

## Chapter 7 Monitoring

### ***7.0 Introduction and Description of Proposed Program Monitoring***

The purpose of Chapter 7 is to summarize the various monitoring initiatives that will be put into place if the Proposed Program is implemented. Monitoring of mitigation measures is required under CEQA in order to document that the mitigation measures are in fact reducing potentially significant effects to less than significant. California law and regulation specifically require monitoring of mitigation measures. In addition to mitigation measures, the implementation of landscape constraints (LC), minimum management requirements (MMRs) and “checked” checklist items are monitored as to their implementation, as described below. Four “generic” types of monitoring exist, 1) Baseline, 2) Implementation, 3) Effectiveness and 4) Validation (Stolnack et al., 2005).

- 1) Baseline monitoring is analogous to an inventory. This type of “monitoring” is used to establish existing conditions within a geographic area, and is generally used for future planning. It is often used to help define the natural range of variability in the ecosystem being sampled.
- 2) Implementation monitoring is designed to determine if the prescribed standards and guidelines are being carried out.
- 3) Effectiveness monitoring is applied to determine the effect of a management prescription. Effectiveness monitoring often involves research. A typical effectiveness monitoring question is whether stream buffers (correctly implemented) are maintaining stream temperature at acceptable levels.
- 4) Validation monitoring is designed to determine if the underlying assumptions about management and effects are sound. The role of validation monitoring is to determine the accuracy of an assumed cause and effect relationship between management activities and the resource being managed. A typical validation-monitoring question would be: do vegetation treatments reduce fire intensity and extent?

CAL FIRE collects a variety of information on an annual or periodic basis. According to FRAP (CAL FIRE, 2003) CAL FIRE collects the following forest and rangeland information:

## Monitoring

<b>Table 7.1 CAL FIRE Monitoring Program</b>		
<b>Element Monitored</b>	<b>Frequency of Monitoring</b>	<b>Accuracy of Information</b>
Conifer forest condition (with other agencies)	10 years	High
Specialized conifer forest stand characteristics	5 years	High
Specialized hardwood forest stand characteristics	Varied	Varied
Range inventories – general	5-10 years	High
Specialized rangeland characteristics	5 years	High
Wildfire history and behavior	Annual	High
Communities and assets at risk	Periodic	High
Impact of fire protection forces on losses	Annual	High
Pest locations and conditions	Annual	Varied
Extent and condition of urban forests	Periodic	High
Specific timber harvest plan monitoring	Periodic	Varied
BOF/CAL FIRE Long Term Monitoring Program	Annual and Periodic	High

CAL FIRE is required to monitor timber harvest plans (THPs) as required by both the Z'Berg-Nejedly Forest Practices Act as well as the Forest Practice rules. Monitoring of THP's would normally be considered as implementation monitoring, as CAL FIRE forest practice inspectors visit on-going THP's, as well as review completion reports, stocking reports and erosion control maintenance.

The BOF/CAL FIRE Long Term Monitoring Program has four main components (CAL FIRE, 2006): 1) the modified completion report (an extension of the normal timber harvest inspections and completion reports that CAL FIRE is required to complete on THPs), 2) the Hillslope Monitoring Program, 3) the Cooperative Instream Monitoring Projects, and 4) the Interagency Mitigation Monitoring Program (IIMP) which will build on the hillslope program and modified completion reports programs. The IIMP is designed to provide information regarding forestry-related practices at high-risk sites for which specific practices have been designed to protect water quality.

Typically monitoring includes evaluation of the progress in meeting the goals and objectives of a program. The goals of the VTP were previously enumerated in Chapter 1 and are paraphrased here as:

- 1) Maintain and enhance forest and range land resources
- 2) Modify wildland fire behavior to help reduce catastrophic losses to life and property
- 3) Reduce the severity and associated suppression costs of wildland fires
- 4) Reduce the risk of large, high intensity fires by restoring a natural range of fire-adapted plant communities through periodic low intensity vegetative treatments
- 5) Maintain or improve long-term air quality through vegetative treatments
- 6) Reduce the detrimental environmental effects of wildland fire on watersheds
- 7) Reduce noxious weeds and invasive plants and improve browse and forage for wildlife and domestic stock

## Monitoring

The Proposed Program will be periodically and annually monitored through completion of implementation and mitigation monitoring. Implementation monitoring will include an annual assessment of the progress at meeting the goals of the VTP

### **7.1 Implementation Monitoring**

The purpose of implementation monitoring is to determine whether a project is being conducted according to the requirements of the EIR; in this case the implementation monitoring will need to assess:

1. Were all of the landscape constraints adhered to?
2. Were all of the minimum management requirements adhered to?
3. Were all of the environmental checklist items adhered to?

All applications for VTP funding will include the following information:

1. Date of Application
2. Projected Date of Treatment
3. Location of project in Lat/Long values
4. Total acres of project
5. Location of project by CalWatershed 2.2 HUC number
6. Location of project by CAL FIRE Ranger Unit, County, and Bioregion
7. Number of acres to be treated by treatment type
8. Acres treated by VTP goal
9. Mitigation measures to be implemented
10. Copy of environmental checklist
11. Copy of application

Information about each VTP project will be maintained in a GIS compatible format.

A “paper review” sample of all submitted applications will be conducted annually to determine whether the Proposed Program is being implemented according to the landscape constraints, minimum management requirements, environmental checklist items and mitigation measures. The results of the paper review of VTP implementation will be reported to the BOF annually.

A subset of office-reviewed applications will be conducted in the field to verify that projects are being implemented according to both the Proposed Program requirements and the requirements in the application. Projects reviewed could include both those planned but not yet implemented and those that have been implemented. The results of field reviews of VTP implementation will be reported to the BOF annually.

Each year the GIS coverage of projects completed will be “intersected” with the FRAP wildfire perimeters GIS coverage ([http://frap.cdf.ca.gov/projects/fire\\_data/fire\\_perimeters/](http://frap.cdf.ca.gov/projects/fire_data/fire_perimeters/)) and a sample of burned projects will be field reviewed to assess the results of treatments and wildfire effects. These results will be reported to the BOF annually.

## Monitoring

In addition, the implementation-monitoring program will also assess yearly progress in meeting the goals and objectives of the Proposed Program. These results will be reported to the BOF annually.

A project completion report will be filed for each completed VTP project. Project completion reports will be filed annually during the duration of any required mitigation along with the mitigation monitoring results.

### **7.2 Mitigation Monitoring**

PRC § 21081.6 requires the lead agency to adopt a mitigation monitoring and reporting plan when making findings pursuant to PRC § 21081. There are two general approaches to mitigation monitoring, 1) evaluate the aggregate effect of the entire set of mitigation measures on achieving the goals and objectives of the Proposed Program and 2) evaluate the effect of individual mitigation measures (Reeves et. al., 2004). In this case, monitoring of individual mitigation measures at the project level will be required. As noted above, any time a mitigation measure is invoked, it will require CAL FIRE at the project level to annually monitor mitigation measure effectiveness throughout the duration of the mitigation measure and report such findings to VTP Sacramento. The results of the mitigation monitoring will be reported annually to the BOF. Mitigation monitoring elements are shown below:

## Monitoring

<b>Table 7.2 Mitigation Monitoring Responsibility and Reporting Requirements</b>					
<b>Mitigation Measure/Checklist Item</b>	<b>Timing</b>	<b>Scope</b>	<b>Implementation Responsibility</b>	<b>Monitoring Responsibility</b>	<b>Criteria</b>
<b>Mitigation Measure 5.5.2-1.</b> Overstory canopy cover shall not be reduced within occupied northern spotted owl territories within the project area.	Planning, Implementation	Occupied NSO territories and vicinity	CAL FIRE/DFG	CAL FIRE/DFG	Maintain canopy cover in and adjacent to occupied territory.
<b>Mitigation Measure 5.5.2-3.</b> In areas where vegetation that provides critical habitat for special status taxa (such as valley elderberry in longhorn beetle habitat) occur, only hand (manual) treatments shall be used. Crewmembers shall be trained to recognize and avoid vegetation of particular concern where it occurs. Treatments shall focus on invasive plants that may inhibit establishment and growth of such species where it has been deemed appropriate by a biologist, botanist or agency personnel.	Planning, Implementation	Special status taxa	CAL FIRE/DFG	CAL FIRE/DFG	Maintain or enhance elderberry populations.  Train crew to recognize, avoid.  Treat invasive plants.
<b>Mitigation Measure 5.5.2-4.</b> Mechanical treatments shall not be used where special status burrowing species (for example, San Joaquin kit fox), or those for which burrows are a critical habitat element, are known or likely to occur unless extensive burrow surveys are carried out in the treatment area immediately prior to treatment and no-treatment buffers are established around any burrows that are found..	Planning, Implementation	special status burrowing species	CAL FIRE/DFG	CAL FIRE/DFG	Preferentially avoid mechanical treatments. If not possible, conduct burrow surveys & establish no-treatment buffers.
<b>Mitigation Measure 5.5.2-5.</b> In areas where special status terrestrial amphibians such as salamanders are known or likely to occur, prescribed fire shall be monitored closely post project to determine if burned cover objects should be replaced. New unburned cover objects shall be introduced at a one-to-one rate (or higher) to replace unsuitable burned cover objects and to enhance habitat quality for salamanders.	Planning, Post-treatment	Special status terrestrial amphibians	CAL FIRE/DFG	CAL FIRE/DFG	Monitor extent of cover objects post-project. Replace cover objects where deficient.

## Monitoring

<p><b>Mitigation Measure 5.5.2-7.</b> Mechanical and prescribed fire treatments shall not be used in riparian zones bordering aquatic sites known or suspected to be in use by special status amphibians (for example, California red-legged frog)..</p>	Planning, Implementation	Burn prescription, Treatment area layout	CAL FIRE/DFG	CAL FIRE/DFG	Avoid fire and mechanical treatments in riparian zones bordering red-legged frog habitat.
<p><b>Mitigation Measure 5.5.2-8.</b> Where burrow-dwelling special-status taxa are found to be present, mechanical treatments and heavy livestock (e.g., cattle) shall not be used.</p>	Planning, Implementation	Locations of special taxa	CAL FIRE/DFG	CAL FIRE/DFG	Avoidance of mechanical and large livestock.
<p><b>Mitigation Measure 5.5.2-10.</b> Treatments shall be conducted at the seasonally appropriate time to minimize impacts to special-status taxa.</p>	Planning, Implementation	Project	CAL FIRE/DFG	CAL FIRE/DFG	Timing of treatment
<p><b>Mitigation Measure 5.5.2-11.</b> Treatments shall not remove essential habitat elements of special status taxa known or likely to occur in the area (for example, buckwheat in Smith’s blue habitat).</p>	Planning, Implementation	essential habitat elements where special status taxa likely to occur	CAL FIRE/DFG	CAL FIRE/DFG	Location of habitat
<p><b>Mitigation Measure 5.5.2-12.</b> Where appropriate, as determined by a biologist or agency personnel, treatments occurring in areas where invasive species are a detriment to special status taxa, removal of invasives and retention of native species will be emphasized (for example, treatments in black legless lizard habitat).</p>	Planning, Implementation	invasive treatments near special status taxa	CAL FIRE/DFG	CAL FIRE/DFG	Location of habitat
<p><b>Mitigation Measure 5.5.3-1.</b> For fire-adapted special status plants, the timing or intensity of prescribed burns shall be adjusted and incorporated into Burn Plan prescriptions to simulate the natural fire regime. The project will be burned in a pattern to create and maintain a mosaic of old and young growth chaparral with diverse habitat structures.</p>	Planning, Implementation, Post-project	Burning prescription	CAL FIRE/DFG	CAL FIRE/DFG	Identify special status species, Simulate native fire regime, Implementation monitoring
<p><b>Mitigation Measure 5.5.3-2.</b> Prescribed fire ignition and timing techniques that result in “cool prescribed burns” shall be used for sagebrush, low sage, bitterbrush, pinyon-juniper, and juniper vegetation types with well-established associations of cheatgrass, medusa-head or other invasives in order to prevent type conversions to cheatgrass or medusa-head. These techniques shall be incorporated</p>	Planning, Implementation, Post-project	Burning prescription	CDF	CDF	Identify veg types & invasives. Implement cool burn. Monitor for invasives post

## Monitoring

into Burn Plan prescriptions.					project.
<p><b>Mitigation Measure 5.5.3-3.</b> Mechanical treatment shall be avoided to the greatest extent possible in special status plant communities with a state rank of 3.2 or lower. If mechanical treatment cannot be avoided, impacts will be mitigated on an acre-for-acre basis by enhancing or restoring the same community type elsewhere in the region.</p>	Planning, Implementation	Special status plant communities ranked 3.2>	CDF/DFG	CDF/DFG	Avoid mechanical if possible, mitigate where not possible. Monitor enhanced/restored community for effectiveness
<p><b>Mitigation Measure 5.5.3-4.</b> A 50' equipment exclusion zone shall be established around vernal pools. DFG shall be notified of the existence of vernal pool habitat in the project area to alert them to the potential for special status plants.</p>	Planning, Implementation	50' buffer vernal pools	CDF/DFG	CDF/DFG	Alert DFG to vernal pools, identify special status plants
<p><b>Mitigation Measure 5.5.3-5.</b> DFG or a qualified biologist shall be consulted during project development when treatments are proposed in maritime chaparral habitat.</p>	Planning	DFG Consultation	CDF	CDF	Maritime Chaparral habitat
<p><b>Mitigation Measure 5.5.3-6.</b> For oak woodland types known to have insufficient natural regeneration rates (blue oak, valley oak and coastal live oak as of 2007) prescriptions for VTP treatments shall require that no more than 25% of oak regeneration on site prior to treatment be top killed during treatment. Mitigation measure effectiveness shall be verified with pre and post-treatment seedling/sapling surveys conducted by CalFire.</p>	Planning, Implementation.  Pre- and Post-Treatment Monitoring	Burn prescriptions  Seedling and sapling surveys	CAL FIRE	CAL FIRE	No more than 10% top kill on existing oak regeneration.

## Monitoring

<p><b>Mitigation Measure 5.5.3-7.</b> Treated stands of blue oak, valley oak and coastal live oak in the Sacramento and San Joaquin bioregions where VTP treatments result in more than 10% mortality to oak regeneration shall be designated as “retarded regeneration.” No more than 2% of the treated blue oak, valley oak and coastal live oak stands in the Sacramento and San Joaquin bioregions shall be allowed to be in a “retarded regeneration” condition at any one time. “Retarded regeneration” stands shall not be re-treated with prescribed fire, mechanical or grazing treatments until 80% of the regeneration onsite is large enough to withstand treatment, usually 20+ years.</p> <p>CAL FIRE shall track the locations of “retarded regeneration” stands and compare them to the total acres of the relevant oak woodland type to determine whether more than 2% of all blue oak, valley oak and coastal live oak stands are in a retarded regeneration condition. Follow-up survey every 5-10 years shall be conducted by CAL FIRE to determine when stands have reached the goal of “treatment resistance” and can be subtracted from the maximum of 2% of stands in the “retarded regeneration” status. CAL FIRE shall check the status of proposed projects against the 2% threshold to determine if the project can be funded.</p>	<p>Post-project</p>	<p>Survey regeneration post-treatment</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Classify treated stands as to regeneration.</p> <p>Modify future prescriptions or avoid treatment until adequately regenerated.</p>
<p><b>Mitigation Measure 5.5.3-8.</b> Current Best Management Practices (BMPs) shall be followed to prevent spread of sudden oak death on personnel or equipment. A list of current BMPs may be found at SuddenOakDeath.org or by linking directly to the following website: <a href="http://nature.berkeley.edu/comtf/pdf/forestry4-08.pdf">http://nature.berkeley.edu/comtf/pdf/forestry4-08.pdf</a></p>	<p>Planning, Implementation.</p>	<p>SOD occurrence or potential occurrence areas</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Utilize web site to identify current BMPs, apply to project where applicable.</p>
<p><b>Mitigation Measure 5.5.3-9.</b> For treatments in or near a sudden oak death-infested area the recommendations of the CAL FIRE state pathologist and/or the most recent recommendations of the California Oak Mortality Task Force shall be followed.</p>	<p>Planning, Implementation</p>	<p>SOD occurrence or potential occurrence areas</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Follow recommendation of pathologist or task force.</p>
<p><b>5.5.3-1 Checklist Question:</b> Have wet areas within the project area been surveyed for and protected including bogs, fens, springs and vernal pools?</p>	<p>Planning, Layout</p>	<p>Wet Areas</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Protect by avoidance.</p>

## Monitoring

<p><b>5.5.3-2 Checklist Question:</b> Has the project area been surveyed for any serpentine inclusions? These need to be mapped for the possibility of special status plant occurrences.</p>	Planning, Layout	Serpentine inclusions	CAL FIRE	CAL FIRE	Map, survey for special status species if serpentine included, protect if found.
<p><b>Mitigation Measure 5.5.4-1.</b> Equipment shall be thoroughly cleaned offsite before beginning ground-disturbing activities when such equipment has previously worked within the last year in an area with invasive species. Equipment shall be thoroughly cleaned onsite before leaving the project area when the project area is infested with invasive species. .</p>	Initiation of project, introduction of new equipment on site.	When equipment was last used in infested areas.	Equipment Operator, Supervisor	CAL FIRE	Need high pressure water or compressed air on project site.
<p><b>Mitigation Measure 5.5.4-2.</b> When mechanical clearing is used in tree-dominated habitats subject to invasive species, the project proponent shall maintain a minimum of 60% tree canopy closure, or 100% of existing canopy if it is less than 60%, to minimize the amount of suitable habitat for invasive species.</p>	During project	Tree-dominated habitats subject to invasives	Equipment Operator, Supervisor	CAL FIRE	Retain at least 60% tree canopy if available.
<p><b>Mitigation Measure 5.5.4-3.</b> Prior to implementing any project, which could create conditions favorable to invasive species, CAL FIRE/applicant shall contact the county Agriculture Dept. and any local groups concerned with noxious weed control, to ascertain the location and extent of known populations of non-native invasive species, which could provide a seed source for the project area.</p>	Planning stage	Knowledge of invasive species presence	CAL FIRE	CAL FIRE	Help in identifying seed sources.
<p><b>Mitigation Measure 5.6-1.</b> The project applicant shall submit a Smoke Management Plan to and obtain a smoke management permit from the local Air District.</p>	Planning, Implementation	Modeling of particulate concentrations	Project proponent	CAL FIRE	Avoid impacts to sensitive receptors, Class I air quality areas.
<p><b>Mitigation Measure 5.6-2.</b> Active-phase smoke monitoring shall be conducted during prescribed burns shall be conducted during prescribed burns. If smoke impacts occur the mitigations or contingencies in the smoke management plan will be implemented..</p>	Implementation	Smoke monitoring	CAL FIRE	CAL FIRE	Smoke management experts needed during implementation.

## Monitoring

<p><b>Mitigation Measure 5.7-1.</b> The ERA of proposed VTP treatments shall be calculated for all Cal 2.2 watersheds that will be directly affected by the proposed project. If the proposed project will cause the ERA values for VTP projects in that watershed to exceed 2%, a more detailed watershed-specific analysis of potential water quality effects shall be required. A <i>qualitative</i> analysis will be required where VTP related ERA is projected to fall between 2 and 5 percent. A <i>quantitative</i> analysis will be required where VTP related ERA is projected to exceed 5 percent. The coefficients for each proposed treatment will be the same as those cited in Tables 5.7-2 and 5.7-3.</p>	<p>Planning stage</p>	<p>Calculation of likely ERA, subsequent analysis</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Need tables from EIR or explanatory document.</p>
<p><b>Mitigation Measure 5.7-2.</b> A protective buffer zone shall be designated on Class III watercourses in order to prevent introduction of sediment into Class III channels or accelerate sediment transport through Class III channels due to VTP treatments. The width of buffer zones shall be a minimum of 25 feet where slopes are less than 30% and 50 feet where slopes exceed 30%. Heavy equipment shall be excluded except at designated crossings in these buffers (ELZ) and broadcast burn intensity will be minimized so that the loss of large fuels (1,000 hour fuels [greater than 9 inches in diameter]) shall be minimized. The project proponent shall develop measures to limit ground disturbance and consumption of wood within streamcourses that contribute to channel stability.</p>	<p>Planning, Layout, Implementation</p>	<p>Field identification of stream classes, buffer zones, slopes.</p>	<p>Project proponent</p>	<p>CAL FIRE</p>	<p>Requires oversight of operations, knowledge of equipment capability, fire behavior.</p>
<p><b>5.10-1 Checklist Item:</b> A project-specific checklist item will require the applicant to confirm that additional VTP projects that rely on the same road will not be conducted simultaneously if combined traffic volumes will exceed 10% of the ADT of access roads in proximal residential or commercial areas.</p>	<p>Planning, Implementation</p>	<p>Project managers must consider adjacency, roads.</p>	<p>Applicant</p>	<p>CAL FIRE</p>	<p>Adjust timing of projects that use same road system to mitigate traffic volumes</p>
<p><b>5.10-2 Checklist Item:</b> The project applicant shall determine if the project would “Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways.” This determination cannot be made at the statewide, programmatic level.</p>	<p>Planning</p>	<p>Traffic analysis vs. road impacts</p>	<p>Applicant</p>	<p>CAL FIRE</p>	<p>Analyze at individual project level.</p>

## Monitoring

<p><b>5.11-1 Checklist Item:</b> Are there any transmission lines or other electrical, telecom or water supply facilities in or near the project area? Protection measures need to be taken and may include installation of fire-breaks using hand treatments around sensitive equipment.</p>	<p>Planning, Implementation</p>	<p>Power lines and water supply infrastructure</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Develop and implement protection measures as needed.</p>
<p><b>5.11-2 Checklist Item:</b> If treatments will include digging below the surface of the ground to a depth of &gt;2 feet, project manager should contact local utilities to determine location of buried underground utilities.</p>	<p>Planning, Implementation</p>	<p>Underground utility lines.</p>	<p>Project Manager</p>	<p>CAL FIRE</p>	<p>Identify and avoid damage to underground lines.</p>
<p><b>Mitigation Measure 5.12-1.</b> The project proponent shall comply with noise standards established in the local general plan or noise ordinance, or applicable standards of other agencies.</p>	<p>Planning, Implementation</p>	<p>Local noise standards</p>	<p>Project proponent</p>	<p>CAL FIRE</p>	<p>Research local standards and incorporate in project.</p>
<p><b>Mitigation Measure 5.12-2.</b> The project proponent shall limit periods of equipment operation to 7AM to 7PM if treatments are within 1,600' of sensitive receptors. The project proponent shall use site-specific measures that take into account the nature of the area and the inhabitants, or receptors.</p>	<p>Planning, Implementation</p>	<p>Adapt timing of project to avoid noise impacts.</p>	<p>Project proponent</p>	<p>CAL FIRE</p>	<p>Identify sensitive receptors, apply timing restrictions.</p>
<p><b>Mitigation Measure 5.12-3.</b> The project proponent shall limit VTP operations within the vicinity of occupied campgrounds and picnic areas to weekdays and non-holidays between 7 am and 7 pm. Noise abatement mitigation (e.g., limiting operations to weekdays, keeping heavy equipment as far away from receptors as feasible, and where necessary, utilizing methods and machinery that are less noisy) shall be included in any treatment that is within 100 feet of an open campground or within 200 feet of a residence, park, or other identified sensitive receptor.</p>	<p>Planning, Implementation</p>	<p>Apply noise reduction methods.</p>	<p>Project proponent</p>	<p>CAL FIRE</p>	<p>Identify sites likely to be affected, mitigate.</p>
<p><b>Mitigation Measure 5.12-4.</b> The noise effects from treatment operations on wildlife shall be mitigated as necessary. Depending on the wildlife species present, its status may require a consultation with DFG staff. within the nesting/breeding areas of noise sensitive listed species on a site-specific basis during the critical reproductive and young-rearing months.</p>	<p>Planning, Implementation</p>	<p>Avoid negative noise effects to wildlife during critical periods</p>	<p>CAL FIRE, DFG</p>	<p>CAL FIRE, DFG</p>	<p>Identify sites likely to be affected, mitigate.</p>

## Monitoring

<p><b>Mitigation Measure 5.15-1.</b> The operational area shall not have detrimental conditions (see description below) on more than 15% of the area. Detrimental soil conditions occur when any of the following are found within the operational area of the project:</p> <ol style="list-style-type: none"> <li>1. Trail used by harvester, forwarder, skidder, bulldozer, etc.</li> <li>2. not used</li> <li>3. Wheel ruts or tracks are &gt;10 cm deep</li> <li>4. Forest floor is missing/partially intact</li> <li>5. Trails have a high level of soil compaction</li> <li>6. Evidence of mineral soil displacement from tractor trails</li> <li>7. Mineral soil displacement from area between tractor skid trails</li> </ol>	Implementa-tion	Avoid impacts to soils, erosion	CAL FIRE	CAL FIRE	Monitor during project, constrain operations to mitigate to less than significant level.
<p><b>Mitigation Measure 5.15-2.</b> Mechanical equipment and prescribed fire shall be limited so that soil cover on treated areas will exceed 30-50% of the operational area the first year and 50-70% the second year.</p>	Implementa-tion	Avoid impacts to soils, erosion	CAL FIRE	CAL FIRE	Monitor during project, constrain operations to mitigate to less than significant level.
<p><b>Mitigation Measure 5.15-3.</b> Mechanical equipment and prescribed fire shall be limited so soil organic matter will cover more than 50% of the operational area, post-treatment.</p>	Implementa-tion	Avoid impacts to soils, erosion	CAL FIRE	CAL FIRE	Monitor during project, constrain operations to mitigate to less than significant level.
<p><b>Mitigation Measure 5.15-4.</b> Mechanical equipment and prescribed fire shall be limited so soil bulk density (compaction) does not exceed 15% over natural conditions.</p>	Implementa-tion	Avoid impacts to soils, erosion	CAL FIRE	CAL FIRE	Monitor during project, constrain operations to mitigate to less than significant level.
<p><b>Mitigation Measure 5.15-5.</b> Mechanical equipment and prescribed fire shall be limited so that after treatment there is still at least ½ of the natural litter layer.</p>	Implementa-tion	Avoid impacts to soils, erosion	CAL FIRE	CAL FIRE	Monitor during project, constrain operations to mitigate to less than significant level.

## Monitoring

<p><b>Mitigation Measure 5.15-6.</b> Mechanical equipment and prescribed fire shall be limited so that displacement of humus does not exceed 15% of the soil organic matter under natural conditions.</p>	<p>Implement- tation</p>	<p>Avoid impacts to soils, erosion</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Monitor during project, constrain operations to mitigate to less than significant level.</p>
<p><b>Mitigation Measure 5.15-7.</b> Mechanical equipment shall not be used on wet or saturated soils. The use of heavy equipment for mechanical treatment shall be limited to periods when there has been no significant (i.e., one inch or more) rainfall within the previous week.</p>	<p>Implement- tation</p>	<p>Avoid impacts to soils, erosion</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Monitor during project, constrain operations to mitigate to less than significant level.</p>
<p><b>Mitigation Measure 5.15-8.</b> Prescribed burning shall not occur on active landslides. On dormant landslides or areas with high landslide potential, canopy cover provided by woody vegetation shall exceed 50% cover following treatment. Vegetation shall not be removed from the headwalls or margins of dormant landslides.</p>	<p>Implement- tation</p>	<p>Avoid impacts to soils, erosion, mass wasting</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Constrain operations to mitigate to less than significant level.</p>
<p><b>Mitigation Measure 5.15-9.</b> Sufficient soil cover shall be maintained to control accelerated erosion and protect soil productivity. Maintaining sufficient soil cover will reduce the effects of prescribed burns on soil erosion and productivity. Guidelines for minimum soil cover for different vegetation types, soil textures, and erosion hazard are described in Table 4-2, page 4-20 of and the Klamath National Forest Land and Resource Management Plan (USDA Forest Service 2010) and on professional judgment.</p>	<p>Implement- tation</p>	<p>Maintain soil cover to avoid erosion, soil degradation</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Use USFS document or professional judgment to design protective measures.</p>
<p><b>Mitigation Measure 5.15-10.</b> Heavy equipment shall not operate on geologically unstable areas except as prescribed below. No heavy equipment will be operated on active landslides, the headwalls or margins of dormant landslides, or areas with high geologic hazard, except on existing stable roads within such areas. If it is not feasible to completely avoid treatment actions on identified geologically unstable areas with high hazard potential, then a licensed geologist shall be consulted to develop appropriate additional mitigation measures.</p>	<p>Planning, Implement- tation</p>	<p>Avoid triggering or exacerbating mass wasting</p>	<p>CAL FIRE</p>	<p>CAL FIRE</p>	<p>Avoid impacts where noted or engage geologist to help design project operations.</p>

## Monitoring

<p><b>Mitigation Measure 5.15-11.</b> Mechanical treatments shall not be implemented perpendicular to contours on areas with high or extreme erosion hazard ratings. Mechanical treatment of vegetation shall be limited to work along topographic contours on areas with a high erosion hazard rating in order to reduce soil disturbance and erosion. Where mechanical clearing is aligned along the slope on highly erodible soils, soil disturbance shall be limited by restricting the hillslope length of cleared areas and interspersing cleared areas with untreated buffers.</p>	Planning, Implementation	Operating heavy equipment along contour, not perpendicular to contour	Project manager	CAL FIRE	Identify potential problem areas, direct operator.
<p><b>Mitigation Measure 5.15-12.</b> No mechanical treatment that removes/uproots the roots of vegetation shall be conducted on areas with a very high or extreme erosion hazard rating.</p>	Planning, Implementation	Avoid uprooting on erodible soils	Project manager	CAL FIRE	Identify very high to extreme soils, avoid uprooting.
<p><b>Mitigation Measure 5.15-13.</b> No more than 25% of the original woody vegetative stems shall be uprooted every two years within project areas with moderate or higher erosion hazard ratings.</p>	Planning, Implementation	Temporal limits on uprooting	Project manager	CAL FIRE	Identify moderate and higher HER soils, track projects on site over time.
<p><b>Mitigation Measure 5.16-1.</b> Rehabilitation measures, including revegetation and erosion control, shall be implemented when prescribed fires escape the project boundaries or burn at higher intensity than was planned.</p>	Post-project	Rehabilitate areas of escaped or intense fire	CAL FIRE	CAL FIRE	Identify areas for rehabilitation immediately after project.
<p><b>Mitigation Measure 5.16-2.</b> Landowners that experience financial impacts due to escaped fires such as damage to agricultural crops, livestock, or structures shall be compensated based on appraised value of such losses by maintaining an insurance policy on each prescribed burn project for a minimum of five million dollars through the state insurance office.</p>	Post-project	Compensate landowner for loss of value	CAL FIRE	CAL FIRE	Make sure insurance is in place beforehand. Conduct appraisal of loss.
<p><b>Mitigation Measure 5.16-3.</b> Emergency fire suppression equipment and personnel shall be made available as necessary to suppress escaped burns at the smallest practicable size. Prescribed fire projects will not be allowed to proceed unless adequate backup fire suppression forces are available in the vicinity to respond as necessary.</p>	Implementation	Adequate suppression forces on hand for escaped fire	CAL FIRE	CAL FIRE	Identify available personnel. ensure availability.

## Monitoring

<p><b>Mitigation Measure 5.16-4.</b> Application of ground-applied fire retardants shall not occur within 100' of Class I or II watercourses and 50' of Class III watercourses.</p>	Implementa-tion	Avoid buffer areas with retardant	CAL FIRE	CAL FIRE	Supply maps of WLPZs to suppression crews.
<p><b>Mitigation Measure 5.16-5.</b> Project personnel shall regularly inspect and maintain hydraulic and fuel hoses on equipment so as to prevent leaks or breaks.</p>	Implementa-tion	Regular inspection to avoid leakage of chemicals	CAL FIRE	CAL FIRE	Develop and monitor inspection schedule.
<p><b>Mitigation Measure 5.16-6.</b> An on-site spill response kit capable of cleaning up five gallons or more of fuel, hydraulic oil, or other fluids where grease, oil, fuel or other similar materials could pass into lakes or watercourses shall be maintained on site.</p>	Implementa-tion	Spill kit on site	CAL FIRE	CAL FIRE	Make sure spill kit is complete, usable, known to project personnel.
<p><b>Mitigation Measure 5.16-7.</b> Project personnel shall never leave the area while equipment is being fueled.</p>	Implementa-tion	Monitor fueling to avoid spills	CAL FIRE	CAL FIRE	Instruct personnel, maintain oversight
<p><b>Mitigation Measure 5.16-8.</b> No hazardous emissions shall occur nor shall hazardous or acutely hazardous materials, substances, or waste be handled within one-quarter mile of sensitive receptors (existing or proposed schools, hospitals, assisted living facilities, etc.).</p>	Implementa-tion	Avoid impacts to sensitive receptors from hazardous materials	CAL FIRE	CAL FIRE	Identify sensitive receptors, distance, likely hazardous materials and spread rates.
<p><b>Mitigation Measure 5.16-9.</b> CAL FIRE shall immediately notify the Department of Fish and Game and Regional Water Quality Control Board when accidental contamination has occurred that may result in harm to fish or wildlife.</p>	Implementa-tion	Notify DFG and RWQCB of contamination	CAL FIRE	CAL FIRE	Have contact information for DFG and RWQCB on site.
<p><b>Mitigation Measure 5.17-1.</b> The maximum chemical application rates specified in the U.S. Forest Service and SERA Risk Assessments shall not be exceeded.</p>	Planning	Temporal limit to chemical use on same site	CAL FIRE	CAL FIRE	Keep records and maps of chemical use areas in project folder.
<p><b>Mitigation Measure 5.17-2.</b> Local Indian tribes shall be consulted to determine areas of culturally significant vegetation and appropriate mitigation measures.</p>	Planning	Avoid contamination of Native American cultural use plants with	CAL FIRE	CAL FIRE	Use CAL FIRE protocol to identify appropriate tribal groups. Incorporate their feedback into

## Monitoring

		herbicides			project design.
<p><b>Mitigation Measure 5.17-3.</b> Herbicides shall not be applied within 100 feet of sensitive receptors that may be found in residential areas, schools or proposed schools, hospitals, high-use recreation areas, or crops susceptible to damage from the specific herbicides that are applied.</p>	Planning, Implementation	Avoid impacts to sensitive receptors & resources from hazardous materials	CAL FIRE	CAL FIRE	Identify sensitive receptors, susceptible resources, distance, likely herbicides and application methods, spread rates.
<p><b>Mitigation Measure 5.17-4.</b> Herbicides that are known to be highly mobile in coarse-textured soils shall not be used if the ground water table is less than 10 feet deep and average annual precipitation exceeds 12 inches.</p>	Planning, Implementation	Avoid chemical contamination of ground water	CAL FIRE	CAL FIRE	Identify sensitive soil types during project planning. Monitor ground water level and precipitation.
<p><b>Mitigation Measure 5.17-5.</b> The use of herbicides shall be minimized to the greatest extent possible on fine-textured or sandy soils near sensitive areas, such as shallow waterbodies or crops susceptible to damage.</p>	Planning, Implementation	Avoid chemical contamination of ground water, crops	CAL FIRE	CAL FIRE	Identify sensitive soil types during project planning. Monitor ground water level and precipitation.
<p><b>Mitigation Measure 5.17-6.</b> Herbicides shall not be used on steep (50+%) slopes if significant rainfall is predicted within 24 hours.</p>	Implementation	Avoid herbicide application during significant rainfall events.	CAL FIRE	CAL FIRE	Identify slopes over 50% on maps. Have weather monitoring equipment and trained personnel on site.

## Monitoring

<p><b>Mitigation Measure 5.17-7.</b> When spraying to meet non-riparian area land management objectives, an untreated buffer of land and vegetation shall be left alongside surface waters, wetlands, or riparian areas. Buffer widths shall be established by the CAL FIRE project manager in consultation with a DFG or certified wildlife biologist, Certified Pesticide Applicator, and/or county agricultural commissioner, as needed. Buffer widths for herbicides not labeled for aquatic use shall be a minimum of 25 feet for vehicle spray applications and 10 feet for hand spray applications.</p>	<p>Planning, Implementation</p>	<p>Establish buffers for herbicide application</p>	<p>CAL FIRE/DFG</p>	<p>CAL FIRE/DFG</p>	<p>Work with other agencies/ personnel listed to develop and identify adequate buffers.</p>
<p><b>Mitigation Measure 5.17-8.</b> When spraying to meet riparian area land management objectives, localized buffers shall be established around non-target species and chemicals shall only be applied by hand methods. Buffer widths shall be established by the CAL FIRE project manager in consultation with a DFG or certified wildlife biologist, Certified Pesticide Applicator, and/or county agricultural commissioner, as needed. Buffer widths for herbicides not labeled for aquatic use shall be a minimum of 25 feet from water bodies for vehicle spray applications and 10 feet for hand spray applications.</p>	<p>Planning, Implementation</p>	<p>Establish buffers for herbicide application, use hand application</p>	<p>CAL FIRE/DFG</p>	<p>CAL FIRE/DFG</p>	<p>Work with other agencies/ personnel listed to develop and identify adequate buffers. Inform applicators of constraints.</p>
<p><b>Mitigation Measure 5.17-9.</b> Treatments near fish-bearing streams shall be minimized to the greatest extent possible during periods when fish are in early life stages that are most sensitive to herbicides. Herbicide formulations that are least toxic to fish shall be used.</p>	<p>Planning, Implementation</p>	<p>Avoid impacts to fish at critical life periods</p>	<p>CAL FIRE/DFG</p>	<p>CAL FIRE/DFG</p>	<p>Identify fish bearing streams, herbicide formulations.</p>
<p><b>Mitigation Measure 5.17-10.</b> Treatments near wetlands and in riparian areas where there are amphibians shall be minimized to the greatest extent possible, especially during periods when amphibians are in early life stages that are most sensitive to herbicides. Herbicide formulations that are least toxic to amphibians shall be used.</p>	<p>Planning, Implementation</p>	<p>Avoid impacts to amphibians, esp. at critical life periods</p>	<p>CAL FIRE/DFG</p>	<p>CAL FIRE/DFG</p>	<p>Identify wetlands, amphibian presence, herbicide formulations.</p>
<p><b>Mitigation Measure 5.17-11.</b> Treatments during bird nesting periods and other times shall be minimized to the greatest extent possible when wildlife is in stages of development that are most sensitive to herbicides. Herbicide formulations that are least toxic to wildlife shall be used.</p>	<p>Planning, Implementation</p>	<p>Avoid impacts to birds, esp. at critical life periods</p>	<p>CAL FIRE/DFG</p>	<p>CAL FIRE/DFG</p>	<p>Identify nesting areas, stages of bird development, herbicide formulations.</p>

## Monitoring

<p><b>Mitigation Measure 5.17-12.</b> Following herbicide treatments, treated areas shall be revegetated with native species if there is no reasonable expectation of natural regeneration. This is especially important if invasive, non-native species are found in abundance in the vicinity of treated areas.</p>	<p>Post-treatment</p>	<p>Revegetation with native species</p>	<p>CAL FIRE/DFG</p>	<p>CAL FIRE/DFG</p>	<p>Identify presences of invasives, seed sources and seeding methods for native species.</p>
---	-----------------------	---	---------------------	---------------------	--

## Monitoring

### Literature Cited

- CAL FIRE (California Department of Forestry and Fire Protection). 2003. The Changing California Forest and Range 2003 Assessment. Information Collection, Monitoring, and Research. Chapter 7. Governance Information Collection, Monitoring and Research. Fire and Resource Assessment Program. Sacramento, CA.
- CAL FIRE (California Department of Forestry and Fire Protection). 2006. Modified Completion Report Monitoring Program. Implementation and Effectiveness of Forest Practice Rules related to Water Quality Protection. Monitoring Results From 2001 through 2004. Sacramento, CA.
- Reeves, G. H. D. B. Hohler, D. P. Larsen, D. E. Busch, K. Kratz, K. Reynolds, K. F. Stein, T. Atzet, P. Hays, and M. Tehan. 2004. Effectiveness Monitoring for the Aquatic and Riparian Component of the Northwest Forest Plan: Conceptual Framework and Options. General Technical Report PNW-GTR-577. USDA Forest Service Pacific Northwest Research Station. Portland, OR.
- Stolnack, S. A.; M. D. Bryant, R. C. Wissmar. 2005. A review of protocols for monitoring streams and juvenile fish in forested regions of the Pacific Northwest. General Technical Report PNW GTR-625. USDA Forest Service Pacific Northwest Research Station. Portland, OR