cultural practices, or “ethnographic” resources. The Program and Alternatives would have a significant adverse impact on ethnographic resources if any of them would:

e) Cause a substantial adverse change to locations associated with the traditional

beliefs of Native Americans, including areas used or assumed to be used for ceremonial activities

f) Cause a substantial adverse change to locations and or resources used by Native Americans to carry out or support economic, artistic, or other cultural practices.

5.5.5.2 Determination Threshold

The thresholds used are the same as those presented in Section 4.6.2.

ARCHAEOLOGICAL RESOURCE

Any change in the classification or potential classification of an archaeological resource that reduces it from significant or potentially significant to less than significant is considered a significant adverse impact from the proposed Program or Alternatives.

HISTORICAL RESOURCE

The material impairment of a historical resource or its immediate surroundings that alters, in an adverse manner, the physical characteristics of a historical resource so that it would no longer be included in the California Register of Historic Places or a local register of historical resources is considered a significant adverse impact from the program. The criteria for listing are included in Section 4.6.2 of this document.

ETHNOGRAPHIC RESOURCE

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

5.5.5.3 Determination of Significance

Section 4.6 addresses potential effects to cultural resources that include prehistoric, historic, ethnographic, and paleontological. Given the abundance of cultural resources across the state, the increase in vegetation treatments that would result from the proposed Program and Alternatives has the potential to contribute to a cumulative effect. The potential impact from different treatment methods and appropriate management methods to prevent significant adverse effects are addressed in Section 4.6. The review procedures as described in *Archaeological Review Procedures for CAL FIRE Projects* (Foster and Pollack, 2010), and included under the Standard Project Requirements (SPRs) for cultural resources, include an evaluation of the potential for cumulative effects. With the increased number of prescribed burns and other vegetation

management projects on private and federal lands, the potential exists that archaeological, historical, and ethnographic resources could be disturbed with a greater frequency and hence the impact could be cumulative. The CAL FIRE project protocol, which includes review by professional archaeologists as needed, and the SPRs for cultural resources (CUL-1 through CUL-5) should reduce the impact to less than significant. See Section 4.6 for additional information on the CAL FIRE protocol for archaeological review.

No significant cumulative impacts to archaeological or cultural resources are expected from the implementation of the proposed Program or any of the Alternatives.

5.5.5.4 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that avoids significant impacts to archaeological, historic, and cultural resources.

5.5.6 NOISE

This section evaluates potential cumulative effects to noise due to implementing either the Proposed Program or any of the alternatives. Program effects to noise are analyzed in Chapter 4.7. Evaluation of cumulative effects to noise is based on the same criteria and thresholds presented in Chapter 4.7.

5.5.6.1 Significance Criteria

The significance criteria and thresholds used for evaluating noise in Chapter 4.7.2 are appropriate for addressing cumulative effects as well.

Noise effects would be considered significant if the Program or the Alternatives would cause:

a) Exposure of persons to or the generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies
b) Exposure of persons to, or the generation of, excessive ground-borne vibration or ground-borne noise levels
c) Substantial permanent increase in ambient noise levels in the project vicinity (above levels existing without the project)
d) Substantial temporary increase in ambient noise levels in the project vicinity (above levels existing without the project)

5.5.6.2 Determination Threshold

The Program and Alternatives are evaluated using thresholds established in Chapter 4.7.2.2 and are considered to create a significant effect when a treatment or treatments creates:

a) Noise in excess of 90 dBA at 50 feet, or in excess of 65 dBA at 1,600 feet at sensitive receptor locations (schools, residential units, churches, libraries, commercial lodging facilities, and hospitals or care facilities)
b) Noise levels in excess of 70 dBA L_{dn}
c) The Program and Alternatives are considered to create moderately adverse effects when noise levels are between 60 and 70 dBA L_{dn} (State Office of Noise Control, 1976)

Potential effects related to noise from proposed Program activities, or any of the Alternatives, are described in Chapter 4.7.2, with background information and data in Appendix F. Chapter 4.7.2 discusses the potential for noise effects from management activities that include: mowing, operating heavy machinery (dozers, excavators, etc.), chain saws, trucks, helicopters, and hand equipment. Noise effects occur only if the noise is heard or felt by a receptor. Sensitive human receptor concerns given particular consideration in Chapter 4.7.2 are recreation areas and residential areas. Wildlife also can be a sensitive noise receptor, particularly during the reproduction season.

Disturbances associated with mechanical treatments could be substantial, though short in duration. Equipment associated with mechanical treatments can generate noise levels ranging from approximately 75 to 90 dBA at 50 feet, depending upon the equipment being used, although mobile chippers can reach sound levels of 115 dBA (Appendix F, Table F.3-2). Typical operating cycles may involve two minutes of full-power operation, followed by three or four minutes of operation at lower levels. With most projects occurring in rural areas, it is unlikely that project noise will combine with other sources of noise to create a chronic or persistent impact. VTP projects particularly within the WUI could have a cumulative impact to noise. However, the effects are short lived and implementing management measures should reduce the impact to less than significant.

For a cumulative noise related effect, VTP projects would need to add to existing ambient noise levels to cause a significant adverse impact, or that noise from two or more individual projects combines to create such an impact. Standards for what constitutes a significant cumulative noise impact in rural forest and range settings, where most projects occur, are not well defined. For effects to occur, cumulative noise must be heard or felt.

5.5.6.3 Determination of Significance

Implementation of the proposed Program will not result in a measurable bioregional cumulative effect contribution to noise after SPRs and PSRs are applied at the project scale. The majority of projects will occur in remote areas and VTP projects occurring concurrently with other noise producing land management activities are expected to be few in number and are generally undeterminable at the scale of the bioregion.

Substantial permanent or temporary increases in ambient noise levels or exposure of persons to noise or vibration levels above applicable local general plan, noise ordinance or other agency standards are not expected with the application of PSRs and are similarly not cumulatively measurable when assessed at the scale of the bioregion. When examined at the scale of a bioregion, VTP projects typically occur in a wildland or wildland-urban interface setting. The vast majority of the noise generated from the proposed Program is located significant distances away from sensitive receptors. Noise effects arising from the proposed Program or any of the alternatives are of short duration (less than 10 weeks per project on average) and limited to typical workday hours (7AM to 7PM) that may also be seasonally limited. Of the approximately 230 projects that might be implemented per year, 135 (57 percent) of the projects will take place in rural bioregions such as the Klamath/North Coast, Modoc, Sacramento Valley, San Joaquin, Mojave and Colorado Desert.

Some projects will occur in the WUI where operations could occur adjacent to residences and other sensitive receptors. Noise in these situations is generally recognized as a necessary element toward achievement of other desirable land condition objectives. Few VTP projects are expected to occur immediately subsequent to other noise generating land management activities and thus the cumulative duration of noise generation is negligible. It is highly unlikely that a single residential or commercial area will be affected by the noise from more than one watershed treated annually and concurrent with or subsequent to other noise generating land management activities.

The cumulative contribution to duration of unwanted noise levels to sensitive receptors is **less than significant** at the scale of the bioregion. Adoption of proposed Program Standard Project Requirements and any PSRs as a result of a Project Scale Analysis (Chapter 7) reduces individual project level effects to a level that are unlikely to create a cumulative impact to baseline noise levels. Mitigation measures are presented in Chapter 4.7.3.

The No Project alternative would apply to a landscape that is larger than the proposed Program, but due to costs, time constraints, and other limitations, it is anticipated that a smaller amount of acreage would actually be treated each year. Because of this, it is not

likely to cause cumulatively significant impacts to human health and community well-being or sensitive receptors due to noise.

Alternative A would treat a smaller landscape as the proposed Program, but treat the same number of acres. Because projects would only be allowed in the WUI, Alternative A is more likely to result in simultaneous projects occurring in or near a particular community, and therefore more likely to cause significant cumulative noise impacts to human health and community well-being or sensitive receptors.

Similarly, Alternative B would treat a smaller landscape but the same number of acres as the Proposed Program, but only allow WUI and fuel break projects. Due to the limited types of projects that could be implemented, it is more likely that, under Alternative B, a community would have more than one simultaneous fuel reduction project occur, and therefor cumulative noise impacts to human health and community well-being or sensitive receptors would be significant.

Alternative C would also treat a smaller landscape but the same number of acres as the Proposed Program. This Alternative would limit projects to Very High Fire Hazard Severity Zone (VHFHSZ), which are determined by the existing fuels, topography, weather/climate, crown fire potential, and ember production and movement. Because this Alternative would exclusively focus projects in areas of high hazard and not human development (as in Alternatives A and B), with the mitigation measures proposed below Alternative C would not result in significant cumulative noise impacts to human health and community well-being or sensitive receptors.

Alternative D would treat the same landscape as the proposed Program but treat a smaller amount of acres due to the reduction of the use of prescribed fire. Although the maximum potential dBA of prescribed fire projects is the highest of all treatment methods, prescribed fire using helicopter has the shortest duration of all treatment methods. Since noise affects individuals differently, different people will be bothered by loud noise over a short period or moderate noise over a longer period. However, the reduction in prescribed fire is not replaced entirely by increases in other treatment methods, and so the overall noise impacts are less. Because of the overall smaller treatment area proposed, and with the mitigation measures proposed below, Alternative D would not result in significant noise impacts to human health and community well-being or sensitive receptors.

5.5.6.4 Mitigations

Please see Section 2.5 of this document for Standard Project Requirements to avoid significant impacts to noise. If the Project Scale Analysis (Chapter 7) uncovers cumulative effects that may occur locally but be undetected at the scale of the

bioregion, Project Specific Requirements will mitigate those effects to a less than significant level.

5.5.7 RECREATION

This section summarizes the potential for cumulative effects to Recreation due to implementing either the proposed Program or any of the alternatives. Program effects to Recreation are analyzed in Chapter 4.8. The same significance criteria and thresholds that were identified in Chapter 4.8 are used here to evaluate potential cumulative effects.

5.5.7.1 Significance Criteria

Appendix G of the CEQA Guidelines, the CEQA Environmental Checklist, poses the following to be considered in determining whether the Program or Alternatives would cause significant impacts to recreation. The Program and Alternatives would create significant effects if they would:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?
b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

5.5.7.2 Determination Threshold

An effect is considered significant if it would:

a) Close a significant portion of public recreational areas because of VTP treatments during the peak visitor season over a calendar year.
b) Severely reduce visual quality (more than 80 percent burned and black, cleared of vegetation, or comprised of dead plants) on more than 10 percent of the area of any one state park, private recreation area or other publicly accessible recreational area, during the peak visitor season over a calendar year.

The estimation of effects (Chapter 4.8) is based on the temporal and spatial extent of VTP treatments that are likely to occur on state parks or other public lands where the VTP operates. Evaluating cumulative effects includes considering potential effects from multiple VTP projects, as well as similar projects on other public lands that could result in a substantial reduction in access to recreational areas.

Implementation of the proposed Program or any of the Alternatives will not result in a measurable cumulative effect to recreation. No substantial increase in recreational areas with severely reduced visual quality or access during the peak visitor season is

detectable. VTP projects are expected to be relatively few in number and occurrence. For the proposed Program, on an annual basis, except in the Colorado Desert, treatable recreation areas are 10 percent or less of the total treatable acreage in each bioregion. Not all projects under this Program EIR in each bioregion will take place on recreational lands, nor would they take place within the same calendar year or take place substantially during peak visitor season.

Public recreational pursuits generally take place on State Parks, National Parks and Recreation Areas, National Forests, Bureau of Land Management lands, and other public lands. A cumulative effect could potentially occur where VTP project acres are adjacent to or within the same bioregion as other land management activities in similar stages of implementation and vegetation recovery that impact the recreational experience or opportunity. Given the expected geographic distribution of VTP projects and number of projects conducted within a bioregion, it is highly unlikely that VTP projects would combine with other land management activities to contribute to a cumulative impact to recreational closures or visual quality of recreational experiences.

No severe reduction in visual quality is expected on state park or other public recreational area during peak visitor periods. Implementation of VTP and similar land management projects is likely to be spread over the entire year, with many projects occurring in non-peak visitation months. Peak visitor use tends to occur during the summer months for many recreational areas. Prescribed fire is most commonly implemented in fall, winter and spring, which are off-peak months for recreational use. From a cumulative effects perspective, at the scale of the bioregion, it is unlikely that short or long term changes in vegetation condition and recreational access associated with VTP projects would combine with other past, current, or planned land disturbing management activities to produce a significant cumulative impact on recreational experience or access.

There is a low likelihood that more than 10 percent of a given recreational area (state park, conservancy, etc.) would be treated in a single year, unless the recreational area was very small. Many recreational areas (state parks, conservancies, etc.) are a part of a larger bioregion and it is unlikely that all recreation areas in a bioregion would be intensively treated (greater than 10 percent area) in a single year, and it is unlikely that 10 percent of most recreational areas would be simultaneously treated. Similarly, when considering the likelihood of cumulative effects, many high use recreational areas on lands potentially subject to VTP projects (state parks, conservancies, wildlife management areas, ecological reserves, etc.) are not subject to significant land disturbing management activities related to resource extraction (timber harvest, mining etc.). These lands of limited or constrained use further reduce the likelihood of a cumulative effect arising from implementation of a VTP project in concert with another

land disturbing management activity that negatively affects recreational values or access.

Tables 5.3-1 and 5.3-2 provide a summary of vegetation management projects for CAL FIRE and federal agencies (National Park Service, US Forest Service, Bureau of Land Management, US Fish and Wildlife Service). Other agencies, local government, water districts, conservancies, and private landowners outside of the VTP program are also likely to conduct fuel reduction projects. However, this information is not available on a statewide basis and likely represents a minor contribution to the overall acreage treated and is not included here.

In areas of mixed ownership (public and private), VTP projects could occur simultaneously with or sequential to other land disturbing activities. This scenario could result in a short-term cumulative effect to recreational value or access. Data is not available to evaluate the likelihood of the spatial and temporal relationship of VTP projects and those on public recreational land at the bioregional scale. Although speculative, it appears unlikely that cumulative bioregional scale negative project impacts on recreational values or access would arise because of the needed intersection of variables such as occurrence of tree and shrub vegetation type, CAL FIRE jurisdiction within a project area of mixed ownership and of high recreational use, and of sufficient VTP and other land disturbance activity acreage of sufficient treatment intensity.

Prescribed fire can also provide maintenance and improvements to the visual aesthetics of recreation areas. Prescribed fire tends to open up forest stands and can increase the number and visibility of flowering plants (Wade and Lunsford, 1998; DeBano et al., 1998).

5.5.7.3 Determination of Significance

Because of the overall low percentage of recreational acres treated as part of the Proposed Program and under similar projects on public lands, as well as the limited resource extraction that occurs on recreational lands, there is a low likelihood of significant cumulative effects to public recreational areas. It is unlikely that VTP projects under the proposed Program will result in closure of a significant portion of public recreational areas because of VTP or related projects during peak visitor season over a calendar year. Similarly, it is unlikely that enough related vegetation management projects – either through the VTP or other programs, would occur geographically close enough to one another to cumulatively severely reduce visual quality during peak visitor season over a calendar year. In addition, VTP treatments can have longer term beneficial effects that may be cumulative if projects are in or near the same recreational area.

As part of the Project Scale Analysis (Chapter 7) each project will identify any known vegetation management projects that have recently occurred in the immediate planning watershed(s) for the proposed project. **No significant cumulative impacts** to recreational resources are expected from the implementation of the project or any of the alternatives.

The No Project alternative would apply to a landscape that is larger than the proposed Program, but due to costs, time constraints, and other limitations, it is anticipated that a smaller amount of acreage would actually be treated each year. Because of this, it is not likely to cause significant cumulative impacts to recreational closures or viewsheds.

Alternative A would treat a smaller landscape as the proposed Program, but treat the same number of acres. Because projects would only be allowed in the WUI, Alternative A would drastically reduce the number of projects on recreational land, since any treated recreational land would have to exist in the WUI area. This Alternative would result in less than significant cumulative impacts to recreational closures or viewsheds.

Similarly, Alternative B would treat a smaller landscape but the same number of acres as the proposed Program, but only allow WUI and fuel break projects. Alternative C would also treat a smaller landscape but the same number of acres as the Proposed Program, but would limit projects to VHFHSZ, which are determined by the existing fuels, topography, weather/climate, crown fire potential, and ember production and movement. Because these Alternatives continue to focus the VTP on areas that do not necessarily overlap with recreational areas (human development and very fire hazard, respectively), there is an overall less than significant cumulative impact to recreational closures or viewsheds due to Alternatives B and C.

Alternative D would treat the same landscape as the proposed Program but treat a smaller amount of acres due to the reduction of the use of prescribed fire. Because of the overall smaller treatment area proposed and the reduction in the use of prescribed fire, Alternative D would not result in significant cumulative impacts to recreational area closures or viewsheds.

5.5.7.4 Mitigations

There are no Standard Project Requirements required to avoid significant impacts to recreation effects. If the Project Scale Analysis (Chapter 7) uncovers cumulative effects that may occur locally but be undetected at the scale of the bioregion, Project Specific Requirements will mitigate those effects to a less than significant level.

5.5.8 UTILITIES AND ENERGY

This section evaluates potential cumulative effects to utilities and energy due to implementing either the proposed Program or any of the alternatives. Program effects to utilities and energy are analyzed in Chapter 4.9. Evaluation of cumulative effects to utilities and energy is based on the same criteria and thresholds presented in Chapter 4.9.

5.5.8.1 Significance Criteria

The significance criteria and thresholds used for evaluating impacts to utilities and energy in Chapter 4.9.2 are appropriate for addressing cumulative effects as well.

An impact to utilities and energy is considered to be significant if the proposed program or Alternatives would:

a) Cause substantial alterations to water, wastewater, or power systems.
b) Cause substantial disruption in utility service or access to public facilities.
c) Cause substantial damage to utilities, utility service or public facilities within the project area.

5.5.8.2 Determination Threshold

Any direct damage to or disruption of water or energy facilities from a project would be considered a significant impact.

Potential effects related to utilities and energy facilities from proposed Program activities, or any of the Alternatives, are described in Chapter 4.9.2. That section discusses the potential for damage to or disruption of water and energy facilities from vegetation management activities. Mechanical, hand, herbicide, and herbivory treatments are all confined to a specific project area and the likelihood of a prescribed fire escaping to damage such facilities is low. None of the projects approved under this Program EIR include the permanent construction of facilities requiring power or water. No significant adverse impacts that would damage water or energy facilities from a project are expected from implementing the proposed Program or any of the Alternatives.

Implementation of the proposed Program or any of the Alternatives will not result in measurable cumulative damage to or disruption of water or energy facilities. Even if a prescribed fire escaped, the distribution of projects under this Program EIR (Table 3.3-1) demonstrates it is unlikely that additional prescribed fires will be utilized in the same *local* area for a fuels management project. None of the Alternatives suggest an increase in projects or acres treated versus the proposed Program.

The effects on water and energy facilities due to the implementation of vegetation management projects outside of this Program EIR are expected to be similar to those used for VTP projects. The only similar programs that use prescribed fire are treatments by the Department of the Interior and US Forest Service. On average, the Department of the Interior and the USFS treat about four times as many acres as the VTP program with prescribed fire, but many of their treatments are in unpopulated forested areas that do not have the utility infrastructure a more developed landscape requires.

5.5.8.3 Determination of Significance

The cumulative effect of individual VTP projects conducted under the proposed Program and similar vegetation management projects undertaken under a different program will not have significant effects on utilities and energy facilities. The cumulative impacts of these projects on utilities are considered **less than significant**.

No water or energy facilities would be directly damaged by any of the Alternatives; there are no significant cumulative impacts from implementing the No Project Alternative or Alternatives A-D.

5.5.8.4 Mitigation(s)

There are no Standard Project Requirements required to avoid significant impacts to utilities and energy. If the Project Scale Analysis (Chapter 7) uncovers cumulative effects that may occur locally but be undetected at the scale of the bioregion, Project Specific Requirements will mitigate those effects to a less than significant level.

5.5.9 TRANSPORTATION AND TRAFFIC

This section evaluates potential cumulative effects to transportation due to implementing either the proposed Program or any of the Alternatives. Program effects to transportation are analyzed in Chapter 4.10. Evaluation of cumulative effects to transportation is based on the same criteria and thresholds presented in Chapter 4.10.2.

5.5.9.1 Significance Criteria

A cumulative effect will be considered significant if results of the analysis indicate that any of the following criteria will be met due to implementation of the proposed Program or Alternatives:

a) An increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)

b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways

5.5.9.2 Determination Threshold

The following threshold is used to determine whether there is a substantial adverse effect to local residential or commercial development due to traffic generated by the Program or any of the Alternatives:

a) Traffic increases in excess of 10 percent Average Daily Trips (ADT) of the capacity of roads that serve residential and/or commercial areas near project areas.

Potential effects related to transportation from proposed Program activities, or any of the Alternatives, are described in Chapter 4.10 Transportation and Traffic. That section discusses the potential for transportation effects associated with increases in traffic volume associated with trips to and from the project site. The findings suggest that most projects are likely to have 5-10 vehicles traveling to and from the work site each day, which result in 10-20 average daily trips (ADT) per project.

Implementation of the proposed Program or any of the Alternatives will not result in a measurable cumulative effect contribution to traffic volume. None of the Alternatives proposed treating more acres or implementing more projects than the proposed Program. No substantial increase in vehicle trips, volume to capacity ratio, or increase in intersection congestion is detectable at the scale of the bioregion due to VTP projects and other concurrent or future projects. Similarly, no cumulative effect contribution to level of service standards established by county congestion management agency for roads or highways is detectable at the scale of the bioregion. The majority of projects will occur in remote areas and background traffic and transportation levels on those road systems are generally well below road capacity.

The types and number of vehicles used to implement vegetation management projects under programs outside of this Program EIR are expected to be similar to those used for VTP projects. The number of vehicles required for each treatment type is expected to vary from one to two light trucks every few days for a prescribed herbivory treatment and up to ten vehicles per day for a large prescribed burn or hand thinning treatment. Most of the vehicles used on VTP projects will be used for transporting people or fire equipment, with a small number of heavy trucks required at the beginning and end of some projects to transport heavy machinery (dozers, masticators, etc.). Heavy truck traffic to transport logs, in the event of nearby timber harvesting, will be on roads designed to support such loads. No logs will be removed from VTP projects, so VTP projects will not add to the cumulative number of logging trucks on the road.

The cumulative effect of individual VTP projects conducted under any alternative and similar vegetation management projects undertaken under a different program may have local short-term effects on transportation and traffic. These effects may be detectable at the scale of the project and are mitigated to less than significant levels as part of project planning and implementation at that scale of analysis. It is unlikely that a single residential or commercial area will be affected by the traffic from more than one VTP treatment annually. Furthermore, in an area where multiple VTP or other treatments could occur within one year, the likelihood of all treatments occurring simultaneously is low. At most, the nearest residential or commercial area to a VTP treated area would be affected by two simultaneous projects.

Additionally, the number of ADT generated per project is expected to be well below the capacity of typical low volume roads. It is highly unlikely that vehicle traffic associated with VTP project implementation will occur concurrently with other land management activities in a remote wildland setting and utilizing the same or redundant portions of an established road system.

5.5.9.3 Determination of Significance

No significant cumulative effects to transportation or traffic are expected from implementing the proposed Program with the application of SPRs and any identified PSRs.

The No Project alternative would apply to a landscape that is larger than the proposed Program, but due to costs, time constraints, and other limitations, it is anticipated that a smaller amount of acreage would actually be treated each year. Because of this, it is not likely to cause significant cumulative impacts to transportation and traffic.

Alternative A would treat a smaller landscape as the proposed Program, but treat the same number of acres. Because projects would only be allowed in the WUI, Alternative A is more likely to result in simultaneous projects occurring in or near a particular community, and therefor likely to cause significant cumulative transportation and traffic impacts.

Similarly, Alternative B would treat a smaller landscape but the same number of acres as the proposed Program, but only allow WUI and fuel break projects. Due to the limited types of projects that could be implemented, it is more likely that, under Alternative B, a community would have more than one simultaneous fuel reduction project occur, and therefor cumulative impacts to transportation and traffic would be significant.

Alternative C would also treat a smaller landscape but the same number of acres as the proposed Program. This Alternative would limit projects to VHFHSZ, which are determined by the existing fuels, topography, weather/climate, crown fire potential, and

ember production and movement. Because this Alternative would exclusively focus projects in areas of high hazard and not human development (as in Alternatives A and B), with the mitigation measures proposed below Alternative C would not result in significant cumulative transportation and traffic impacts.

Alternative D would treat the same landscape as the proposed Program but treat a smaller amount of acres due to the reduction of the use of prescribed fire. However, the reduction in prescribed fire is not replaced entirely by increases in other treatment methods, and so the overall transportation and traffic impacts are less. Because of the overall smaller treatment area proposed, and with the mitigation measures proposed below, Alternative D would not result in significant cumulative transportation and traffic impacts.

5.5.9.4 Mitigation(s)

Please see Section 2.5 of this document for Standard Project Requirements to avoid significant impacts to transportation and traffic. If the Project Scale Analysis (Chapter 7) uncovers cumulative effects that may occur locally but be undetected at the scale of the bioregion, Project Specific Requirements will mitigate those effects to a less than significant level.

5.5.10 POPULATION, EMPLOYMENT, HOUSING, AND SOCIO-ECONOMIC WELLBEING

This section summarizes the potential for cumulative effects to Population, Employment, Housing, and Socio-economic Wellbeing due to implementing either the proposed Program or any of the alternatives. Program effects to Population and Housing are analyzed in Chapter 4.11 Population, Employment, Housing, and Socio-economic Wellbeing. The following significance criteria and threshold were identified and are used here to evaluate potential cumulative effects.

5.5.10.1 Significance Criteria

Appendix G of the CEQA Guidelines, the CEQA Environmental Checklist, contains only one question which is relevant to the VTP program. The proposed Program and Alternatives would be considered to create a significant effect if treatments would:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

5.5.10.2 Determination Threshold

As stated in Chapter 4.11.2, there is no accepted threshold for evaluating a significant change in population. Population increases less than 0.5 percent were considered less than significant.

5.5.10.3 Determination of Significance

There are no growth-inducing effects associated with VTP projects under the proposed Program or any of the Alternatives and no changes to the population in project areas, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

No significant cumulative effects are expected from implementing the Program or any of the Alternatives.

5.5.10.4 Mitigation(s)

There are no Standard Project Requirements or mitigation measures required to avoid significant impacts to population, employment, housing, and socio-economic wellbeing. If the Project Scale Analysis (Chapter 7) uncovers cumulative effects that may occur locally but be undetected at the scale of the bioregion, Project Specific Requirements will mitigate those effects to a less than significant level.

5.5.11 AIR QUALITY

This section summarizes potential cumulative effects to air quality due to implementing vegetation treatment activities under the VTP and Alternatives. Impacts to air quality and the potential for vegetation treatment activities to generate emissions identified by the State of California as pollutants of concern are analyzed in Chapter 4.12.

5.5.10.5 Significance Criteria

The significance criteria identified in Chapter 4.12.2 are used here to evaluate potential cumulative effects. Significance criteria are based on the checklist presented in Appendix G of the State CEQA Guidelines as well as by mass emission thresholds set by the various air districts in California. Refer to Chapter 4.12.2 for the significance criteria used in this cumulative impacts analysis.

5.5.10.6 Determination of Significance

Implementation of the VTP would result in emissions of criteria air pollutants (CAPs) (e.g., particulate matter [PM_{10} and $PM_{2.5}$]) and precursors (e.g., oxides of nitrogen [NO_X] and reactive organic gases [ROG]) throughout the State. While the specific locations of where VTP projects would occur are not currently known, many counties throughout the

state are currently in nonattainment for CAPs subject to the California Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS). Air districts in California develop air quality attainment plans designed to reduce emissions of criteria air pollutants. Air quality attainment plans include a multitude of air pollution control strategies. When developing air quality attainment plans, air districts account for the emissions from all present and future development in the region by relying on city and county general plans.

As described in Chapter 4.12, air quality impacts from VTP projects fall into two categories: construction emissions and prescribed fire emissions. Emissions from the combustion of vegetation during prescribed fire treatments constitute the largest source of emissions from VTP projects. The location and timing of prescribed fires are controlled by local air district having authority through their burn authorization program and adherence to the conditions and requirements in the approved smoke management plan. Through this process, the local air district limits the amount of material burned on any given day to that which would not cause or contribute to exceedances of air quality standards or result in smoke impacts to smoke sensitive areas. Implementation of AIR-3, AIR-4, and AIR-12 require all projects conducted under this VTP to adhere to these protocols prior to igniting any prescribed burn project.

It is important to note that while the VTP's contribution from prescribed burning to pollutant emissions would be considerable, it may actually be less than what is reported in this Program EIR. As described in Chapter 2, the purpose of the VTP program is to modify wildland fire behavior to help reduce losses to life, property, and natural resources. The intended outcome is to have less frequent, smaller (i.e., less acres burned), and shorter duration wildfires over time. Therefore, the emissions from the prescribed burning activities would to some degree be replacing and potentially reducing total emissions from wildfires that would occur to a greater degree and duration without fuel modification. While there is not a direct correlation between implementation of a vegetation treatment project and a proportionate reduction in numbers of fires or acres burned, it is reasonable to acknowledge that while the VTP program would result in substantial emissions of CAPs as a result of prescribed fire, it would likely result in some reduction in the numbers of fires and/or burned acres from wildfires and, therefore, would avoid the emissions associated with those fires. Prescribed burning in the VTP program would also shift those emissions to the fall, winter and spring months not normally associated with wildland fires, and only on days authorized by the local regulating authority (AIR-3) when emissions are less likely to impact population centers. The VTPs contribution to air quality impacts from prescribed fire emissions would not be cumulatively considerable; the **cumulative impact would be less than significant**.

Emissions from construction like activities as described in Chapter 4.12 constitute the remainder of the emissions from VTP projects that may impact air quality. SPR AIR-2 requires all projects to identify the project's CAP emissions and compare these against the thresholds identified by the local air district. When project level emissions exceed the air district's thresholds, AIR-2 requires the implementation of AIR-3 through AIR-11 to further constrain the projects emissions. MM AIR-1 would further limit the number of projects that could occur simultaneously in the San Joaquin Valley Unified Air Quality Control District, the most sensitive air district to the TAC class of pollutants, to those that would keep the cumulative project level daily emissions of CAPs and precursors below that set by the air district for construction like activities. Through limitations in the number of projects that could occur simultaneously and other emission reducing constraints, the VTPs air quality emissions for construction like activities would not be cumulatively considerable; the **cumulative impact would be less than significant**.

As discussed under Impacts 3 through 5 in Section 4.12.2.3, the vegetation treatment activities under the VTP would not generate significant health risks associated with toxic air contaminants, expose sensitive receptors to odors, or expose sensitive receptors to NOA-containing fugitive dust because projects implemented under the VTP would be required to implement several SPRs. SPRs AIR-9, AIR-10, AIR-11, NSE-4 and NSE-5, would limit or minimize exposure of sensitive receptors to TAC emissions that would exceed air district thresholds, fugitive dust emissions containing natural occurring asbestos, and/or excessive odors. Therefore, the increases in health risk attributable to the project would not be cumulatively considerable; the **cumulative impact would be less than significant**.

CUMULATIVE IMPACT ANALYSIS FOR ALTERNATIVES CONSIDERED

Because the scale of Alternatives A, B, and C would be the same as the proposed VTP at 60,000 treated acres for ten years, with the same vegetation treatment activities by vegetation type expected to occur, Alternatives A, B and C would have similar CAP emissions, TAC emissions, NOA-containing fugitive dust emissions, and objectionable odors from vegetation treatment activities. Emissions from prescribed fires and construction related activities would be similar to the proposed program. Alternatives A, B, and C would implement similar constraints on prescribed burning and construction like activities as the proposed program to reduce the air quality impacts from these activities. Therefore, implementation of Alternatives A, B, or C would not result in a considerable contribution to significant cumulative air quality impacts; **the cumulative impact would be less than significant.** Similar to the proposed VTP, Alternatives A, B and C would not generate significant health risks associated with toxic air contaminants, NOA-containing fugitive dust emissions, and/or excessive odors. Therefore, the

increases in health risk attributable to Alternatives A, B, and C would not be cumulatively considerable; **the cumulative impact would be less than significant.**

Alternative D would reduce the total number of acres treated and significantly reduce the number of acres treated through use of prescribed fire. This alternative would also disallow variances to burn on no burn days in non-attainment air basins. This alternative would reduce the expected CAP emissions, TAC emissions, NOA-containing fugitive dust emissions, objectionable odors, toxic air contaminants, and NOA-containing fugitive dust emissions from vegetation treatment activities. Therefore, the increases in health risk attributable to Alternative D would not be cumulatively considerable; **the cumulative impact would be less than significant.**

5.5.10.7 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that avoids or minimizes significant impacts to air quality. One additional mitigation measure was identified in this analysis to reduce air quality impacts in the San Joaquin Valley Unified Air Quality Management District. This is identified as MM AIR-1 below.

Mitigation Measure AIR-1

To achieve compliance with local air district emission thresholds in the San Joaquin Valley Unified Air Quality Management District, simultaneously projects within that air district will be constrained to appropriate number as not to exceed air quality standards. As a result, the Program shall implement the following:

- CAL FIRE shall not allow more than 7 simultaneous treatment activities to occur in the San Joaquin Valley Unified Air Quality Management District.

5.5.11 AESTHETICS AND VISUAL RESOURCES

This section summarizes the effects to aesthetic and visual resources due to implementing either the Proposed Program or any of the alternatives. Program effects to aesthetic and visual resources are analyzed in Chapter 4.13. The following significance criteria and thresholds were identified and are used here to evaluate potential cumulative effects.

5.5.11.1 Significance Criteria

The significance criteria and thresholds used for evaluating aesthetics and visual resources in Chapter 4.13 are appropriate for addressing cumulative effects as well. According to Appendix G of the CEQA Guidelines: the CEQA Environmental Checklist,

an aesthetic impact would be considered significant if the Program and Alternatives would:

a) Have a substantial adverse effect on a scenic vista
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway
c) Substantially degrade the existing visual character or quality of the site and its surroundings
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area

5.5.11.2 Determination Threshold

Visual effects from the program would be considered significant if the acreage of treatments causing adverse and long term effects, as determined through the analysis process, exceeds more than 10 percent of the scenic byways viewshed acreage within that bioregion in any 10-year period.

5.5.11.3 Determination of Significance

Visual effects from vegetation treatments tend to have very localized and project specific effects. Treatment effects that may impair visual or aesthetic conditions in one location don't combine to degrade conditions at another location. When treatments occur in the same area they may cumulatively add to the total amount of viewshed acreage that is temporarily impaired. The perceived impact to visual quality varies substantially with the treatment method. Scorched ground and tree trunks from a prescribed fire are likely to be viewed negatively, especially if the fire kills overstory trees. However, this is not a permanent impact. Studies have shown that the perception of visual quality of a forested area can improve within one to two years following a low intensity prescribed fire (Jakes, 2006a). Mechanical treatments also can affect visual quality. The public tends to perceive clearcuts negatively, while thinning that reduces stand density has been shown to improve visual quality (Jakes, 2006b). Treatment of slash is another factor that affects visual quality. Studies have shown that increasing amounts of slash and downed woody material decrease the perception of visual quality.

The threshold of 10 percent or more of the viewshed acreage in a bioregion in a 10 year time period is a measure of the potential cumulative effects of the program. At a program level there is unlikely to be a noticeable impact at the bioregion or state level from a project implemented under the proposed Program. Any project level effects are likely to be short-term effects to visual resources that results from vegetation treatments. In addition, many projects occur on private lands where public access is limited and the opportunity for visual impairments is less likely. As such, there is a **less**

than significant cumulative impact to scenic vistas and viewsheds from implementing the proposed Program.

Prescribed burn projects generate smoke which has the potential to contribute to short term effects to visibility and longer term effects to regional haze. These issues are addressed in Chapter 4.12 Air Quality and Chapter 4.13 Aesthetics and Visual Resources, and under Chapter 5.5.11 Cumulative Effects to Air Quality. For all prescribed burns, however, a burn plan will be required that includes a smoke management plan (SMP). The SMP will minimize public exposure to smoke generated by prescribed burns. Because only a small amount of smoke would remain in the treatment area for a short period during and after the prescribed burn, the cumulative effects to visual resources are considered **less than significant**.

As described in Section 4.6 Archaeological, Cultural, and Historic Resources, protections are in place to reduce damage to scenic resources such as historic buildings via the use of CAL FIRE Archaeologists and the *Archaeological Review Procedures for CAL FIRE Projects* (Foster and Pollack, 2010). The cumulative impacts to scenic resources of this type are considered **less than significant.**

Due to the activities described as part of the Proposed Program and Alternatives under this Program EIR, there would not be any new sources of substantial light or glare which would adversely affect day or nighttime views in the area. The land management activities described in this Program EIR would not involve the construction involving materials that may produce light or glare. This impact is considered **less than significant**.

The No Project alternative would apply to a landscape that is larger than the proposed Program, but due to costs, time constraints, and other limitations, it is anticipated that a smaller amount of acreage would actually be treated each year. Because of this, it is not likely to cause significant cumulative impacts to aesthetic and visual resources.

Alternative A would treat a smaller landscape as the Proposed Program, but treat the same number of acres. Because projects would only be allowed in the WUI, Alternative A would drastically reduce the number of prescribed fire and mechanical projects in grass or shrub, since any treated land would have to exist in the WUI area. Similarly, Alternative B would treat the same number of acres as the proposed Program across a smaller landscape, but only allow WUI and fuel break projects. The overlap of those project types, grass or shrub vegetation, a scenic viewshed and WUI area or fuel break need is unlikely to occur often, and Alternatives A and B would cause a less than significant cumulative impact to aesthetic and visual resources.

Alternative C would also treat a smaller landscape but the same number of acres as the Proposed Program. This Alternative would limit projects to VHFHSZ, which are

determined by the existing fuels, topography, weather/climate, crown fire potential, and ember production and movement. Because this Alternative would exclusively focus projects in areas of high hazard, the required overlap of prescribed fire or mechanical treatment, grass or shrub vegetation, a scenic viewshed, and VHFHSZ is unlikely to occur often. Alternative C will have a less than significant cumulative impact to aesthetic and visual resources.

Alternative D would treat the same landscape as the Proposed Program but treat a smaller amount of acres due to the reduction of the use of prescribed fire. However, the reduction in prescribed fire is not replaced entirely by increases in other treatment methods, and so the overall visual impacts are less. Because of the overall smaller treatment area proposed, and with the mitigation measures proposed below, Alternative D would not result in significant cumulative aesthetic and visual resources impacts.

5.5.11.4 Mitigation(s)

There is a Standard Project Requirement for shrublands in San Diego, Imperial, Riverside, Orange, Los Angeles, Ventura, Santa Barbara, and San Bernardino counties to mitigate potential aesthetic and visual impacts to those areas:

AES-1: See **BIO-5** for shrublands in San Diego, Imperial, Riverside, Orange, Los Angeles, Ventura, Santa Barbara, and San Bernardino counties.

BIO-5: Vegetation treatment projects that are not deemed necessary to protect critical infrastructure or forest health in San Diego, Imperial, Riverside, Orange, Los Angeles, Ventura, Santa Barbara, Kern, and San Bernardino counties shall:

- Be designed to prevent vegetation type conversion.
- Not take place in vegetation that has not reached the age of median fire return intervals.
- Not re-enter treatment areas for maintenance in an interval shorter than the median fire return interval outside of the wildland urban interface and excluding fuel break maintenance.
- Not take place in old-growth chaparral without consultation regarding the potential for significant impacts with the Department of Fish and Wildlife and the California Native Plant Society.
- Take into account the local aesthetics, wildlife, and recreation of the Shrub-dominated Subtype during the planning and implementation of the project.
- During the project planning phase provide a public workshop, or public notice in a newspaper that is circulated locally describing the proposed project during the project planning phase for projects outside of the WUI. The notification will be used to inform stakeholders and to solicit information on the potential for significant impacts during the project planning phase.

For areas located outside of the counties specified in AES-1, the Project Scale Analysis (Chapter 7) will uncover any cumulative effects that may occur locally but be undetected at the scale of the bioregion. Project Specific Requirements will mitigate those effects to a less than significant level.

5.5.12 CLIMATE CHANGE

This section summarizes potential cumulative effects to Greenhouse Gas (GHG) emissions and global climate change due to implementing vegetation treatment activities under the VTP and Alternatives. Impacts from and the potential of vegetation treatment activities to generate GHG emissions and their contribution to global climate change are analyzed in Chapter 4.14.

5.5.12.1 Significance Criteria

The significance criteria identified in Chapter 4.14.2 are used here to evaluate potential cumulative effects. Significance criteria are based on the checklist presented in Appendix G of the State CEQA Guidelines. Refer to Chapter 4.14.2 for the significance criteria used in this cumulative analysis.

5.5.12.2 Determination of Significance

Section 4.14 addresses climate change and GHGs, which, because no single project can meaningfully effect global climate change, by their very nature are cumulative impacts. As described, a number of SPRs are included in the VTP to reduce the impact on climate change and GHGs, including: BIO-8, BIO-9, CC-1, FBE-1, GEO-1, HYD-7, HYD-8, HYD-13, and HYD-15. The VTP would not exceed the screening threshold of significance for GHG used in this Program EIR and no additional mitigation is necessary to reduce this impact. Thus, the projects contribution to cumulative GHGs is considered to be **less than significant**.

CUMULATIVE IMPACT ANALYSIS FOR ALTERNATIVES CONSIDERED

Because the scale of the Alternatives A, B, and C would be the same as the proposed VTP at 60,000 treated acres for ten years, with the same vegetation treatment activities by vegetation type expected to occur, Alternatives A, B and C would have similar GHG emission impacts. Emissions from prescribed fires would still likely constitute the largest source of emissions, with yearly GHG emissions less than the screening threshold of significance used in this Program EIR. Therefore, Alternatives A, B, and C would not result in a considerable contribution to the cumulative GHG impact. Similar to the project, c**umulative GHG impacts for Alternatives A, B, and C would be less than significant.**

Alternative D would reduce the total number of acres treated and significantly reduce the number of acres treated through use of prescribed fire. This alternative would also disallow variances to burn on no burn days in non-attainment air basins. This alternative would reduce the expected GHG emissions from vegetation treatment activities on the program scale, but emissions from any individual project would be similar to those under the proposed VTP and all other alternatives. Therefore, Alternative D would not result in a considerable contribution to the cumulative GHG impact. Similar to the proposed VTP, **cumulative GHG impacts for Alternative D would be less than significant.**

5.5.12.3 Mitigations

Please see Section 2.5 and Chapter 7 of this document for SPRs and the Project Scale Analysis that minimize significant impacts to climate change.