5.2 Effects of Program/Alternatives on Wildfire Severity and Extent

This section summarizes the impacts of implementing the Proposed Program and Alternatives on wildfire severity and wildfire extent. Wildfire severity is usually measured by the percent mortality of the resulting burned vegetation. Wildfire extent is usually measured as the number of acres burned by severity class. Wildfire frequency is the number of wildfires occurring in a bioregion in any year. Implementing the Proposed Program or the Alternatives responds to several of the goals of the VTP including:

- Modify wildfire behavior to help reduce catastrophic losses to life and property.
- Reduce the severity and associated suppression costs of wildfires by altering the volume and continuity of wildland fuels.
- Reduce the risk of large, high severity fires by restoring a natural range of fire-adapted plant communities through periodic low intensity vegetation treatments.

5.2.1 Significance Criteria

Appendix G of the CEQA Guidelines contains only one-significance criteria relating to wildfire:

The Program and Alternatives would create a significant effect if treatments:

a) Expose people or structures to the risk of loss, injury or death involving wildfires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

5.2.2 Determination Threshold

The Program and Alternatives will have a significant adverse effect if treatments ultimately result in an:

a) Increase of 50% or more in the short term size and severity of individual fires; or

b) Increase of 50% or more in the frequency of large-scale fires.

Fifty percent was chosen as the threshold because year-to-year variation is such that changes less than 50% are likely to be masked by the statistical variation of wildfire size and large-scale wildfire frequency both today and in the future. For instance, the yearly average acreage burned since 1950 is 230,00 acres plus or minus 195,250 acres, which is a coefficient of variation of 85%.

5.2.3 Data and Assumptions

This section describes some of the pertinent literature about the effectiveness of treatments at both the treated area scale and at the landscape scale. The difference in the effectiveness of the treatments including the scale of treatment is an important consideration for whether the Program or the Alternatives meet both the goals for the program and reduce the severity and extent of wildfires. Besides the literature on treatment effectiveness, this section also outlines the analytical approach used to describe the impact of the treatments on wildfire severity and extent.

Literature on Treatments

There is general agreement within the scientific community that over a half- century of research shows reduced wildfire severity following fuel treatments (Finney, McHugh and Grenfell, 2005). Agee et al., (2000) found that wildfire behavior has been observed to decrease with fuel treatment. Simulations conducted by van Wagtendonk in 1996 found both pile burning and prescribed fire reduced fuel loads and subsequent wildfire behavior. However, most research to date [in California] on fuel treatments, particularly prescribed fire, has taken place in regimes of frequent, low-severity fires, such as ponderosa pine and mixed conifer forests (Omi and Martinson, 2002a) while not as much research has taken place in crown fire regimes (Keeley, 2002). Recent research on chaparral in southern California by Wohlgemuth (2001) showed that moderate intensity prescribed fire treatment reduced subsequent wildfire burn severity of the treated area from "very high" severity to moderate to high.

In a 1997 analysis, Sapsis found that:

"Fuel management practices clearly reduce fire behavior, particularly for area treatments such as broadcast prescribed fire (Biswell 1963,Truesdell 1969, Van Wagner 1968, Helms 1979, Rawson 1983). Fuel treatments removing ladder fuels on forested systems can significantly affect potential for crown fires, which are extremely difficult to control and often devastating (Dodge 1972, Rothermel 1991, Sapsis and Martin 1994). Fuels management also significantly reduces wildfire occurrence and acreage burned (Weaver 1955 & 1957, Davis and Cooper 1963, Wood 1978,1979). In southern California, fuelbreaks, areas previously burned by wildfires, and areas that had been prescribe burned, all contributed to limiting the final size of the 1985 Wheeler Fire (Salazar and Gonzalez-Caban 1987). Walker (1995) reports that the 1995 Warner Fire and the 1993 Geujito Fire similarly lost intensity when they ran into recent prescribed burn areas.

"Fuels management may have little impact on spread during periods of extreme weather (Rawson 1983). However, recent wildfires burning under severe conditions in California have shown significantly reduced fire behavior when they burned into prescribed fire treated areas. Both the Pierce Fire in Sequoia National Park (Stephenson et al., 1991) and the A-Rock fire in Yosemite (Clark 1990) resulted in lower fire intensity and associated reduced fire size due to interaction with recently treated areas. Area restricted treatments such as firebreaks and fuelbreaks have shown mixed levels of success (Davis 1965, Omi 1977, Pyne 1984, Salazar and Gonzalez-Caban 1987). Fuelbreaks are strategically placed strips of low volume fuels designed to provide attack points, safe access, and reduced fire behavior. Their spatial placement and maintenance frequency influence their effectiveness. In general, surface fire intensity is reduced in as much as fuel volume has been regulated in the treatment areas, allowing suppression to act on portions of the fire that may otherwise have been uncontrollable. Extreme fire behavior on the heading front of wildfires, including crowning and spotting can quickly make fuelbreaks ineffective. Flanking and backing fires are often controlled using fuelbreaks as lines for indirect attack (Omi 1977, Salazar and Gonzalez-Caban 1978). In addition, fuelbreaks form ideal perimeter boundaries for establishing other area-based

fuel management units (Omi 1977). In summary, fuels treatment programs reduce, but do not eliminate threats from wildfire attributable to fire behavior."

Finney (2001) found that the greatest reduction in wildfire size and severity occurs when fuel treatment units limit wildfire spread in the heading direction of a wildfire since the heading portion of wildfires have the fastest spread rates and highest intensities. On the other hand, Finney (2001) also noted that treatments often remove some overstory trees, which can produce faster wind speeds in the understory and thereby elongate the fire spread and increase spread rates. Also, treatments can actually produce an increase in fire spread rates over time if burning and harvesting encourage growth of fine fuels and understory vegetation. Raymond and Peterson (2005) found that hardwood sprout regrowth after mechanical treatments resulted in higher mortality to mixed evergreen forests burned by wildfire than in untreated stands.

- Prescribed fire

Carey and Schumann (2003) reviewed 250 papers on the effectiveness of fuel treatments in modifying wildfire behavior. They found that there was substantial literature on the use of prescribed fire to alter wildfire behavior including case studies, simulations and even, significantly, several empirical studies. The several empirical studies seem to show reduced crown scorch and tree mortality as a result of treatments using prescribed fire. Others have arrived at the same conclusion about the beneficial effects of prescribed fire on altering fuel structure and wildfire behavior and effects (Graham, McCaffrey, and Jain 2004). However, Graham et al., (2004) state that there is generally less predictability in post treatment stand structure following prescribed fire than with mechanical thinning treatments—regardless of the targeted condition and burning prescriptions, since prescribed fire is not as precise a tool for modifying stand structure and composition.

While there are risks associated with use of prescribed fire because of the possibility of escapes that may cause unintended resource and economic damage, in practice, these types of problems are extremely rare relative to the large number of prescribed fires successfully conducted every year.

- Mechanical

Mechanical thinning has the ability to more precisely create targeted stand structure than does prescribed fire (Graham, McCaffrey and Jain, 2004). Used alone, mechanical thinning, especially emphasizing removal of smaller trees and shrubs, can be effective in reducing the vertical fuel continuity that fosters initiation of crown fires. In addition, thinning of small material and pruning branches are more precise methods then prescribed fire for targeting ladder fuels. The net effect of removing ladder fuels is that surface fires burning through treated stands are less likely to ignite the overstory canopy fuels. However, by itself mechanical thinning does little to beneficially affect surface fuels with the exception of possibly compacting, crushing, or masticating it during the thinning process. Depending on how it is accomplished, mechanical thinning may add to surface fuels (Graham, McCaffrey and Jain, 2004). In addition, Raymond and Peterson (2005) found that mortality in Southern Oregon's Biscuit fire was more severe in mechanically thinned treatments compared to no treatment, in mixed evergreen forests. On the other hand, a mechanical treatment with follow-up prescribed burn resulted in substantially lower mortality due to wildfire compared to untreated stands. Researchers agree that while thinning provides more exact control over the trees removed and retained in a stand, thinning does not replicate burning processes such as nutrient cycling, removal of fine fuels, etc. (Omi and Martinson, 2002a).

Carey and Schumann (2003) found a limited number of papers on the effects of mechanical thinning on wildfire behavior. They report on one case study and one empirical study linking the effects of mechanical thinning to reduce wildfire behavior. In the case of the empirical study (Omi and Martinson, 2002b) only one out of several study sites showed a reduction in wildfire severity as a result of mechanical thinning treatments.

Carey and Schumann (2003) found a limited number of studies that address the effectiveness of a combination of thinning and burning in moderating wildfire behavior. In their research they found one case study and one empirical study demonstrating a direct link between mechanical thinning followed by prescribed fire and a reduction in wildfire behavior. In addition, their analysis of papers describing computer simulations of mechanical/prescribed fire treatments showed inconsistent results.

On the other hand, Stephens et al., (2009) found that "*Mechanical treatments without fire resulted in combined 1-, 10-, and 100-hour surface fuel loads that were significantly greater than [no treatment at all]. Canopy cover was significantly lower than controls at three of five sites with mechanical-only treatments and at all sites with the mechanical plus burning treatment; fire-only treatments reduced canopy cover at only one site. For the combined treatment of mechanical plus fire, all sites with this treatment had a substantially lower likelihood of passive crown fire as indicated by the very high torching indices. Sites that experienced significant increases in 1-, 10-, and l00-hour combined surface fuel loads utilized harvest systems that left all activity fuels within experimental units. When mechanical treatments were followed by prescribed burning or pile burning, they were the most effective treatment for reducing crown fire potential and predicted tree mortality because of low surface fuel loads and increased vertical and horizontal canopy separation. Results indicate that mechanical plus fire, fire-only, and mechanical-only treatments using whole-tree harvest systems were all effective at reducing potential fire severity under severe fire weather conditions. Retaining the largest trees within stands also increased fire resistance.*"

According to Evans et al., (2011), Safford et al., (2009) found that during the 2007 Angora Fire in the Lake Tahoe Basin, combined thinning and pile burning treatments reduced bole char height, crown scorching, torching, and mortality. Notably, the Lake Tahoe treatments were effective in changing fire behavior from an active crown fire to a surface fire (Safford et al., 2009).

According to Evans et al., (2011), mastication can increase surface fuel depth and continuity, allowing fires to spread more easily and burn hotter at the soil surface. Evans also reports that soil heating during post-mastication fires has the potential to cause biological damage, particularly in dry soil with a mulch depth of 3 inches or greater.

A preliminary report (Bostwick, Menakis and Sexton, 2011) describing the effectiveness of fuel treatments in the area of the Wallow Fire in eastern Arizona, shows that various fuel treatments (mostly mechanical) were able to slow crown fires approaching homes in the community of Alpine, and in some cases substantially reduced fire intensity and severity. North et al., 2009 describe a multi-age silvicultural system that includes ecological restoration which can lead to more fire resilient Sierra Nevada forests.

- Hand Treatments

The effects of hand treatments on wildfire behavior are expected to be similar to mechanical treatments with prescribed fire, as most hand treatments are designed to thin understory trees and shrubs, reduce ladder fuels, and utilize hand pile and burn to reduce surface fuels.

- Herbivory

The effects of herbivory on reducing wildfire behavior have not been well studied. Grazing animals can reduce grass height and thus reduce grassland fire flame lengths and fire severity, however the effects are often short term. Goats have been used often to reduce shrubs and ladder fuels up to approximately five feet in height and thus can resemble hand treatments, though goats, sheep, etc., do not affect surface dead fuel loads. Goats are often used as a follow-up treatment, though they have been used in Tehama County to initially treat over 4,000 acres of dense shrublands. Overall, the practice of herbivory is expected to be similar to hand and mechanical treatments in terms of wildfire behavior.

- Herbicides

Herbicides are normally used in conjunction with other treatments, such as by browning/killing shrubs to help carry a prescribed fire through shrublands under weather and prescribed burn prescription conditions where burning might not be possible (e.g. during the winter). Herbicide application alone is not used to moderate wildfire behavior, except for limited treatments to control invasive grasses as practiced in sage ecosystems in the Modoc, Colorado Desert, and Mojave Bioregions.

- Effects of Treatments at the Landscape Scale

Rice et al., (1981) postulated that a very intensive fuel break system in Southern California chaparral stands could reduce average annual acreage burned by 12%. Finney, McHugh and Grenfell, (2005) and Keeley (2006) note that very large fires now burn under extreme weather conditions and tend to be oriented along a particular axis determined by the direction of episodic wind events such as Santa Ana winds. Finney's 2005 work analyzing the 2002 large Arizona fires suggests that [landscape] wildfire growth and severity under extreme weather conditions can be reduced by fuel treatments such as prescribed fire in forested ecosystems. In addition, Finney's 2001 paper documents, through simulation, that treating approximately 35%

of the landscape can reduce wildfire extent and severity. On the other hand, Keeley in 2006 found that in chaparral ecosystems at least, the mosaic of treated vegetation did little to stop the spread of fire. In fact, Keeley notes that the Southern California fires which burned in 2003 burned in numerous locations where previous fires had occurred, in some cases within 3 years prior to the 2003 fire. Moritz determined that in the South Coast bioregion 10% of all wildfires generate 75% of the acreage burned in any one year, mostly due to their occurrence during extreme fire weather conditions (Moritz, 1997).

Analytical Procedure

For this analysis, the potential location of ten years of Proposed Program treatments across the state was combined in a GIS with the number of times that an individual watershed has burned in the last 50 years (see Figure 5.2.1 and Table 5.2.1). Over 80% of the watersheds in the state burn less than once every ten years, the approximate amount of time over which treatments are expected to be effective. The results also show however, that at least for a limited number of bioregions, a relatively high proportion of watersheds might be treated that burn more than once every ten years. The South Coast Bioregion potentially has the most watersheds that could be treated and that burn at least once in ten years – 141 out of 155 watersheds. The Sierra Bioregion could have potential projects in 254 of the 756 watersheds that have burned more than once every ten years, while the Central Coast could have 90 treated watersheds out of 372 watersheds that have burned at least once in the last ten years. For the balance of the state, there could be potential treatments in 202 out of the 968 watersheds that have burned more than once in ten years. In order to have a landscape effect, however, according to Finney, at least 35% of a watershed would need treatment in order to reduce the size and severity of wildfires during moderate fire weather conditions. The South Coast Bioregion could benefit the most from treatments which could result in a reduction in wildfire size and severity at the landscape scale since 26 of the 141 watersheds could potentially receive treatments covering 35% or more of the watershed in any ten year time period.

Figure 5.2.1

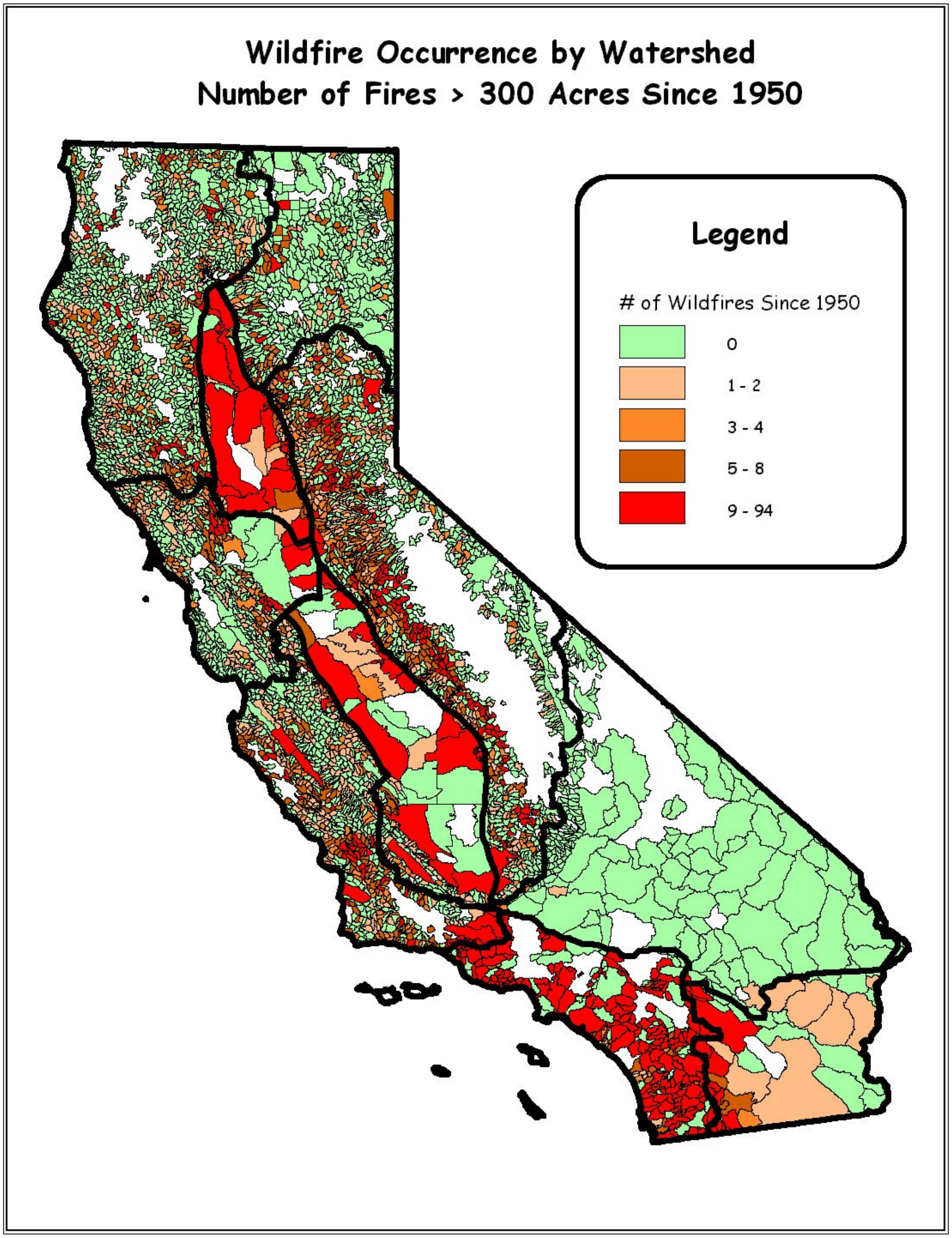
Wildfire Occurrence by Watershed
Number of Fires > 300 Acres Since 1950
Legend
# of Wildfires Since 1950
0
1 - 2
3 - 4
5 - 8
9 - 94

Table 5.2.1
Number of Watersheds by Percent Treated and Number of Wildfires Over Last 50 Years

Bioregion	% Watershed Treated	Number of Wildfires Last 50 Years						
		0	=<5	5-10	10-20	20-30	30 +	Grand Total
		Number of Watersheds						
Sierra	0%	337						337
	<5%	189	201	89	34	7		520
	5-10%	72	155	53	28		1	309
	10-20%	23	92	26	7			148
	20-30%	8	26	6	1			41
	30-50%	2	6	1	1			10
	50%+	1	2					3
	Total	632	482	175	71	7	1	1,368
Central Coast	0%	106						106
	<5%	71	82	19	7	1		180
	5-10%	40	79	25	5	1		150
	10-20%	24	81	19	4			128
	20-30%	6	32	6				44
	30-50%	7	7	3				17
	50%+	1	1					2
	Total	255	282	72	16	2		627
South Coast	5-10%	1	1	6	10	9	5	32
	<5%	7	1	5	14	8	22	57
	10-20%		6	9	7	4	2	28
	20-30%			6	6	2		14
	30-50%		2	9	5			16
	50%+		4	10	2			16
	Total	8	14	45	44	23	29	163
Other Bioregions, Klamath/ North Coast, Modoc, Sacramento Valley, Bay Delta, San Joaquin, Mojave, Colorado Desert	0%	1,277						1,277
	<5%	355	381	85	25	8	5	859
	5-10%	159	215	30	5	3		412
	10-20%	63	100	20	2		1	186
	20-30%	12	19	4	2			37

	30-50%	6	20	3	2			31
	50%+	6	31	5	2			44
	Total	1,878	766	147	38	11	6	2,846
Grand Total		**2,773**	**1,544**	**439**	**169**	**43**	**36**	**5,004**

Also for this analysis, prescribed burns in surface fire regimes were assumed to change wildfire behavior post treatment from moderate to low based on using the USFS Forest Vegetation Simulator (FVS) and Forest Inventory Analysis (FIA) plots from the various bioregions. For crown fire regimes and regimes not inventoried by the FIA system, predicted flame lengths from Scott and Burgan (2005) were used which show changes in fire intensity due to potential treatments including changes in severity during extreme fire weather conditions. Overall, this analysis showed that for crown fire ecosystems, treatments will most often reduce wildfire severity from severe to moderate for extreme fire weather conditions and from severe to low to moderate in more moderate fire weather conditions, depending on the vegetation type assessed.

Mechanical and hand treatments were assigned a lower level of efficacy, such that the severity and intensity of wildfires burning in these types of treatments was assumed to be low for surface fire regimes and severe for crown fire regimes.

In addition, not all bioregions were assumed to experience a wildfire during the ten-year term during which potential treatments are expected to remain viable. Based on the number of times burned since 1950, bioregions were assigned a wildfire likelihood proportionate to the number of watersheds that have burned more than five times in the past 50 years compared to the total number of watersheds within each bioregion. Thus, the North coast bioregion, where only 90 of 1,529 watersheds had burned more than 5 times in the past 50 years was assigned a likelihood of wildfire burning a treated area of 1 in 17 (e.g. 1529/90). On the other extreme, virtually every watershed in the South coast bioregion could be expected to burn every 10 years and the likelihood of a treated area burning is much greater than on the North Coast.

5.2.4 Direct Effects Common to all Bioregions From Implementing the Program/Alternatives

Table 5.2.2 summarizes the information from the balance of this subchapter on the effects of implementing the Program across the state by bioregion in terms of wildfire severity and frequency. In this case, a significant effect is one in which there is a 50% increase in the short term size and severity of individual fires, or a 50% increase in the frequency of large scale fires.

The Proposed Program acreage and treatment effects between bioregions have previously been described in Tables 5.0.1, 5.0.4 and 5.0.5. The effect of treatments on reducing wildfire severity and extent are relatively similar between bioregions. However, the consequences of implementing the Proposed Program can vary between bioregions due to the number of acres treated, the potential for wildfire to occur, the types of wildfires that do occur, and the vegetation in the bioregion.

Table 5.2.2 Summary of Effects [1/] on Wildfire Severity and Frequency From Implementing the Proposed Program				
Bioregion	**Prescribed Fire**	**Mechanical**	**Hand**	**Herbivory**
Klamath / North Coast	MB	NB	NB	NB
Modoc	MB	NB	NB	NB
Sacramento Valley	MB	NB	NB	NB
Sierra	SB	MB	MB	MB
Bay Area	MB	NB	NB	NB
San Joaquin	MB	NB	NB	NB
Central Coast	SB	MB	MB	MB
Mojave	NB	NB	NB	NB
South Coast	SB	MB	MB	MB
Colorado Desert	NB	NB	NB	NB

1/ Key to effects; adverse effects are those effects which degrade the diversity, structure, size, integrity, abundance or number of; or are outside the natural range of variability, for the resource at issue. Beneficial effects are those effects that improve the diversity, structure, size, integrity, abundance or number of; or are within the natural range of variability, for the resource at issue. SA/SB – significant adverse or beneficial effects are those effects that are substantial, highly noticeable, at the watershed scale; and often irreversible. MA/MB - moderately adverse or beneficial effects - those effects that can be detected beyond the affected area, but are transitory and usually reversible. NA/NB - negligible adverse or beneficial effects - those effects that are imperceptible or undetectable.

Consequences of Implementing the Program on Reducing Watershed-Level Wildfire Frequency

Implementing 216,910 acres of treatments annually (on average) across nearly 38,000,000 acres of the State of California available for treatment under this program treats about 5% of the state's available area in any ten-year period which is approximately 2% of the entire state. However, as noted above, not all treatments are equally effective at reducing the effects of wildfire, particularly in crown fire vegetation regimes. Based on Finney and Keeley's work, treating more than 35% of a watershed can potentially reduce wildfire size and severity in surface fire regimes during severe fire weather conditions. These benefits occur at the watershed or landscape level, that is: treatment of 350 acres of a 1,000-acre watershed potentially reduces wildfire size and severity on 1,000 acres, not just the 350 acres treated because, as Finney (2001) points out treatments can affect the head fire rate of spread and deflect fast spreading wildfire into a flanking fire condition.

Table 5.2.3 summarizes information from Chapter 4 and shows the average annual acres burned by wildfire according to whether they burned in surface or in crown fire vegetation types.

Table 5.2.3
Average Annual Acres Burned by Wildfire 1996-2005 by Vegetative Type and Bioregion

Bioregion	Acres in Bioregion	Treatable Acres in Bioregion	Annual Acres Burned by Wildfire		
			Surface Fire Vegetation Types	Crown Fire Vegetation Types	Total Acres Burned
Klamath / North Coast	14,340,563	8,158,000	5,242	2,204	7,446
Modoc	8,359,825	3,616,900	1,269	546	1,815
Sacramento Valley	4,138,720	1,524,300	13,048	22,776	35,824
Sierra	17,926,621	6,605,500	3,849	9,810	13,659
Bay / Delta	6,225,831	3,346,500	1,685	6,783	8,468
San Joaquin Valley	8,603,630	1,799,800	770	15,696	16,466
Central Coast	7,930,780	4,989,200	264	6,618	6,882
Mojave	20,283,721	3,112,800	296	22,455	22,751
South Coast	6,639,611	2,737,600	5,506	37,205	42,711
Colorado Desert	6,819,050	2,067,800			
Total	**101,268,352**	**37,958,400**	**31,929**	**124,093**	**156,022**

The South Coast Bioregion benefits the most from the Program because 26 of the 163 watersheds in the bioregion might wind up with more than 35% of the watershed treated in a ten-year period. For the Sierra only two of the 254 watersheds might potentially have sufficient treatments to reduce the potential landscape size and severity of wildfire, while the Central Coast might successfully treat nine out of 90 watersheds, and the balance of the state could see 12 watersheds out of 202 watersheds with sufficient potential treatments to result in a reduction in the landscape extent of wildfire.

Based on Table 5.2.1, about 86,500 acres in the South Coast, Central Coast, and Sierra Nevada Bioregions could be expected to experience reduced wildfire size and severity, particularly during moderate fire weather conditions, because 35% or more of the watersheds where the treatments occur also burn more than once every ten years. Another 336,700 acres in the rest of the bioregions could also exhibit reduced wildfire size and severity related to treatment and natural fire frequency.

Because of the complexity of modeling wildfire occurrence and behavior at the bioregional level, let alone at the state level, it is difficult to predict whether implementation of the Program (or Alternatives) could reduce the frequency of large-scale wildfires. However, based on the analysis above, it appears that the size and severity of wildfires (but not the frequency of wildfires), particularly those burning in moderate fire weather conditions, could be reduced at the watershed level in the South Coast, Central Coast, and Sierra Bioregions and to a lesser extent in the balance of the bioregions, across both surface and crown fire regime adapted vegetation. The analysis also suggests that wildfire size could be reduced at the watershed scale during severe fire weather conditions for surface fire regime vegetation types across the entire state, but in crown fire regimes, wildfire size at the watershed scale would not be reduced.

Since Program treatment would likely not greatly reduce the acreage burned by wildfire in most bioregions (except in the South Coast, Central Coast and Sierra), the additive total acreage burned in the state due to wildfire and prescribed fire could increase by 67% over current levels. That is, across the state the reduction in acreage burned by wildfire due to treatments covering more than 35% of a watershed is substantially less than the additional acreage treated by prescribed fire.

Consequences of Implementing the Alternatives on Reducing Watershed Level Wildfire Frequency

Under the Proposed Program, almost 3% of the watersheds within the state (see Table 5.0.7) would have treatments during a decade such that more than 35% of a given watershed would be treated. Alternative 1 would only treat about 0.4% of watersheds sufficiently to potentially reduce the landscape effects of wildfire. Alternatives 2 and 3 would treat about 2.6% and 3.4% respectively of all watersheds in the state (Table 5.0.8) during a decade. Alternative 4 would only treat about 1.0% of all of the state's watersheds in a decade. Overall, the treatments under the alternatives are not expected to greatly affect the level of wildfire frequency, though none of the alternatives is likely to increase the frequency of wildfire.

Consequences of Implementing the Proposed Program on Wildfire Extent and Severity of Treated Areas

As noted above, because of the complexity of modeling wildfire occurrence and behavior at the bioregional level, let alone at the state level, it is difficult to absolutely predict whether implementation of the Program (or Alternatives) could reduce the extent or severity of wildfire at the watershed scale. It is only slightly less difficult to determine whether implementation of the Proposed Program or the Alternatives could reduce wildfire extent and severity within the treated areas themselves. Wildfire extent and severity in treated areas is partly a function of the efficacy of the treatments, vegetation type(s) treated, fire weather conditions and most importantly, whether a treated area would be expected to be burned by wildfire during the time the treatment remains effective. Reducing wildfire intensity within treated areas requires assessing both the efficacy of the treatments themselves as well as the possible extent and severity of wildfires that might occur.

Based on the methodology described above, Table 5.2.4 shows the likely consequences of implementing the Proposed Program in terms of the expected severity/extent of wildfires burning both treated and untreated lands, as well as the severity of both wildfires and prescribed fires. Treated acreage shown is less than the Program as herbivory and herbicide treatments are not expected to greatly affect wildfire behavior.

Table 5.2.4
Comparison of Average Wildfire Acres Burned per Year to Total Acres Burned as a Result of Program Implementation

Bioregion	Average Wildfire Acres Burned Per Year 1996-2005 by Severity Class			Treatments by Bioregion		Average Annual Total Acres Burned (Wildfire and Program Prescribed Fire Combined) by Severity Class			
	Moderate	Severe	Total	Prescribed Fire	Mechanical and Hand	Low	Mod	Severe	All classes
Klamath / North Coast	5,200	2,200	7,400	13,400	7,100	14,100	4,800	2,000	20,900
Modoc	1,300	500	1,800	11,800	6,300	12,300	1,100	300	13,600
Sacramento Valley	13,000	22,800	35,800	16,500	8,700	20,400	14,400	17,600	52,300
Sierra	3,800	9,800	13,700	22,700	11,900	25,700	5,500	5,100	36,400
Bay / Delta	1,700	6,800	8,500	8,300	4,300	8,600	2,000	6,100	16,700
San Joaquin Valley	800	15,700	16,500	6,200	3,300	6,800	1,500	14,400	22,700
Central Coast	300	6,600	6,900	20,700	10,900	23,000	3,100	1,400	27,500
Mojave	300	22,500	22,800	1,100	600	1,100	300	22,400	23,800
South Coast	5,500	37,200	42,700	10,900	5,800	16,000	10,400	27,200	53,600
Colorado Desert	0	0	0	4,100	2,200	5,200	1,300	300	6,700
Total	**31,900**	**124,100**	**156,000**	**115,700**	**60,800**	**133,200**	**44,300**	**96,800**	**274,300**

The average number of acres annually burned by wildfire between 1996 and 2005 has been around 156,000, of which 124,000 acres have burned at high severity. Implementing the Program could potentially burn an additional 115,000 acres, mostly at low to moderate intensity. Due to treatments, particularly in the South Coast, Central Coast and Sierra Bioregions, the number of acres severely burned by wildfire could fall from 124,000 acres per year to ~ 97,000 acres per year. Part of the reason that there is not a larger effect is that only about 41,500 acres of treatments in any one-year period could be expected to burn in a wildfire.

The proportion of acres severely burned (mostly from wildfire but some from prescribed fire) could decrease by 22% in any one decade (343,000 acres of the 1.56 million acres that are burned by wildfire on jurisdiction lands). Given the increase in total acres burned (wildfire and prescribed fire) from 156,000 acres to 274,000 acres there could be an associated increase of 8% in total acres burned at a moderate level and a 76% increase in total acres burned at a low severity level as a result of implementing the Program while the area burned at high severity might drop by 22%. The Proposed Program would meet the goal to reduce detrimental effects on the environment due to wildfire since 22% of the jurisdiction lands would be expected to burn at a lower severity annually due to the Program's implementation.

The Proposed Program would likely meet Goal number 6, which seeks to reduce the detrimental environmental effects of high intensity wildfire on watersheds through treatments that reduce fire extent and severity. As noted above, implementation of the Proposed Program would reduce fire severity on 22% of the acres treated annually. In addition, the Proposed Program would also likely meet Goal 2 to reduce catastrophic losses to life and property and Goal 3 to reduce the severity and associated suppression costs of wildland fires. Each decade about 343,000 acres of the 1.56 million acres that are burned by wildfire on jurisdiction lands would burn at lower intensity due to treatments under the Proposed Program, which is likely to reduce the severity of the fires themselves as well as suppression costs ($105.3 million in 2005) and the potential losses to life and property (an average of 458 structures per year between 2000 and 2005).

Consequences of Implementing the Alternatives on Wildfire Extent and Severity of Treated Areas

Implementing the alternatives results in a different total number of acres burned each year as well as the potential acres burned at high severity. Using the same logic described above, Table 5.2.5 shows possible results from implementing the Alternatives.

Table 5.2.5
Total Average Annual Acres Burned by Alternative by Wildfire and Prescribed Fire by Severity Class

	Low	Moderate	Severe	All classes
Alt 1	34,300	35,300	116,700	186,400
Alt 2	141,700	45,400	95,400	282,400
Alt 3	142,400	45,200	94,800	282,400
Alt 4	7,600	38,200	118,700	164,500

Although no alternative would create a potential increase in wildfire extent/severity, implementation of Alternative 4 would have the least impact of all of the alternatives on reducing the amount of acres that are severely burned every year. Implementation of Alternative 1 would not have any effect on wildfire severity, since wildfire severity today includes treating 47,000 acres per year. Alternative 4 would not have much effect on wildfire severity because while it treats twice as many acres as the Status Quo, it treats so few acres that severity only decreases by about 5,000 acres per year. Implementation of Alternative 2 would have approximately the same impact on wildfire severity as implementing the Program. Alternative 3 would likely be less effective than the Program at reducing wildfire extent and severity because even though it winds up treating a somewhat larger number of acres in any decade at the 35% level it only treats about 13.7 million acres with prescribed fire and mechanical treatments while the Proposed Program would treat about 22.4 million acres with prescribed fire and mechanical treatments. Mechanical treatment followed by prescribed fire, and prescribed fire and mechanical treatments alone are far more effective at lowering fire severity and intensity than hand, herbivory or herbicide treatments.

Alternative 2 would meet Goal 6 (reduce the detrimental effects to the environment by wildland fire) at approximately the same rate and magnitude as the Proposed Program. Alternatives 1 and 4 would not meet Goal 6 nearly as well as the Proposed Program, due to the fact that each of these alternatives treats so few acres. In addition, Alternative 4 would limit prescribed fire and mechanical treatments to a landscape of only about 11.7 million acres compared to the Proposed Program and Alternative 2, which would limit the treatable landscape to about 22.4 million acres.

Alternative 3 would not meet Goal 6 to reduce detrimental effects of wildland fire as well as the Proposed Program because while it treats about the same number of acres annually, the treatable landscape where prescribed fire and mechanical treatments would take place, which represents about 75% of all treatments, would only take place on about 13.7 million acres.

Alternative 2 would likely meet Goals 2 and 3 to reduce losses to life and property and reduce suppression costs in a manner similar to the Proposed Program. Alternative 1, the Status Quo would not change the suppression costs of wildland fire nor would it reduce losses to life and property, since CAL FIRE already treats about 470,000 acres per decade and these treatments are already factored into current estimates of the costs of suppression ($105.3 million in 2005) and losses to life and property (an average of 458 structures/year between 2000 and 2005).

Alternative 3 would initially meet Goals 2 and 3 but over the long term, fewer acres would be treated by prescribed fire and mechanical treatments compared to the Proposed Program (13.7 million acres compared to 22.4 million acres, respectively). As a result, over the long term, Alternative 3 would not meet Goals 2 and 3 to the same extent as the Proposed Program.

Alternative 4 would meet Goals 2 and 3 at a slightly faster rate than Alternative 1, however it would lag far behind the Proposed Program and Alternatives 2 and 3 at reducing wildfire suppression costs and at reducing the likely number of structures that burn every year.

5.2.5 Indirect Effects of Implementing the Program/Alternatives

Indirect effects of implementing the Program or Alternatives are numerous and include both beneficial impacts and adverse impacts as a result of both increasing the total number of acres burned while at the same time reducing the number of acres severely burned.

One of the most important indirect effects is the potential for prescribed fires, particularly broadcast burns, to escape control. Few such incidents occur, notwithstanding several very high profile escaped fires such as the Lewiston fire in Northern California in 1999 and the Cero Grande Fire in New Mexico in 2001. Graham, McCaffrey and Jain concluded in their 2004 report that the risk of prescribed fire escaping is “*extremely*” low given the number of prescribed burns which take place each year. Escapes can occur if weather predictions are ignored, or are inaccurate, if data is misinterpreted or wrongly analyzed, if fuel loading is underestimated or if lighting or holding crews do not follow the prescribed burn plan. The effects of escaped prescribed fire include more watershed area burned than planned, possible catastrophic effects to improvements such as homes, barns, fences, crops, etc. and additional fire suppression resources are often needed to put out the resulting escaped fire. These indirect effects can be reduced by using VTP funds to rehabilitate areas burned due to escaped fire, using required insurance settlements to provide reimbursements for effects to improvements such as houses and maintaining sufficient suppression resources on site to suppress any escaped fire at the smallest possible size.

Positive indirect impacts due to a reduction in acres severely burned can include increased firefighter safety and potentially fewer catastrophic losses to human life and property. Fewer acres severely burned could also potentially reduce impacts to air quality and to water quality. On the other hand, the number of acres burned at low and moderate severity could potentially result in minor to moderate adverse impacts to wildlife, vegetation, air quality and water quality. These impacts are addressed in other subsections of Chapter 5.

5.2.6 Determination of Significance

Implementation of the Program would not result in a 50% increase (the threshold of significance) in the frequency of large-scale wildfires. Indeed, as a result of Program implementation over a ten-year period, there is a potential to actually reduce the size and severity (but not the number) of large-scale wildfires on approximately 290,000 acres of watersheds during moderate fire weather conditions. Implementation of the Program would not expose people or structures to substantial risk of loss, injury or death involving wildfires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands, resulting in a less than significant impact to the environment.

Implementation of the Program would not create a 50% or more increase (the threshold of significance) in the short-term in the size or severity of individual wildfires. Indeed, as a result of Program implementation there might be as much as a 20% reduction in the acreage that is severely burned by wildfire each year. Implementation of the Program would not expose people or structures to substantial risk of loss, injury or death involving wildfires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands resulting in a less than significant impact to the environment.

Implementation of the Proposed Program would not result in significant increase in Wildfire Severity and Extent; therefore, no mitigation is required.

5.2.7 Similar Effects Described Elsewhere

See Section 5.4 for a discussion of the potential climate effects that might alter wildfire frequency and severity over the next 50 years. In addition, Section 5.6 discusses the impacts of implementing the Program and Alternatives on air quality, Sections 5.5.1 through 5.5.5 discuss impacts to biological resources, and Section 5.7 discusses impacts to water quality.

5.3 Reserved for Future Use