



## **Best Management Practices Working Paper**

### **Overview**

Hills Emergency Forum members' fuel reduction projects have been on-going in the East Bay hills for decades. These projects include many best management practices (BMPs) to reduce the potential of environmental impacts and comply with various laws and regulations. Hills Emergency Forum members have varying policies and agreements that have led to these best management practices. Most have been formalized in documents in order to comply with the National Environmental Policy Act and the California Environmental Quality Act.

The following compendium provides an overview of the various BMPs used in the region drawn from published environmental documents and current practices as of the date of this document's most recent revision. Each of the members continues to refine their practices as new equipment or innovative techniques become available and are shown to be effective. This working paper will be updated periodically as new adaptive management strategies are available and adopted by Hills Emergency Forum Members.

This working paper is divided into four sections:

**Project Actions:** Identifies the project actions and techniques often used for vegetation management.

**Potential Impacts:** Provides an overview and quick look-up matrix that identifies the potential environmental impacts that may be associated with various project actions.

**Best Management Practices:** Each impact includes a range of BMPs or Mitigations to reduce the potential environmental impact, as well as timing considerations and comments.

**Appendices:** More detailed support information is provided including:

Documents Reviewed

Special Status Plant and Animal Species with Potential to Occur in HEF Areas

Potential Avoidance and Mitigation Measures for the Alameda Whipsnake

## Project Actions

Projects can be divided into two overall categories for review of potential for environmental impact.<sup>1</sup> Non-ground disturbing techniques and ground disturbing techniques. In general, ground-disturbing techniques have a greater potential for negative impacts for on air quality, cultural resource, and water quality.

### Non Ground Disturbing techniques

- Mowing (brush or grass)

Weed whipping: This technique uses a hand-held tool (normally gas powered) that cuts grass and very small shrubs with a fishing-line type of cutter or cutting blade. The treatment is usually annual after the grass has dried or cured, so the grass does not grow back. The mower reduces the height of the fuel, but does not create areas of bare soil, so the fuel remains continuous but lower. Weed whipping is often the only type of "mowing" treatment possible in steep wooded areas or landscaped slopes. Heavier machines can be fitted with plastic or steel knives or serrated saw blades (brush cutters or brush saws), but is limited to pieces under 1" diameter in size.

Mowing: Mowing using a tractor with a rotary or flail attachment) reduces the fuel height and thus the rate of spread in a grass fire. Timing of mowing has an impact on the type of grasses promoted -- late mowing after annual grasses have cured enhances growing conditions for perennial native grasses provided mowing does not occur during seed production. Mowing at the right time to the right height minimizes weed and brush encroachment and reduces the amount of manual work needed to maintain the site. Mowing may be used in conjunction with other techniques such as disking requiring a thinner strip of disked area.

- Roadside Treatment: This includes mowing the grass, thinning or removing young trees for a distance of 30 to 100 feet from the road, or removing/pruning overhanging branches. Mechanical equipment can be used to mow (such as with a tiger mower) or cut the roadside vegetation with a mechanical tree-cutting machine called a feller-buncher used to cut trees with maximum control in the placement of the cut tree. Equipment with an articulated arm has the advantage of keeping the machinery off of steep banks. Hand labor is required to prune and thin vegetation where specimens are left.

- Tree Pruning/ Shrub Removal

Pruning entails removal of under-story shrubs, small trees and lower limbs of trees up to a height of 10 feet to create a vertical separation (discontinuity) between surface fuel and tree canopy. The materials may need to be re-cut or chipped to make them smaller if debris is not removed from the site. This method can lower ignitability, decrease the available fuel and heat output, which can reduce the potential for fires moving from the surface to crown, and decreases spotting potential. The removal of dead materials has the net result of increasing fuel moisture with a higher proportion of new lush growth in subsequent years. Shrub/Tree pruning also reduces the amount of smaller material in the understory decreasing the availability of fine fuels to carry a fire into larger fuels.

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<sup>1</sup> From: Hills Emergency Forum, 1995 unpublished Appendices: Available Techniques for Vegetation Management on Public Wildlands.

- Prescribed fire - pile burning
 

Pile burning reduces the volume of cut material fuel through combustion. The technique can be used to burn piles of cut brush or grass. Burning is conducted under specific regulations when conditions permit both adequate combustion and control. Prescribed burning requires the development and approval by BAAQMD of a prescription or burn plan usually developed by the local fire protection district.
- Prescribed fire - broadcast burn
 

The technique can be used to burn over a designated prepared area. Prescribed burning reintroduces fire into the ecosystem as a "natural treatment" and can closely approximate the forces that have shaped the natural vegetation. Burning reduces the volume of fuel through combustion. Burning is conducted under specific regulations when environmental conditions permit both adequate combustion and control. Prescribed burning requires the development and approval of a prescription or burn plan usually developed by the local fire protection district. Specific pre-burn planning tasks must be completed prior to utilizing this technique. Note: Some environmental review agencies may view broadcast burns as ground disturbing especially if there are archeological resources present in the site.
- Chipping
 

This mechanical technique is used subsequent to other removal techniques and actually reduces the size of materials by feeding materials up to 4" in diameter through a chipper, with a tub grinder able to process logs up to 24" in diameter. The small materials produced may then be removed from the site or redistributed as mulch. Logs greater than 4" are often cut for firewood or other commercial use or hauled away.)
- Chemical treatments
 

Most of the HEF jurisdictions have active Integrated Pest Management (IPM) programs that evaluate alternative treatment methods when they consider using chemicals. This reduces the overall level of use of herbicide in the area. However judicious use of chemicals may be an acceptable solution to both the public and agency in some cases provided there is sensitivity to time of application, dosage and safety measures. Specialize techniques include:

  - Chemicals that prevent seed germination (pre-emergence chemicals) and kill sprouted plants (post-emergence chemicals) can be used to establish firebreaks and in roadside treatments. Application of sub lethal level of glyphosate (Roundup and similar products) ) has been shown to limit grass growth but still allow seed development maintaining a low fuel level without changing the species composition or encouraging weeds.
  - The use of triclopyr (Garlon 4 Ultra) appears to be one of the most successful treatments for the eradication of eucalyptus resprouting - other than completely uprooting the stump. The chemical moves down the stem and roots to control regrowth from underground reproductive parts. Successful use appears dependent upon how quickly the product can be applied directly to the cambium after the tree is cut.
  - Foliar application with triclopyr of French Broom and Eucalyptus resprouts is a common successful treatment.
  - Roadside spraying: Foliar application of glyphosate is common roadside treatment by some of the agencies that kill fine fuels in areas of high ignition risk.

## Ground Disturbing

### ○ Tree removal

Tree removal varies from cutting of individual trees to removal of the entire overstory canopy. This process is slow and expensive, but, depending upon the scale of removal can be selective with limited impact beyond the removal of the target plants. This technique can generate considerable debris that should be removed. A portion of debris may be left as a sort of erosion control measure and to cover bare spots. The boles of trees and other debris should be hauled away or may be burned later as a part of a prescribed burn.

By removing the trees their canopy no longer contributes to a fire in the form of a crown fire or ember production. Additionally the production of surface fuels is reduced since biomass production (branches, leaves, duff etc.) is decreased. It is just the opposite, surface fuels will increase as a result due to more sunlight and reduced biomass (mulch). This technique has positive impact on reducing spotting potential, heat output, spread rate and potentially ignitability depending upon what replaces the overstory. Specialized techniques include:

- **Stand Density Reduction:** This technique, generally called “thinning,” focuses on removal of selected trees to reduce the overall number of trees in a forest stand. Targeted trees can include those damaged by frost, disease or pests, or old age and well as re-sprouts or young shrubby trees. This is especially useful where the density creates the potential for canopy fires or where vertical continuity of fuels is created by the clumped arrangement of different sizes of trees. This technique is also appropriate where a shaded fuel break is to be established.
- **Overstory removal:** By definition this technique includes complete removal of the overstory trees. This technique is appropriate where a healthy understory of desirable species already exists or along roadside clearance.
- **Eucalyptus sprout removal** is often required as a follow up treatment. No one treatment has been proven 100% effective to prevent resprout of Eucalyptus. A mixture and combination of treatments scheduled over three years is the best approach. Methods that have been used in the past include:
  - application of herbicide (such as glyphosate or triclopyr) applied to stump within one-hour after cutting
  - cutting the stump to "frill" the cambium layer and then applying herbicide to outside of cambial layer.
  - piling slash on stumps and burning the pile at a later date. (Fires in stumps and roots can be very difficult to monitor and put out).
  - manually removing regrowth on a repeated basis
  - spraying of regrowths less than 4 feet tall with glyphosate or triclopyr.
  - fastening heavy black plastic over the stump and leaving in place for several years.
  - grinding or extracting the entire stump

### ○ Brush removal (ground disturbance) – mechanized

Crushing, mastication or mowing brush: Crushing methods are usually done by a tractor with a blade that is kept slightly off the ground. A variety of attachments include rollers (called a brush hog), a horizontal rotating disk with blades that operates similar to a large mower, brush rake, or a set of chains to flail the material. The rotating disk cuts or breaks off the brush top, knocks down the larger shrubs and compacts the material which is left to dry so that it can be subsequently burned. The brush that is older or dead is more brittle and breaks more easily than the thin, young stems which are easily bent. The soil surface is

disturbed slightly where the tractor travels, and where some shrubs are uprooted, however the surface is not scraped.

**Disking:** Fuel treatment commonly used along the perimeter of open space, ranches and roadways, also known as cultivating. Tractor with disker attachment can typically cultivate a swatch 15 feet wide in a single pass. Resulting area is an uneven surface that reduces water flow across surface and by design creates an area with discontinuous fuel with many bare spots. While this is an effective barrier to surface fire spread, it is also an ideal disturbed area with prime growing conditions for weeds and distribution of their seeds.

- **Grazing/ biological**

This method includes the intentional use of animals (cattle, sheep, goats, horses etc.) to consume vegetation thus reducing the amount, depth or density of fuel. The option is effective where the plants are palatable to the animals selected. Control of the livestock and prevention of the impacts of overgrazing is critical to successful use of this technique. As a fuel management technique, livestock need not graze every year, except in annual grasslands. Historically, grazing has been mostly by cattle, with a recent increase in the use of goats for fuel management. Maintenance of weedy pest, such as thistle and French broom, needs to be coordinated so that methods are compatible with a grazing program.

## Potential Adverse Environmental Impacts<sup>2</sup>

Table 1 provides a quick overview of potential adverse issues related to specific types of fuel reduction techniques. Further information for judging if a project impact is significant can also be found at <http://ceres.ca.gov/ceqa/>.

**Table 1 Fuel Reduction Actions and Potential for Adverse Environmental Impact**

	POTENTIAL FOR ENVIRONMENTAL IMPACT								
	<i>Aesthetics</i>	<i>Air Quality</i>	<i>Biological Resources</i>	<i>Cultural Resources</i>	<i>Geology/ Soils</i>	<i>Hazards &amp; Hazardous Materials</i>	<i>Hydrology/ Water Quality</i>	<i>Noise</i>	<i>Transportation &amp; Traffic</i>
<b>Non-Ground Disturbing</b>									
Cutting grasses (hand held weed whipper)			✓					✓	
Mowing grasses (rotary or flail mower)		✓	✓			✓		✓	✓
Roadside mowing (grass and small shrubs - tiger mower)		✓	✓					✓	✓
Cutting shrub (retains roots)			✓					✓	
Tree pruning / "limbing up"	✓							✓	
Pile burning	✓	✓	✓	✓			✓		✓
Chipping cut materials		✓						✓	
Broadcast burning (includes control lines)	✓	✓	✓	✓		✓	✓		✓
Pre emergent chemical treatment			✓			✓	✓		
Post emergent chemical treatment			✓			✓	✓		
Limited chemical application for prevention of resprout						✓	✓		
<b>Ground Disturbing</b>									
Shrub removal (removes roots e.g weed wrench)			✓	✓	✓		✓		
Tree Removal (Felling trees chain saws by hand/ horse logging)	✓		✓	✓	✓		✓	✓	✓
Masticating shrubs (tractor w/ blade or brush hog)	✓	✓	✓	✓	✓		✓	✓	
Shrub removal (removes roots/ disturbs soil - bulldozer)	✓	✓	✓	✓	✓		✓	✓	
Tree removal (includes removal of slash)	✓	✓	✓	✓	✓		✓	✓	✓
Discing fuel breaks (15- 25' wide exposed earth)	✓	✓	✓	✓	✓		✓	✓	
Blading existing fire roads (bulldozer)	✓	✓			✓		✓	✓	
Grazing grasslands (cattle, horse, sheep, goat)			✓		✓		✓		
Grazing shrublands (goat)			✓		✓		✓		

<sup>2</sup> From CEQA Guidelines Appendix G found at [ceres.ca.gov/ceqa/guidelines/pdf/appendix\\_g-3.pdf](http://ceres.ca.gov/ceqa/guidelines/pdf/appendix_g-3.pdf) (accessed 4/7/08).

### **Aesthetics:**

Communities may be concerned about removal of trees, screening requirements, or negative visual impacts resulting from fuel treatment. This could include changing of views from removal of trees or shrubs (which may actually enhance the vistas), or short-term impact of smoke from prescribed fire. Local regulators may be concerned if the fuel reduction projects:

- 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 along a state scenic highway
- c) Substantially degrade the existing visual character or quality of the site and its surroundings

### **Air Quality:**

Dust and emissions from equipment or prescribed fires are the most common potential impacts associated with fuel reduction projects. Methane production of grazing cattle is also a potential impact. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. HEF members fall within the Bay Area Air Quality Management District (BAAQMD). Project impacts could:

- a) Conflict with or obstruct implementation of the applicable air quality plan.
- b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
- d) Expose sensitive receptors, such as schools or hospitals, to substantial pollutant concentrations.
- e) Create objectionable odors affecting a substantial number of people.

### **Biological Resources**

HEF member agencies include many best management practices to avoid, reduce or mitigate impacts on biological resources. There are several federally listed, state and local species of special concern that have the potential to be found in the East Bay hills, (see Appendix \_). In addition to species protection, HEF members are concerned about control of the spread of disease or pests, including weed species. Potential impacts from a project could include:

- 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 Game or U.S. Fish and Wildlife Service.

- b) 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 Game or US Fish and Wildlife Service..
- c) 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.

### **Cultural Resources**

HEF fuel reduction projects include review of the potential for discovery of historic, archaeological, paleontological resources and human remains. Potential impacts from a project could include:

- a) Substantial adverse change in the significance of a historical resource as defined in § 15064.5.
- b) Substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5.
- 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.

### **Geology and Soils**

Erosion and slope instability are the greatest concern for most of the fuel removal projects. Potential impacts from a project could include:

- a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.
- b) Result in substantial soil erosion or the loss of topsoil.
- c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.



## **Hazards and Hazardous Materials**

Hazards and hazardous materials include use of herbicides, as well as accidental releases of more common materials such as gasoline and other fuels, or escaped fire. Mechanized equipment used for cutting grass and mowing also presents an ignition potential. Potential impacts from a project could:

- a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.
- b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
- c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter of an existing or proposed school.
- d) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
- e. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

## **Hydrology and Water Quality**

Water quality concerns include wetland and water quality degradation including sedimentation, altered chemistry, temperature, flow and volume. Issues also can include local creek protection, drainages and wetlands within USACE and CDFG jurisdictions as well as stormwater pollution prevention (both during and after a project). Potential impacts from a project could:

- a) Violate water quality standards or waste discharge requirements.
- b) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.
- c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.
- d) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- e) Otherwise substantially degrade water quality. This could include changes in pH or other water chemistry factors, or change of temperature by removal of overhanging streamside vegetation.

## **Noise**

Noise issues are typically associated with mechanical equipment. Potential impacts from a project could:

- a. Exposure of persons to or 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 generation of excessive groundborne vibration or groundborne noise levels?
- c) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

### **Traffic and Transportation**

Major concerns related to traffic and transportation are project operations that impede local traffic or block emergency access, impair vision on roads (due to smoke from prescribed fire), reduce local parking capacity or temporary close parking lanes. These impediments may be temporary in nature during specific stages of the fuel reduction project. Potential impacts from a project could:

- a) Cause an increase in traffic which 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?
- c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?
- d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., large equipment/ vehicles)?
- e) Result in inadequate emergency access?
- f) Result in inadequate parking capacity?

## Documents Reviewed

### East Bay Regional Park District (EBRPD)

- EBRPD FEMA HMGP 919-515-24 Environmental Assessment

### East Bay Municipal Utility District (EBMUD)

- Fire Management Plan, 2000
- East Bay Watershed Plan 1996
- Range Resource Management Plan, 2001

### Lawrence Berkeley National Lab

- LBNL Long Range Development Plan Final EIR July 2007

### City of Oakland

- 2006 Annual Vegetation Management Plan for the Wildfire Prevention Assessment District. Safe Solutions.
- City of Oakland, Standard Conditions of Approval 2007

### University of California, Berkeley (UCB)

- UCB OEP Checklist for Mitigation Monitoring
- UCB Draft EA Strawberry Canyon PDMC-J-09-CA-2005-011, 2008
- UCB 2020 Hill Area Fire Fuel Management Program
- UCB Long Range Development Plan/ EIR

### Regulatory Agencies

- US Fish and Wildlife Service Formal Consultation for the Strawberry Canyon Vegetation Management Project Alameda County CA (PDMC-PJ-09-CA-2005-0011), August 3, 2007
- Amendment to the Biological Opinion for the Claremont Canyon Vegetation Management Project Alameda County CA (PDMC-PJ-09-CA-2005-003), December 17, 2007

**Hills Emergency Forum – Documented Best Management Practices**

<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
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**Air Quality**

<p>Emissions from vehicles and equipment for logging or mechanized and hand clearing (chainsaws) would affect local air quality in the vicinity of the project site.</p> <p>Temporary increase in PM<sub>10</sub> from exposed soil and/or tree-felling and skidding activities, as well as negligible increases of PM<sub>10</sub>, CO, NO<sub>2</sub>, SO<sub>2</sub>, and O<sub>3</sub> precursors from mechanical equipment exhaust.</p> <p>Bay Area Air Quality Management District (BAAQMD) is classified as being in attainment of all federal standards except for O<sub>3</sub></p>	<p>Equipment shall be properly tuned and maintained in accordance with manufacturers’ specifications.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Best management construction practices shall be used to avoid unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use to minimize idling time of support vehicles.)</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Perform low- NO<sub>x</sub> tune-ups on all diesel-powered construction equipment greater than 50 horsepower (no more than 30 days prior to the start of use of that equipment). Periodic tune-ups (every 90 days) should be performed for such equipment used continuously during the project period.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Any stationary motor sources such as generators and compressors located within 100 feet of a sensitive receptor shall be equipped with a supplementary exhaust pollution control system as required by the BAAQMD and the California Air Resources Board.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Incorporate use of low-NO<sub>x</sub> emitting, low-particulate emitting, or alternatively fueled project equipment into the project equipment fleet where feasible, especially when operating near sensitive receptors.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
<p>Reduce project-worker trips with ride-sharing or alternative modes of transportation.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>	

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	<p>Demonstrate compliance with Bay Area Air Quality Management District (BAAQMD) Regulation 2, Rule 1 (General Requirements) for all portable equipment subject to that rule. BAAQMD Regulation 2, Rule 1 provides the issuance of authorities to construct and permits to operate certain types of portable equipment used for construction purposes (e.g., gasoline or diesel-powered engines used in conjunction with power generation, pumps, compressors, and cranes) unless such equipment complies with all applicable requirements of the “CAPCOA” Portable Equipment Registration Rule” or with all applicable requirements of the Statewide Portable Equipment Registration Program. This exemption is provided in BAAQMD Rule 2-1-105.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
<p>Project activities would generate short-term emissions of fugitive dust</p>	<p>Follow BAAQMD basic, enhanced and optional dust control procedures:</p> <p>Elements of “basic: dust control for projects that disturb less than one acre shall include at a minimum:</p> <p style="padding-left: 40px;">Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible.</p> <p style="padding-left: 40px;">Cover all trucks hauling loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer).</p>	<p>During Treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>



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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
	<p>Install appropriate wind breaks at the construction site to minimize wind blown dust.</p> <p>Suspend earth disturbing activity when winds (instantaneous gusts) exceed 25 mph.</p> <p>Limit the amount of the disturbed area at any one time, where feasible.</p> <p>Designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of dust offsite. Their duties shall include holidays and weekend periods when work may not be in progress. The name and telephone number of such persons shall be provided to the BAAQMD prior to the start of construction as well as posted on-site over the duration of construction.</p>		
<p>Prescribed burn emissions would affect local air quality in the vicinity of the project site.</p>	<p>In performing the prescribed fires or burning the slash piles comply with BAAQMD and CDF requirements regarding permitting and public notification prior to initiating burns. Burning is only permitted on specific “burn days” each month (designated by BAAQMD).</p>	<p>Before and during treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
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**Biologic**

<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
<p>Projects could disturb nesting birds or raptors either through direct disturbance (removal of tree /shrub or nest destruction) or indirect disturbance (noise or increased activity).</p> <p>See Appendix for potential species</p>	<p>Avoid disturbance or removal of nests of raptors and other special-status bird species when in active use.</p> <p>A pre-treatment survey is not required if activities commence during the non-nesting season</p> <p>A pre-treatment nesting survey for loggerhead shrike or raptors, covering a 100 yard perimeter of the project site, would be conducted during the months of March through July prior to commencement of any project that may impact suitable nesting habitat. The survey would be conducted by a qualified biologist no more than 30 days prior to initiation of disturbance to potential nesting habitat. Surveys would be conducted for projects involving removal of trees and other natural vegetation.</p> <p>If any nesting species are found within the survey area, the project would not commence, or would continue only after the nests are protected by an adequate setback approved by a qualified biologist. To the full feasible extent, the nest location would be preserved, and alteration would only be allowed if a qualified biologist verifies that birds have either not begun egg-laying and incubation, or that the juveniles from those nests are foraging independently and capable of survival.</p> <p>Size of buffer zones and types of construction activities</p>	<p>Project planning</p> <p>Project planning</p> <p>Pre-project survey (within 2 week/ 30 days of start of project)</p> <p>During Treatment</p> <p>During</p>	<p><i>Nesting season typically August through February (dates vary).</i></p> <p><i>Incorporate requirements in project contract documents.</i></p> <p><i>Incorporate requirements in</i></p>



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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
	<p>restricted within them will be determined through consultation with CDFG, taking into account:</p> <ul style="list-style-type: none"> <li>a. Noise and human disturbance levels at the project site and the nesting site at the time of the survey and the noise and disturbance expected during the project activity;</li> <li>b. Distance and amount of vegetation or other screening between the project site and the nest; and</li> <li>c. Sensitivity of individual nesting species and behaviors of the nesting birds.</li> </ul> <p>Trees supporting nests of sensitive species or colonial nesting birds (herons or egrets) in established rookeries to remain permanently undisturbed and protected by a designated 100 foot buffer zone around perimeter of tree(s).</p> <p>Nests initiated during project activities would be presumed to be unaffected by the activity and a buffer zone around such nests would not be necessary.</p>	treatment	<i>project contract documents.</i>
<p>Projects could disturb federally listed amphibian species</p> <p>Alameda whipsnake (<i>Masticophis lateralis euryxantus</i>)</p> <p>California Red-legged frog (CRLF)</p>	<p>Research project developed with EBRPD, USFWS and CDFG to last for a minimum of 5 years (including live trapping and radio telemetry before, during and after management occurs)</p> <p>Prescribed fire implemented in fall and winter.</p> <p>Project will submit plans and information to US Fish and Wildlife Service for review at least 20 working days prior to project implementation including (see further detail in Appendix):</p> <ul style="list-style-type: none"> <li>o Project map with identification of sensitive</li> </ul>	<p>Project planning</p> <p>Project planning</p> <p>Project planning</p>	

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
<p><i>(Rana aurora draytonii)</i></p> <p>See Appendix for other amphibian species</p>	<p>locations</p> <ul style="list-style-type: none"> <li>○ Project contacts</li> <li>○ Biological monitor credentials</li> </ul> <p>USFWS approved biological monitor shall be on-site and given authority to stop work (see additional requirements in Appendix items 4 – 14)</p> <p>With approval by USFWS on a case-by-case basis, relocate any snake encountered that is at risk of harassment; cease activity until snake is moved to suitable refugium. Alternatively, submit a general protocol for relocation to the USFWS for approval prior to project (see further detail in Appendix).</p> <p>Complete employee education program for all workers on site and submit training documentation to USFWS 10 days prior to start of project</p> <p>Follow protocols for project materials and practices (see Appendix __)</p>	<p>Project planning</p> <p>Pre-project training</p> <p>During Treatment</p> <p>During Treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p>
<p>Projects could disturb special species bats.</p> <p>See Appendix for potential species</p>	<p>Avoid areas with the potential for direct mortality of special status bats and destruction of maternal roosts.</p> <p>A pre-treatment survey is not required if activities commence outside of the maternal roosting season.</p> <p>A pre-treatment nesting survey for special species bats covering the project area, would be conducted during the months of March through August prior to commencement of any project that may impact suitable nesting habitat. The survey would be conducted by a qualified biologist no more than 30 days prior to</p>	<p>Project planning</p> <p>Project planning</p> <p>Pre-project survey (within 2 weeks/ 30 days of start of project)</p>	<p><i>Maternal roosting season typically September through February.</i></p>





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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
	planting or other acceptable techniques.  Enclose occurrences of plant species with highly visible temporary construction fencing to protect plant.	Before and during treatment	
Projects could disturb federally listed invertebrate species  <i>Speyeria callippe callippe</i> Callippe silverspot butterfly  See Appendix for other invertebrate species	No more than the total number of individuals inhabiting a maximum of 51 acres in any 1 year would be incidentally taken due to mortality, harm or harassment during prescribed fires.  Burn only on-fifth of any grassland area for a given colony in any one year.  Conduct adequate USFWS approved surveys for Callippe silverspot butterflies prior to vegetation removal  Receive written concurrence from the US FWS that Callippe silverspot butterflies are not present in the project area.	Project planning  Project planning  Project planning  Project planning	<i>Colony is delineated by field based habitat assessment for the host plant (Viola pendunculata) or all grassland is considered potential habitat.</i>
Project could increase invasive weed populations	Monitoring and follow-up treatments for 5 years to maintain less than 20 percent cover of invasive weeds as listed by CalEPCC.	Post project follow-up	
Spread of pest/ disease  Eucalyptus longhorn borer  Ips beetle (Monterey pine)  Phytophthora ramorum (cause of Sudden Oak)	Follow federal and state quarantines that restrict movement of materials	Project planning	<i>Longhorn borer active from March until October</i>  <i>Ips beetles active from March until October</i>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
Death)			
Negative effects to wildlife from chemical treatment of Eucalyptus stumps	<p>Herbicide to treat eucalyptus trees only be applied by hand by a licensed contractor during the dry season.</p> <p>Biological monitor to safely remove any transient wildlife prior to application.</p> <p>Fence all aquatic, riparian and/ or wetland areas including a 100 foot buffer zone with highly visible construction fencing prior to chemical use.</p> <p>Follow listed use guidelines for herbicide</p>	<p>Project planning</p> <p>Before treatment</p> <p>Before and during treatment</p> <p>Before and during treatment</p>	<p><i>Focused use of Garlon 4 on cut stumps and follow up resprouts</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p>
<p>Project impacts from Grazing</p> <p>Erosion and sedimentation from heavy grazing, hoof impact during dry season grazing,</p> <p>Livestock waste concentration</p> <p>Changes in species composition</p> <p>Benefit grassland species over shrub and woodland adapted species.</p>	<p>Install livestock fencing (5 strand barbed wire) to prevent livestock from straying outside of designated areas.</p> <p>Short grazing periods implemented to avoid impacts to native perennial grasses.</p> <p>Grazing monitored for seasonal production grassland production, stocking rate, and quantity and quality of vegetation left.</p> <p>Monitoring to prevent soil erosion, expansion of weeds and depletion of sensitive herbs.</p> <p>Minimum vegetative cover of 65% to 75% required to maintain soil stability and water quality.</p> <p>Site Conservation Thresholds based on minimal residual dry matter (RDM): 0-5% Slope: 840 lbs / acre</p>	<p>Before and during treatment</p> <p>During treatments</p> <p>During and after treatments</p> <p>During and after treatments</p>	<p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
	<p>6-35% Slope: 1,120 lbs/ acre                      &gt;35% Slope: 1,400 lbs/ acre</p> <p>Fence out all major tributary creeks.</p> <p>Restrict grazing in areas where special species plant or animal species exist. Mt. Diablo fairy lantern (<i>Calochortus pulchellus</i>), Oakland star tulip (<i>Calochortus umbellatus</i>) and Diablo sunflower (<i>Helianthella castanea</i>), Western pond turtle (<i>Clemmys marmorata</i>), Steelhead/ rainbow trout (<i>Oncorhynchus mykiss</i>), California red-legged frog (<i>Rana aurora spp Draytonii</i>) can be damaged by grazing.</p>	<p>Before treatments</p> <p>Project planning</p>	<p><i>Incorporate requirements in project contract documents</i></p>





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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
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**Hazardous Materials**

<p>Mechanical treatments and equipment could create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment</p>	<p>Follow manufacture’s recommendations on use, storage, and disposal of chemical products used in project.</p>	<p><i>During treatment</i></p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Avoid overtopping construction equipment fuel gas tanks.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>During routine maintenance of construction equipment, properly contain and remove grease and oils.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Properly dispose of discarded containers of fuels and other chemicals.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>If soil, groundwater or other environmental medium with suspected contamination is encountered unexpectedly during project activities (e.g., identified by odor or visual staining, or if any underground storage tanks, abandoned drums or other hazardous materials or wastes are encountered), the applicant shall cease work in the vicinity of the suspect material, the area shall be secured as necessary, and the applicant shall take all appropriate measures to protect human health and the environment. Appropriate measures shall include notification of regulatory agency(ies) and implementation of the actions described in Standard Conditions of Approval 50 and 52, as necessary, to identify the nature and extent of contamination. Work shall not resume in the area(s) affected until the measures have been implemented under the oversight of the City or regulatory agency, as appropriate.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
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**Hydrology and Water Quality**

<p>Mechanical treatments, hand clearing, or prescribed fire could increase erosion and siltation</p>	<p>Prepare an individual erosion control plan/ stormwater pollution prevention plan (SWPPP) specific to each treatment area for the proposed vegetation management sites that is consistent with standards set forth by the Regional Bay Area Water Quality Control Board (BAWQC).</p> <p>At a minimum, the SWPPP shall include a description of materials, practices, and equipment storage and maintenance; a list of pollutants likely to contact stormwater; site-specific erosion and sedimentation control practices; a list of provisions to eliminate or reduce discharge of materials to stormwater; Best Management Practices (BMPs), and an inspection and monitoring program.</p> <p>Develop and implement erosion control techniques such as weed-free hay bales, silt fences, or mulch, geosynthetic mats, log etc.</p> <p>Project sites in the vicinity of storm drains would require the installation of storm drain protection.</p> <p>A qualified representative would inspect the project area to ensure that proper erosion control methods are applied throughout the project duration.</p>	<p>Project planning</p> <p>Before Treatment</p> <p>Before and during treatment</p> <p>Before and during treatment</p> <p>Before and during treatment</p>	<p><i>Disturbance &gt; 1 acre requires Storm water permit from BAWQC. The project applicant must file a notice of intent (NOI) and a notice of termination to with the SWRCB.</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p>
<p>Soil Compaction</p>	<p>To minimize compaction of area soils, all access, staging, , and stockpiling associated with logging, mechanical equipment would occur within existing roads or trails or</p>	<p>Project planning</p>	<p>Incorporate requirements in project contract documents</p>



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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
	<p>drainage that exclusively drains rainwater runoff.</p> <p>Fence off area using highly visible, temporary construction fencing.</p> <p>Prevent soil and/or sediment from washing into wetland or riparian areas (see erosion BMPs above).</p>	<p>treatment</p> <p>Before and during treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
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**Noise**

<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
<p>Expose people to a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project</p>	<p>Construction activities are limited to between 7:00 AM and 7:00 PM Monday through Friday, except that extreme noise generating activities greater than 90 dBA shall be limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Any construction activity proposed to occur outside of the standard hours of 7:00 am to 7:00 pm Monday through Friday for special activities shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident’s preferences for whether the activity is acceptable if the overall duration of construction is shortened and such project activities shall only be allowed with the prior written authorization of the contract administrator.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Equipment and trucks used for project shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Impact tools used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
	<p>the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.</p> <p>Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.</p> <p>If feasible, the noisiest phases of construction shall be limited to less than 10 days at a time.</p> <p>Develop noise complaint procedure and post sign on-site. Notify neighbors within 300 feet of project at least 30 days in advance of extreme noise generating activities and estimated duration of activity.</p> <p>Pre project meeting to confirm noise measures and practices are completed.</p>	<p></p> <p>During treatment</p> <p>During treatment</p> <p>Before treatment</p> <p>During treatment</p>	<p></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p> <p><i>Incorporate requirements in project contract documents</i></p>

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<i>Impact Description</i>	<i>BMP or Mitigation</i>	<i>Timing Considerations</i>	<i>Comments</i>
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**Traffic and Transportation**

<p>Increase traffic congestion and impact of workers parking</p>	<p>Develop project traffic management plan to include:</p>	<p>Before treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>A set of comprehensive traffic control measures, including scheduling of major truck trips/ hauling to avoid peak traffic hours, detour signs if required, lane closure procedures, signs, cones for drivers, and designated project access routes.</p>	<p>During treatment</p>	<p>Incorporate requirements in project contract documents</p>
	<p>Notification procedures for adjacent property owners and public safety personnel regarding when major trucking, detours, and lane closures will occur.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>Location of project staging areas for materials, equipment, and vehicles at an approved location.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
	<p>A process for responding to, and tracking, complaints pertaining to project activity, including identification of an onsite complaint manager. The manager shall determine the cause of the complaints and shall take prompt action to correct the problem.</p>	<p>Before and During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>
<p>Provision for accommodation of pedestrian flow if required.</p>	<p>During treatment</p>	<p><i>Incorporate requirements in project contract documents</i></p>	

## Appendix A

### Special Status Plant and Animal Species with Potential to Occur in HEF Areas

Scientific Name	Status Fed/ State/ CNPS*	Location in HEF Area	Preferred Habitat
<b>Plants</b>			
<i>Amsinkia lunaris</i> Bent-flower fiddleneck	--/--/4	EBMUD	Open woods and valley and foothill grassland; 50 – 100 m.
<i>Arctostaphylos pallida</i> Pallid manzanita	C1/SE/1B	EBMUD EBRPD Oakland	Found in chaparral. Found only in the northern Diablo Range of California. Range into several distinct units: Contra Costa Hills, Mt. Diablo, Mt. Hamilton Range, Panoche Hills, San Carlos Range, and Estrella Hills. Prefers to grow in limited locations of the East Bay Hills on north- and east-facing slopes where bare, siliceous, mesic soils with low fertility exist.
<i>Calochortus pulchellus</i> Mt Diablo Fairy Lantern	--/--/B	EBMUD	Wooded slopes, shaparral and valley and foothill grasslands; 200 – 800 m
<i>Calochortus umbellatus</i> Oakland star tulip	--/--/4	EBMUD	Chaparral, broadleaved upland forests and valley and foothill grasslands; 100-700 m
<i>Chorizanthe robusta</i> var. <i>Robusta</i> Robust spineflower	FE	--	Cismontane woodland, coastal dunes, coastal scrub. Sandy terraces and bluffs or in loose sand; elevation from 3–120 meters.
<i>Cirsium andrewsii</i> Franciscan thistle	--/--/4	EBMUD	Broadleaved upland forests and coastal scrub; < 100m
<i>Dirca occidentalis</i> Western leatherwood	--/--/1B	EBMUD	Moist, partially shaded slopes; boradleaved upland forests, closed cone conifer forests, riparian habitats and chaparral; 50 – 300 m
<i>Helianthella castanea</i> Diablan sunflower	C2/--/1B	EBMUD	Open grassy areas, often associated with broadleaved upland forests, riparian woodland, chaparral and coastal scrub; 200 – 1,300 m.
<i>Holocarpha macradenia</i> Santa Cruz tarplant	C1/SE/1B	EBMUD EBPRD	Grasslands and prairies found on coastal terraces below 100 meters (330 feet) in elevation, from Monterey County north to Marin County. In the Santa Cruz area, the gently sloping terrace platforms are separated by steep-sided “gulches,” whereas in the Watsonville area (Monterey County) and on the eastern side of San Francisco Bay, the terraces are more extensively dissected, and <i>Holocarpha macradenia</i> populations occur on alluvium derived from the terrace deposits (Palmer 1986).
<i>Juglans californica</i> var <i>hindsii</i> Northern California black walnut	C2/--/1b	EBMUD	Riparian forests and woodlands; requires deep alluvial soil associated with creek or stream; 50 – 200m
<i>Lasthenia conjugens</i> Contra Costa goldfields	FT	--	Valley and foothill grassland, vernal pools, cismontane woodland. Extirpated from most of its range. Found in vernal pools, swales, and low depressions in open grassy areas; elevation from 1–455 meters.



## Appendix A

<i>Scientific Name</i>	<i>Status Fed/ State/ CNPS*</i>	<i>Location in HEF Area</i>	<i>Preferred Habitat</i>
<i>Layia carnosa</i> Beach layia	FE	--	The species is restricted to openings in coastal sand dunes ranging in elevation from 0-30 meters (0-100 feet), where it colonizes sparsely vegetated, partially stabilized dunes or relatively bare blowouts in secondary succession. In Northern California, it occurs in the northern fore dune community. It generally occupies sparsely vegetated open areas on semi-stabilized dunes. The species also occurs in open areas, such as along trails and roads.
<i>Monardella antonina ssp. Antonina</i> San Antonio monardella	C3C/--/3	EBMUD EBRPD	Open rocky slopes in chaparral and open woods; 500 – 900 m
<i>Suaeda californica</i> California seablite	FE	--	Marshes and swamps. Margins of coastal salt marshes; elevation from 0–5 meters.
<b>Mammals</b>			
<i>Bassariscus astutus</i> Ringtail	--/SP/--	EBMUD	Inhabits chaparral and foothill canyons, preferring riparian areas.
<i>Felis concolor</i> Mountain lion	--/SP/--	EBMUD EBRPD	Inhabits forested and brushy regions; tends to avoid open areas.
<i>Reithrodontomys raviventris</i> Salt marsh harvest mouse	FE	--	Pickleweed is the primary habitat. Inhabits only saline emergent wetlands of San Francisco Bay and its tributaries. Requires higher areas for flood escape.
<b>Amphibians</b>			
<i>Ambystoma californiense</i> California tiger salamander	FT	EBMUD EBRPD UCB	Annual grasslands and grassy understory of valley-foothill hardwood habitats, need underground refuges, need vernal pools, stock ponds, or other seasonal water sources for breeding. The species persists in disjunct remnant vernal pool complexes in Sonoma and Santa Barbara counties, in vernal pool complexes and isolated ponds scattered mainly along narrow strips of rangeland on each side of the Central Valley from southern Colusa County south to northern Kern County, and in sag ponds and human maintained stock ponds in the coast ranges from Suisun Bay south to the Temblor Range.
<i>Rana aurora draytonii</i> California red- legged frog	FT	EBMUD UCB	Dense, shrubby riparian vegetation associated with deep (> 0.7 meter), still or slow-moving water. Lowlands and foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development, must have access to aestivation habitat.

## Appendix A

Scientific Name	Status Fed/ State/ CNPS*	Location in HEF Area	Preferred Habitat
<b>Reptiles</b>			
<i>Clemmys marmorata pallida</i> Southwestern pond turtle	C1/CSC/--	EBMUD	Inhabits permanent or nearly permanent bodies of water in many habitat types at <6,000 ft elevation; requires basking sites such as partially submerged logs, vegetation mats or open mud banks.
<i>Masticophis lateralis</i> <i>Euryxanthus</i> Alameda whipsnake	FT	UCB EBRPD Oakland EBMUD	Rock outcrops in association with chaparral and coastal sage scrub. Inhabits south-facing slopes and ravines where shrubs form a vegetative mosaic with oak trees and grasses. Restricted to valley-foothill hardwood habitat of the coast ranges between the Monterey vicinity and north of San Francisco Bay.
<i>Phrynosoma coronatum</i> California horned lizard	--/CSC/--	EBMUD	Frequents a wide variety of habitats; mostly common in lowlands along sandy washes with scattered low bushes; requires open areas for sunning, bushes for cover, patches of loose soil for burial and abundant supply of ants and other insects.
<b>Birds</b>			
<i>Accipiter striatus</i> Sharp-shinned hawk	--/CSC/--	EBMUD EBRPD	Inhabits open deciduous woodlands, mixed or coniferous forests and thickets.
<i>Accipiter cooperi</i> Cooper's hawk	--/CSC/--	EBMUD	Nests in forests or woodlands; prefers broad-leaved trees in riparian areas.
<i>Agelaius tricolor</i> Tricolored blackbird	--/CSC/--	EBMUD	Frequents fresh emergent wetlands; roosts in large flocks in emergent vegetation or trees. Winters on EBMUD watershed.
<i>Aquila chrysaetos</i> Golden Eagle	--/CSC, SP/--	EBMUD	Nests usually found on cliff ledges; prefers nesting in trees in hilly areas.
<i>Asio otus</i> Long eared owl	--/CSC/--	EBMUD	Frequents dense riparian and live oak thickets near meadows; requires riparian or other thickets with small, densely canopied trees for nesting and roosting. Winters on EBMUD watershed.
<i>Asio flammeus</i> Short-eared owl	--/CSC/--	EBMUD	Frequents open treeless areas with elevated perches and dense vegetation for roosting and nesting. Winters on EBMUD watershed.
<i>Branta Canadensis leucopareria</i> Aleutian Canada goose	FT/--/--	EBMUD	Winters on lakes and inland prairie; forages on natural pasture or that cultivated to grain; feeds and roosts on lakes, reservoirs and ponds. Winter resident on EBMUD watershed.
<i>Buteo regalis</i> Ferruginous hawk	C2/CSC/--	EBMUD	Inhabits western plains and prairies, nesting in trees along stream courses; in treeless areas, nests on low cliffs or on the ground.
<i>Circus cyaneus</i> Northern harrier	--/CSC/--	EBMUD	Inhabits coastal and freshwater marshes; nests on ground in shrubby vegetation and grasslands; forages in grasslands.
<i>Charadrius alexandrinus nivosus</i> Western snowy plover	FT	--	Habitats used by nesting and nonnesting birds include sandy coastal beaches, salt pans, coastal dredged spoils sites, dry salt ponds, salt pond levees, and gravel bars.

## Appendix A

<i>Scientific Name</i>	<i>Status Fed/ State/ CNPS*</i>	<i>Location in HEF Area</i>	<i>Preferred Habitat</i>
<i>Dendroica petechia</i> Yellow warbler	--/CSC/--	EBMUD	In breeding season, frequents open to medium density riparian zones, woodlands and forests with a brushy understory; in migration found in a variety of sparse to dense woodland and forest habitats. Occurs on the EBMUD watershed during migration.
<i>Elanus leucurus</i> White-tailed kite	--/SP/--	EBMUD	Inhabits herbaceous lowlands with variable tree growth.
<i>Eremophila alpestris actia</i> California horned lark	C2/CSC/--	EBMUD	Inhabits prairies, fields and open grasslands.
<i>Falco columbarius</i> Merlin	--/CSC/--	EBMUD	Frequents coastlines, open grasslands, savannas, woodlands, lakes and wetlands
<i>Falco peregrinus anatum</i> American peregrine falcon	FE/SE, SP/--	EBMUD	Inhabits riparian areas and coastal and inland wetlands throughout the year. Occurs as a migrant on the EBMUD watershed.
<i>Falco mexicanus</i> Prairie falcon	--/CSC/--	EBMUD	Inhabits perennial grasslands, savannas, rangeland, agricultural fields and desert scrub areas.
<i>Gavia immer</i> Common Loon	--/CSC/--	EBMUD	Required deep freshwater lakes with sufficient foot; needs at least 18m (60 ft) of water for running takeoff from water. Winter migrant on EBMUD watershed.
<i>Haliaeetus leucocephalus</i> Bald eagle	FT/SE, SP/--	EBMUD	Winters throughout most of California at lakes, reservoirs, river systems, and some rangelands and coastal wetlands on protected cliffs and ledges. Also nests on bridges and buildings in urban areas. Nests are normally built in the upper canopy of large trees, usually conifers. Roosts communally in winter.
<i>Lanius ludovicianus</i> Loggerhead shrike	--/CSC/--	EBMUD	Inhabits open brushy areas with lookout posts (e.g., wires, trees and scrub)
<i>Larus californicus</i> California gull	--/CSC/--	EBMUD	Frequents coastal and interior lowlands in winter, often roosting in large concentrations along shorelines, landfills, pastures and on islands; needs undisturbed isolated islands for nesting.
<i>Pandion haliaetus</i> Osprey	--/CSC/--	EBMUD	Requires snags or living trees adjacent to or over water for nesting; also will nest on poles or cliffs.
<i>Pelecanus erythrorhynchos</i> American White Pelican	--/CSC/--	EBMUD	Found along the coast in estuaries and salt ponds; also frequents reservoirs and lacustrine habitats in the coastal slope lowlands and Central Valley.
<i>Pelecanus occidentalis californicus</i> California brown pelican	FE	--	Found in estuarine, marine subtidal, and marine pelagic waters along the California coast. In Northern California, fairly common to uncommon June to November. Usually rests on water or inaccessible rocks (either offshore or on mainland), but also uses mudflats, sandy beaches, wharfs, and jetties.

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Scientific Name	Status Fed/ State/ CNPS*	Location in HEF Area	Preferred Habitat
<i>Phalacrocorax auritus</i> Double-crested cormorant	--/CSC/--	EBMUD	Frequent along the coast in estuaries and salt ponds; also frequents reservoirs and lacustrine habitats in the coastal slope lowlands and Central Valley.
<i>Rallus longirostris obsoletus</i> California clapper rail	FE	-	Tidal salt marshes near tidal sloughs; perennial inhabitant of tidal salt marshes of the greater San Francisco Bay.
<i>Sterna antillarum browni</i> California least tern	FE	-	Nests on beaches and estuaries near waters that produce small fish. Prefers open areas where visibility is good. Substrate choice is generally sand or fine gravel and can be mixed with shell fragments.
<b>Invertebrates</b>			
<i>Branchinecta lynchi</i> Vernal pool fairy shrimp	FT		Vernal pools; small swales, earth slumps, or basalt-flow depression basins with grassy or occasionally muddy bottom, in unplowed grassland.
<i>Euphydryas editha bayensis</i> Bay checkerspot butterfly	FT		Found in serpentine grasslands Francisco Bay. The host plant plantain ( <i>Plantago erecta</i> ); also owl's clover ( <i>Castilleja</i> spp.).
<i>Speyeria callippe callippe</i> Callippe silverspot butterfly	FE		Historically this butterfly-inhabited grasslands ranges over much of the northern San Francisco Bay region. On the San Francisco peninsula, this butterfly is now only known from San Bruno Mountain (approximately 10 miles south of San Francisco). In the East Bay, it was known from Richmond in the north to the Castro Valley in Alameda County. The only remaining population of this butterfly in Alameda County occurs in an undisclosed city park. The host plant is violet ( <i>Viola pedunculata</i> ).
<b>Fish</b>			
<i>Acipenser medirostris</i> Green sturgeon	FP		A demersal (bottom-dwelling) species, mostly seen from inshore waters to 60 meters (197 feet). Spawns in the mainstem of large river systems in relatively fast water flows and probably in depths greater than 3 meters. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock. The only recently documented green sturgeon spawning locations are in the Klamath, Sacramento, and Rogue rivers along the west coast of North America. However, green sturgeon are known to range in near-shore marine waters from Mexico to the Bering Sea and are commonly observed in bays and estuaries along the coast with particularly large concentrations entering the Columbia River estuary, Willapa Bay, and Grays Harbor during the late summer.

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Scientific Name	Status Fed/ State/ CNPS*	Location in HEF Area	Preferred Habitat
<i>Eucyclogobius newberryi</i> Tidewater goby	FE		E Tidewater gobies are uniquely adapted to coastal lagoons and the uppermost brackish zone of larger estuaries, rarely invading marine or freshwater habitats. The species is typically found in water less than 1 meter (3.3 feet) deep and salinities of less than 12 parts per thousand.
<i>Hypomesus transpacificus</i> Delta smelt	FT		Found only in the Sacramento-San Joaquin Estuary, from the Suisun Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties. Euryhaline species, but for a large part of its life span, is associated with the freshwater edge of the mixing zone (saltwater-freshwater interface). Spawning habitats are side channels and sloughs in the middle reaches of the Delta. Spawns in shallow freshwater from December through July. Pelagic feeder.
<i>Oncorhynchus kisutch</i> Central California coast Coho salmon	FE		Pacific Ocean, spawns in coastal streams and rivers, over gravel beds. Pool depth, volume, amount of cover, and proximity to gravel for spawning play key roles.
<i>Oncorhynchus mykiss</i> Central California coastal steelhead	FT		Pacific Ocean, spawns in coastal streams and rivers, over gravel beds. Pool depth, volume, amount of cover, and proximity to gravel for spawning play key roles.
<i>Oncorhynchus mykiss</i> Central Valley steelhead	FT		Pacific Ocean, spawns in coastal streams and rivers, over gravel beds. Pool depth, volume, amount of cover, and proximity to gravel for spawning play key roles.
<i>Oncorhynchus tshawytscha</i> Central Valley fall/late fall-run Chinook salmon	FC		Pacific Ocean, spawns in coastal streams and rivers, over gravel beds. Pool depth, volume, amount of cover, and proximity to gravel for spawning play key roles..
<i>Oncorhynchus tshawytscha</i> Central Valley spring-run Chinook salmon	FT		Pacific Ocean, spawns in coastal streams and rivers, over gravel beds. Pool depth, volume, amount of cover, and proximity to gravel for spawning play key roles.
<i>Oncorhynchus tshawytscha</i> Sacramento River winter-run Chinook salmon	FT		Pacific Ocean, spawns in coastal streams and rivers, over gravel beds. Pool depth, volume, amount of cover, and proximity to gravel for spawning play key roles.

### Key to Status Symbols

#### Federal Endangered Species Act

- FE – Listed as Endangered
- FT- Listed Threatened
- FP- Proposed for listing status
- FC/ C1 – Category 1 candidate for federal listing.
- C2 – Category 2 candidate for federal listing.

#### California Endangered Species Act

- CE – Listed as Endangered
- CT- Listed Threatened
- CP- Fully protected under CA Fish & Game Code
- CSC – Species of special concern

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C3 – No longer candidate for federal listing.

### California Native Plant Society

1B – List 1b species: rare threatened or endangered in California and elsewhere

4 – List 4 species; plants of limited distribution

3 – List 3 species: more information needed to determine status

### Sources:

FEMA. Strawberry Canyon EA. Appendix A Federally Listed, Proposed, and Candidate Species with Potential to Occur in the Strawberry Canyon Vicinity. *USFWS species list and California Natural Diversity Database search for five quadrangles surrounding the project area*

*EBMUD Range Management Plan EA Engineering Science and Technology 1994a; updated based on Federal Register 219:58982-59028*

*EBRPD HMGD*

## Appendix B

### Potential Avoidance and Mitigation Measures for Alameda Whipsnake<sup>1</sup>

USFWS Biological Opinion August 3, 2007 with amendment December 17, 2007

#### **Project Planning/ Administration**

1. Prior to project implementation, the locations of sensitive areas, including Alameda whipsnake habitat, wetlands, and native trees to be retained would be clearly indicated on project plans. These plans would be submitted to the USFWS for review prior to project implementation.
2. Project manager or his/her designee would be directly responsible for implementing these avoidance and minimization measures and would be the point of contact for the project. Project manager or his/her designee would maintain a copy of the USFWS Biological Opinion (BO) (Appendix B) on site whenever earthmoving and/or fuel reduction activities are taking place. The names and telephone numbers of the project manager or his/her designee would be provided to USFWS at least 7 working days prior to project implementation. Prior to project implementation, the project manager would submit a letter to USFWS verifying that he/she possesses a copy of the BO and has read the Conservation Measures in the BO.
3. At least 20 working days prior to the date that the project is initiated in the field, Project Manager would submit the name(s) and credentials of biologists/monitors who would serve as the on-site biological monitors and on-call biologists to USFWS for review and approval. The biological monitor(s) must have demonstrated knowledge of the biology, ecology, and field experience identifying Alameda whipsnakes and CRLF. The on-call biologist(s) must have demonstrated knowledge of the biology, ecology, and field experience capturing and handling Alameda whipsnakes and CRLF. No project activities would begin until Project Manager has received written approval from USFWS that the biologist(s) and monitor(s) are qualified to conduct the work.

#### **Project Monitoring/ Worker Education**

4. The USFWS-approved biological monitor(s) would be on site during all activities that may result in the take of CRLF and/or Alameda whipsnake. The potential for take would be determined by the USFWS and CDFG, or in their absence, the USFWS-approved biological monitor. Prior to approval, the USFWS-approved biologist(s) must submit a letter to USFWS verifying that they possess a copy of the BO and understand the Terms and Conditions of the BO. The USFWS-approved biologist(s) would keep a copy of the BO in their possession when on site.
5. The USFWS-approved biologist(s) and/or biological monitor(s) would be given the authority through communication with the project manager or his/her designee to stop any work that may result in take of CRLF, Alameda whipsnake, and/or other listed species. If the USFWS approved biologist(s) or biological monitor exercises this authority, the USFWS and CDFG would be notified by telephone and electronic mail within 1 working day. The USFWS contact is Chris Nagano, Deputy Assistant Field Supervisor, Endangered Species Program at

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<sup>1</sup> Strawberry Canyon DEA, pg 4-7 - 4-11.

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the Sacramento Fish and Wildlife Office at telephone (916) 414-6600 and email [chris\\_nagano@fws.gov](mailto:chris_nagano@fws.gov).

6. The USFWS-approved monitor(s) would be on site to monitor the initial vegetation removal and/or ground-disturbing activities. The USFWS-approved biological monitor(s) would perform a clearance survey for listed species immediately prior to the initial ground disturbance. Safety permitting, the USFWS-approved biological monitor(s) would also investigate areas of disturbed soil for signs of listed species within 30 minutes following the initial disturbance of that given area. The USFWS-approved biological monitor(s) would be responsible for inspecting the project area for Alameda whipsnakes and CRLF before activities begin each day by checking under standing equipment before it is moved and checking any debris piles.
7. If the USFWS-approved biological monitor(s) observes either of the two listed species in the work area, he/she would stop work and call the on-call biologist(s) to move the CRLF to a safe location within walking distance of the location where it was found or, if possible, the CRLF or Alameda whipsnake would be allowed to disperse on its own. The biological monitor(s) would not trap, handle, or move either of these two listed animals. The individual animal would be monitored by the USFWS-approved biologist(s) and/or biological monitor(s) until it has been determined that it is not imperiled by predators or other dangers. Neither of these two listed species would be moved to laboratories, holding facilities, or other facilities without the written authorization of the USFWS and CDFG.
8. The USFWS-approved on-call biologist(s) may use nets or his/her bare hands to capture CRLF at the project area. The USFWS-approved biologist(s) would not use soaps, oils, creams, lotions, repellents, or solvents of any sort on his/her hands within 2 hours before and during periods when he/she is capturing and relocating either of the two listed species. The USFWS-approved biologist(s) would limit the duration of handling and captivity of individuals of the listed amphibian. While in captivity, CRLF individuals would be kept in a cool, moist, aerated environment, such as a bucket containing a damp sponge. Containers used for holding or transporting adults of the amphibian would not contain any standing water. The Alameda whipsnake would be placed in a pillowcase or similar container for transport to the release site.
9. The USFWS-approved biologist(s) and/or biological monitor would take precautions to prevent introduction of amphibian diseases to the project area by disinfecting equipment and clothing as described within the *Revised Guidance on Site Assessment and Field Surveys for the California Red-Legged Frog* (USFWS 2005). This item is available at the USFWS Sacramento office website (<http://www.fws.gov/sacramento/es/protocol.htm>).
10. An employee education program on the Alameda whipsnake and CRLF would be completed prior to the date of initial groundbreaking or vegetation clearing (whichever date comes first) at the project area. The program would consist of a brief presentation by the USFWS approved biologist(s) to explain endangered species issues to all contractors, their employees, and agency personnel involved in the vegetation clearing and earthmoving portions of the project. The program would include a description of the Alameda whipsnake and CRLF and their habitat needs, an explanation of the status of these species and their protection under the Endangered Species Act, associated consequences of noncompliance with the BO, and a



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description of the measures being taken to reduce effects to these species during project implementation. Documentation of the training, including original sign-in sheets, would be submitted to USFWS within 10 working days of the completion of the class.

11. If any fuel reduction personnel or other personnel find what they believe may be one of the listed species, the following protocol would be implemented:
  - a. Work or activities that may result in injury, death, harm, harassment, or capture of the individual animal would immediately cease.
  - b. The project manager and the USFWS-approved biological monitor and biologist would be immediately notified.
  - c. The USFWS-approved biologist would immediately notify the USFWS and/or CDFG by telephone.
  - d. The USFWS-approved biologist would move the CRLF to a safe location within walking distance of the location where it was found; if possible, the CRLF or Alameda whipsnake would be allowed to disperse on its own. The individual would be monitored by the USFWS-approved biologist until it has been determined that it is not imperiled by predators or other dangers. Neither of these two listed species would be moved to laboratories, holding facilities, or other facilities without the written authorization of the USFWS and CDFG.
12. To avoid injury or death of the Alameda whipsnake and/or CRLF, no firearms would be allowed on the project area except for those carried by authorized security personnel, or local, state, or federal law enforcement officials.
13. The USFWS-approved biological monitor(s) would monitor all project activities. The biologist(s) would be given the authority to stop any work that may result in the take of listed species and would be allowed sufficient time to contact the USFWS-approved on-call biologist to move the animals from the site before work activities begin or resume. The individuals would be relocated to suitable habitat that would not be affected by project activities. Only individuals of the listed species that are at risk of injury or death by project activities would be moved by the USFWS-approved biologist(s); any others would be left undisturbed.
14. If the USFWS-approved biological monitor and/or biologist(s) exercises stop authority, the USFWS and CDFG would be notified by telephone and electronic mail within 1 working day. The USFWS-approved monitor/biologist would be the contact for any employee or contractor who might inadvertently kill or injure a CRLF and/or Alameda whipsnake; or anyone who finds a dead, injured, or entrapped individual of these two listed species. The USFWS-approved monitor(s)/biologist(s) would possess a working cellular telephone whose number is provided to USFWS and CDFG.
15. Sensitive habitat areas shall be identified and delineated with high visibility, temporary, orange-colored fence at least 4 feet in height, flagging, or other type of barrier. These areas contain core habitat and primary constituent elements for the Alameda whipsnake and

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riparian habitat for the CRLF. Such fencing would be inspected by the USFWS-approved biological monitor and maintained daily until completion of the project. The fencing would be removed only when all construction equipment is removed from the site. No project activities would occur outside the delineated project area.

### **Project Materials/ Practices**

16. Plastic monofilament netting (e.g., erosion-control matting) or similar material would not be used in the project area because CRLF and Alameda whipsnakes may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.
17. Native understory plant species would be protected to the extent practical.
18. Identify and limit to the maximum extent possible all access roads and skid trails. These areas would avoid scrub habitat, primary constituent elements for the critical habitat of the Alameda whipsnake, and stream and riparian habitats. The plans for these roads and trails would be submitted to USFWS for review.
19. All material stockpiling and staging areas would be located within designated disturbed/developed areas that are outside of sensitive habitat areas as determined by the USFWS-approved biologist(s), CDFG, and/or the USFWS. Locations and methods of vegetation disposal within the project area would be submitted to USFWS for review and approval.
20. Vehicle and equipment refueling and lubrication would only be permitted in designated disturbed/developed areas where accidental spills can be immediately contained. All project related equipment would be regularly maintained to avoid fluid leaks (e.g., gasoline, diesel fuel, hydraulic fluid). All leaking fluid would be stopped or captured in a container until such time that the equipment can be immediately moved off site and repaired. Project Manager would create a containment zone at each refueling point, employing a 45-millimeter ethylene propylene diene monomer liner and berm or similar product to assure that prophylactic containment would be established prior to refueling or equipment maintenance involving fluids. On-site equipment would be parked in these containment areas when not in use. A plan would be prepared for immediate containment and cleanup of hazardous material spills within or adjacent to each site.
21. • Project-related vehicles would observe a 15-mile-per-hour speed limit in all project areas, except on city or county roads and state and federal highways. Off-road traffic outside of designated project areas would be prohibited.
22. To avoid or minimize attracting predators of the CRLF and Alameda whipsnake, all food related trash items, such as wrappers, cans, bottles, and food scraps, would be disposed of in a securely covered container. These containers would be emptied and debris removed from the project area at the end of each workday. All project-related debris, such as extra logs, equipment, or fuel-reduction-related materials, would be removed from the work site upon completion of the project.

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23. BMPs, as identified by the San Francisco Bay Regional Water Quality Control Board, would be implemented to control erosion during and after vegetation removal.
24. The spread or introduction of exotic plant species would be reduced by minimizing disturbance to areas during and following fuel reduction treatments. During the course of post-treatment monitoring, each site would be inspected for the presence of newly established populations of threatened and endangered species as a result of the fuel reduction prescriptions. Additionally, each area would be inspected for evidence of severe erosion as a result of the vegetation management. If severe erosion is occurring at a site, only native plant seeds or stock would be used for erosion control, unless otherwise approved by USFWS. If necessary, fencing, signs, maintenance, access control, vegetation management, exotic species control, or any other commonly used erosion control technique may be used to promote the ecological health of the sites.
25. Stump application of Garlon® 4, Stalker®, or RoundUp® would be conducted by a qualified licensed pest control applicator. No herbicide spraying or foliar application would occur. Herbicides would not be applied directly to water or to plants within 50 feet of standing water or an ephemeral stream.

### **BMP Related to use of Prescribed Fires:**

26. Prescribed fires implemented during wetter months of fall or winter when whipsnakes are expected to be underground and less susceptible to harm.<sup>2</sup> Except where site needs to be burned in late summer to avoid impact to *Presidio clarkia*.
27. In areas used for slash piles, snake-proof drift fencing would be installed around the perimeter unless the piles are to remain permanent. This fencing would prevent the use of the piles by reptiles, including the Alameda whipsnake, and reduce the chance of incidental take of a snake during chipping or burning of piles.

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<sup>2</sup> FEMA HGMP # EBRPD