

**Burned Area Emergency Response Plan
Lime Complex 2 (Lime, Miners, Slide)
Susan Erwin, Shasta-Trinity National Forest, Westside Planning Botanist
Vegetation Resource Assessment**

I. OBJECTIVES

- Identify known locations and extent of/impacts to rare plant populations and unique habitat in relation to individual fires
- Identify noxious weed populations and pre- and post-fire suitable habitat for weeds
- Provide management recommendations for reducing impacts from noxious weed introductions as a result of the fires
- Provide management recommendations, where warranted, for repair of impacts to rare plants or unique habitats

II. ISSUES

- Impacts of damage to unique habitats and rare plants from wildfire and fire suppression activities on ecosystem stability
- Impacts of noxious weeds on ecosystem stability and soil productivity

III. OBSERVATIONS

A. Background Information

The Lime Complex fires started on June 14, 2008 from a multi-day lightning fire in northern California. Approximately 51,121 acres burned in the 3 fires with soil burn severities of 18,925 acres low, 8,551 acres moderate, and 754 acres high severity. All fires had unburned portions within their perimeter that add into the total Fire area size. The Lime, Miners, and Slide fires of the Lime Complex were contained on August 15, 2008.

Fire Name	Fire Area Size in Acres	Burn Severity Acres		Miles of Dozer Line Construction	Equivalent Acres of Dozer Line Construction
Lime	25181	Low	9786	97.8	237
		Moderate	3734		
		High	342		
Miners	24783	Low	8516	46.5	113
		Moderate	4686		
		High	877		
Slide	1157	Low	623	4.9	12
		Moderate	131		
		High	0		
TOTAL	51,121			149.2	362

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Land Management Designations

There are several parcels of private land interspersed through the Lime fire, but all of the Slide fire and almost all of the Miners fire are under National Forest management.

Plant Communities

Fire Name	Dominant Plant Communities
Lime	Mixed conifer/hardwood Montane shrub Jeffrey pine/incense cedar woodland Serpentine barren Red fir forest Fens and other wetlands
Miners	Mixed conifer/hardwood Montane shrub Jeffrey pine/incense cedar woodland Serpentine barren Red fir forest Fens and other wetlands
Slide	Mixed conifer/hardwood Montane shrub Jeffrey pine/incense cedar woodland Serpentine barren Red fir forest Fens and other wetlands

Rare Plants and Unique Habitats

No threatened or endangered plant species are known from any of the three fires. Several Forest Service Sensitive plant species are documented within the Lime and Miners fires. There are no rare plants in the Slide fire.

Fire Name	Fire Size in Acres	Sensitive (FSS) and Forest Plan Endemic (FPE), Plant Populations	Acres of Serpentine Soils Present
Lime	25181	Niles' madia (<i>Harmonia doris-nileseae</i>) (FSS) Dubakella Mountain buckwheat (<i>Eriogonum libertini</i>) (FPE) California globeflower (<i>Iliamna latibracteata</i>) (FSS) Umpqua green gentian (<i>Frasera umpquaensis</i>) (FSS)	734
Miners	24783	Canyon Creek stonecrop (<i>Sedum paradisum</i>) (FSS) Brownie lady's-slipper (<i>Cypripedium fasciculatum</i>) (FSS)	139
Slide	1157	none	124

Niles' madia and Dubakella Mountain buckwheat are rare plant species that occupy serpentine soils and are both endemic to the Rattlesnake Creek Terrane in northwestern California. Niles' madia is an annual species that responds in population size to climatic or other environmental impacts, but the exact triggers for response are unknown. Seed set occurred just prior to the onset of the Lime Complex fires, and it is unlikely there were any adverse impacts to the species as a result of wildfire. Dubakella Mountain buckwheat is a perennial mat-forming shrub that is not fire-resistant, but it primarily occurs in serpentine habitats that are very low in organic materials that can carry fire.

California globeflower is a fire-adapted perennial that resprouts vigorously after fires. There are three known populations from the Lime fire on top of South Fork Mountain, but none were within any burned areas. The response of Umpqua green gentian to fire is unknown, but it typically occupies wet habitats that don't burn or gravelly openings in conifer forest with little or no surface organic matter to carry fire. No dozer lines were constructed through any populations of Umpqua green gentian.

Canyon Creek stonecrop is a rock-dwelling succulent that rarely experiences wildfire impacts because it occupies large rock outcrops that usually don't burn in wildfire. Several populations of Canyon Creek stonecrop are located on and around Hayfork Bally on large rock outcrops. There are mapped dozer lines within this area, but it is unlikely any construction occurred on rock outcrops due to the impenetrable nature of the rocks.

Brownie lady's-slipper is found on the forest floor within mid-late seral forest, typically rich in organic matter. Research indicates it may have some requirement for periodic wildfire, but high-severity fire may not be beneficial because it can kill underground reproductive tissues. Because Brownie lady's-slipper is a common resident of conifer forest, there is some possibility of impacts from wildfire. One population is known from the southern part of the Miners fire. A field visit was made to this site and low to moderate burn intensity was observed with no significant adverse impacts were seen.

Serpentine Soils

There are 733 acres of serpentine soils, in serpentinite barren and Jeffrey pine/incense cedar woodland habitats within the 3 fire areas, with 470 acres within the Lime fire. The Rattlesnake Creek Terrane, a 375,000 acre geologic area high in serpentine soils, lies in a northwest to southeast direction and through Trinity County and falls directly between the Lime and Slide fires to the west and the Miners fire to the east. This geologic terrane is rich in serpentine soils and has a high diversity of plant species that are not only adapted to the high heavy metal content in these soils, but also found nowhere else in the world. A multi-species conservation strategy to protect several sensitive species endemic to this formation is currently under development.

Wildfire does little damage to serpentine soils or its resident vegetation because there is little surface matter to carry flames. Dozer construction can have heavy impacts on serpentine soils because they are very fragile with a high heavy metal content, low calcium level, and harsh surface environment that isn't conducive to germination and growth of most plant species growing in surrounding areas. Outcrops that were impacted in the 1970's and 1980 (logging and road construction) still show disturbance and little recovery in 2008.

The majority of the serpentine soils in the three fire areas are clustered within the narrow overlap of the Rattlesnake Creek Terrane and the boundaries of those fires. Outcrops accessible by road were observed in field visits and while some surface vegetation was burned, these outcrops as a whole were only lightly affected because of little surface organic debris is available to carry fire. Inaccessible outcrops could not be observed and there is some possibility that dozer lines were constructed through serpentine outcrops.

There is little, if any, information available on successful restoration techniques on serpentine soils and repair or restoration of these soils after dozer line construction may be ineffective. Impacts of heavy excavation of serpentine soils include dramatic reductions in soil porosity, accelerated loss of soil moisture and disturbance of moisture retention components in the soil, and heavy disturbance to subsurface microorganisms that presumably play an important role in germination and establishment of species that occupy them.

Noxious Weeds

Weeds in the three fires are mostly restricted to roadsides, but some are found within openings that have been disturbed. Common invasive weeds include prickly lettuce (*Lactuca serriola*), annual grasses (*Avena* spp, *Bromus* spp., *Cynoserus echinatus*, etc.), filaree (*Erodium* spp.) and hedge parsley (*Torilis arvensis*), but there are many more that make up the suite of early seral forbs and grasses common in Mediterranean ecosystems in California. These are abundant and widespread species that would be difficult and cost-prohibitive to control because of repeated recruitment from vehicles and other vectors.

Noxious weeds of localized concern within individual fires are shown in the table below.

Fire Name	Known Weed Species of Concern Within Burned Portion of Fires
Lime	Diffuse knapweed (<i>Centaurea diffusa</i>) brooms (<i>Spartium junceae</i> , <i>Cytisus scoparius</i> , <i>Genista monspessulana</i>) yellow starthistle (<i>Centaurea solstitialis</i>)
Miners	brooms tree-of-heaven (<i>Ailanthus altissima</i>) yellow starthistle
Slide	tree-of-heaven brooms tansy ragwort (<i>Senecio jacobaeae</i>) yellow starthistle

B. Reconnaissance Methodology

Information on noxious weeds and on rare plant habitat and populations was derived from Shasta-Trinity National Forest noxious weed records and from visits to the fire areas between August 15-18, 2008 as well as many visits to all the fire areas in the past.

IV. RESULTS

Rare Plants

Wildfire and Dozer Line Construction

A sample of known rare plant populations were site checked to determine impacts from wildfire and fire suppression activities, with a focus on species expected to be less resilient to these impacts. Brownie lady's-slipper had the greatest potential to be impacted, but no significant impacts were observed with. All other known rare species within the fire area occupy habitats that don't carry fire well because of high moisture, lack of surface fuels, or location outside of burned areas or dozer line construction.

Unique Serpentine habitats

Wildfire

There was limited time for field visits and all serpentine habitats could not be observed for impacts. Outcrops that were burned appeared to suffer few adverse impacts from wildfire, outside of damage to shrubs and surface plants. Because fire passes through these sites infrequently, there is some potential for beneficial reductions in decadent plant material and germination of fire-dependent species in the seedbank.

Dozer Line Construction

Significant habitat damage may have occurred where dozer lines were constructed through serpentine habitats. 149 miles of dozer line were constructed in the Lime, Miners and Slide fire, with less than 5 miles in the Slide fire, 47 miles in the Miners fire, and 98 miles in the Lime fire. GIS mapping indicates there is some overlap between mapped dozer lines and serpentine habitats in the Lime and Miners fires, but not in the Slide fire.

Noxious Weeds

Wildfire

Low to moderate intensity fire is beneficial for native plants (nutrient release, growth invigoration, reduction of duff layer) and usually only topkills, but it also stimulates weed growth. High intensity fire also stimulates weed growth, but is not as beneficial to native plants because plants are killed entirely and soil can be sterilized deeper than the depth of the local native seedbed. In the case of high-intensity wildfire, noxious weeds have a greater advantage for post-fire site establishment. No more than 10% of wildfire acres in each fire area burned at high-intensity, resulting in little damage to native plants and only minor increases in noxious weed suitable habitat from fire stimulus.

Dozer Line Construction

Noxious weeds impact healthy ecosystems in a number of ways, including replacing parts or all of native plant communities, loss of wildlife habitat and forage, loss of pollinators, and reductions in recreation and scenic values. Noxious weeds are usually superior competitors to

native species and have developed growth strategies that allow them to survive on harsh sites better than native species.

Soil disturbance creates optimum habitat for noxious weed introduction and establishment. It also disrupts underground growth processes for native plants, further giving weeds a competitive edge. The greater the soil disturbance, the greater the competitive edge for noxious weeds.

Roadways are the greatest source of invasive species introduction. Weed seeds and plant parts are carried on primarily by motorized vehicles, but also on boots and animals. Soil freshly disturbed by dozers creates a suitable seedbed for invasive species carried in by vehicles and other vectors.

Fireline construction was the most significant source of soil disturbance during fire suppression activities. Handline construction was light and disturbed only a narrow line of soil, usually no more than 2 feet for handline. Dozer line construction resulted in heavy soil disturbance because the ground was thoroughly scraped off to remove surface vegetation, shrubs and trees are pulled out by their roots or sawn at the soil surface, and blades are invasive in the soil to create a wide surface of bare mineral soil. Dozer line construction creates optimum habitat for noxious weed introduction and establishment because it both exposes a bare mineral soil seedbed and it heavily disrupts above and belowground growth processes of native plants.

Approximately 145 miles of dozer lines were constructed associated primarily with the 2 largest fires in this analysis. Dozer line width varied from ten to thirty feet on average.

Safety zones were constructed in each of the fires, creating additional noxious weed habitat. There are an average of 5 safety zones of 2 acres each in the Lime and Miners fires, with potentially 1 safety area in the Slide fire. Together there are approximately 22 additional acres of disturbed soil and noxious weed habitat.

The three fires areas were visited to assess impacts of wildfire and fire suppression activities. The focus of survey was on number and quality of firelines and safety zones, the overall damage caused by the fire, and to determine the scope of existing weed populations for each of the nine fires.

C. Findings/Description of Emergency

Value at Risk: Ecosystem Stability of Serpentine and Native Plant Communities

Priority Threats: Dozer line construction and noxious weed introduction

Serpentine habitats may have been greatly impacted where dozer lines were constructed through serpentine openings. Dozer excavation and scraping reduced soil porosity and removed surface litter that is important in such harsh environments. Observations of past soil disturbance in serpentine habitats indicate recovery of plant communities is very slow.

Many roadsides in the Lime, Miners, and Slide fires are occupied to varying degrees by noxious weeds, in particular yellow starthistle, broom species, tree of heaven, and Klamath weed. Of

acute concern are western groundsel in the Slide fire, diffuse knapweed in the Lime fire, and broom species in the Miners fire. With 145 miles of dozer line construction in the 3 fires, there is a large possibility that these species will spread to internal portions of the three fires. Noxious weed infestations will displace valuable native plant species (reducing wildlife habitat) and can result in increased soil erosion because these species are less capable of stabilizing soil than their native counterparts. Some portion of the 145 miles of dozer lines will intentionally or unintentionally be converted to OHV trail, increasing the chance to import noxious weeds.

Diffuse Knapweed

A large population of diffuse knapweed is located on top of South Fork Mountain on approximately 85-100 acres, with isolated individuals and subpopulations spreading along Highway 36 east and north from its intersection with FS 4N12. The majority of plants are located along roadsides.

Diffuse knapweed is a California Invasive Plant Council List A rated weed, meaning it is of the highest ecological concern for its potential to impact wildland native plant communities in California. The Shasta-Trinity National Forest has been treating this population since 2001 and reductions in numbers and subpopulations were occurring prior to the Lime fire. A weed washing station was contracted to clean all fire-related vehicles leaving South Fork Mountain during fire work, but there was no way to mitigate impacts from dozer line construction that occurred within reach of the ridgetop where the population resides. Diffuse knapweed spreads primarily by seed and handpulling can be effective in reducing numbers of plants.

Dozer line construction originating or meeting with FS 4N12 (ridgetop road) is of particular concern because of the creation of optimum suitable habitat for noxious weed establishment in direct proximity to the diffuse knapweed seed source. Diffuse knapweed has remained restricted to the top of South Fork Mountain since its introduction, but there is a large threat of it spreading rapidly downslope along the large number of dozer lines that were created during fire suppression. In addition, diffuse knapweed treatments did not occur this year because the Lime fire started just before the scheduled time for treatment (June 25). All lines should be carefully monitored for noxious weeds and treated where individuals show up.

Overall diffuse knapweed treatment efforts have been set back tremendously with the increased soil disturbance and loss of the 2008 treatment season. Vigilant monitoring and treatment are required to regain a hold on this species on South Fork Mountain.

Additional diffuse knapweed infestations are found on 2 parcels of private land on South Fork Mountain on the Miller Place (60 acres) and the Wrench property (20 acres). Additional infestations may be present on the River Spirit property, but access is restricted and no visits have been made to verify presence or absence. California Department of Agriculture treated knapweed on the Miller Place in 2006 and 2007, but the population is scattered over a large area and not all individuals could be removed. The Wrench property has never been treated for removal. Both landowners have been contacted and are agreeable to have knapweed removed from their property through the BAER process.

Tansy Ragwort

There is a high potential for infestation of dozer lines constructed in the Slide fire. Tansy ragwort increased dramatically in burned areas in the Sims fire in 2004. Plant communities, soils, and general habitats in the Slide fire are very similar to that seen in the Sims fire, which is located geographically adjacent. It is very likely tansy ragwort will be introduced to the Slide fire area.

TREATMENT RECOMMENDATIONS

FSM 2523.3 gives direction to monitor burned areas for up to 3 years from containment to ensure emergency stabilization measures are functioning as planned and effective.

Noxious Weed Detection Surveys

Areas that were excavated by dozers and their adjacent uplands in the 3 fires should be monitored in 2009 to determine if new noxious weed infestations have occurred. Entire lengths of dozer lines that originate or intersect with the west side of the Lime and Slide fires should be monitored and treated with handpulling as needed.

Dozer lines that intersect with roads that can be traveled by automobile or off-road vehicles have a high potential of being a conduit for noxious weed introduction. The entire length of all dozer lines on the west side of the Lime fire should be monitored with removal of individual stems as needed in 2009 (and longer if funding requests are approved). Approximately 33% of the total Lime fire dozer line length is contained in the western half of the fire area; about 32 miles of line or 78 acres.

The first 200 feet of dozer lines from their intersections with travelable roads on the east side of the Lime fire and all of the Miners fire should be surveyed in 2009 and any new individuals of brooms, starthistle, tree of heaven, tansy ragwort, and diffuse knapweed. Approximately 67% of the total Lime dozer line length is contained within the eastern half of that fire area; about 66 miles or 160 acres. Dozer lines were mapped with varying levels of quality in each fire area, so number and length of lines in the GIS database can only be considered to be estimates. Line location and number would be validated in the field as treatments proceed. Using the GIS database line length and number of intersection with drivable roads are as follows:

Fire Name	Miles of Dozer Line	Miles of Dozer Line to Survey (First 200 Feet/All) + Safety Zones	Number of Dozer Line/Road Intersections
Lime – west	33	33	100
Lime-east	67	4.7	125
Miners	46.5	1.8	50
Slide	4.9	4.9	9

Seeding and Mulching Treatments

Roadways are the primary conduit of noxious weed introduction as weed seeds and plant parts are carried on the tires and underbellies of vehicles. Noxious weeds are typically introduced

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closest to the road and spread along disturbed or suitable habitat if left unchecked. To discourage noxious weed introduction on constructed dozer lines and the interior of fires, intersections of dozer lines and travelable roads should be seeded with native seed and mulched with weed-free straw. Seeding and mulching the first 50 feet of dozer lines where they meet travelable roads should discourage noxious weed introduction, which should discourage spread further down individual dozer lines.

Fire Name	Miles of Dozer Line	Number of Dozer Line/Road Intersections	Miles of Dozer Line to Seed and Mulch (First 50 Feet) + Safety Zones	Acres of seeding treatment
Lime – west	33	100	1.0 + 5 acres	7.4
Lime-east	67	125	4.7 + 5 acres	11.4
Miners	46.5	50	1.8 + 10 acres	4.4
Slide	4.9	9	0.34 (1800 feet) + 2 acres	2.8
TOTAL				26

Sites would be seeded with a mix of native species. Native grasses would include blue wildrye (*Elymus glaucus*) and California brome (*Bromus* spp.) and would be provided from the Shasta-Trinity native seed cache at a rate of 15-30 pounds per acre, but funding is being requested to pay for the labor to distribute the seed.

A forb and shrub mix would also be seeded to provide nitrogen fixation and assist soils in providing nutrients to early-seral plant communities. This mix would include one or more of the following species: bicolor lupine (*Lupinus bicolor*), foothills deervetch (*Lotus humistratus*), birds-foot trefoil (*Lotus purshianus*), buckbrush (*Ceanothus cuneatus*), goldfields (*Lasthenia californica*), tomcat clover (*Trifolium wildenovii*), California poppy (*Eschscholzia californica*) and western yarrow (*Achillea millefolium*). Seeding rates would vary from 2-20 pounds per acre, depending on the site.

Seeding Serpentine Outcrops

Serpentine outcrops damaged by dozer lines would be seeded with locally-collected Idaho fescue seed. Straw mulching would not be appropriate on these soils that are naturally low in organic matter. An estimate of 1% of the serpentine soils/habitats was assumed to incur damage from dozer line construction, resulting in a need to seed 7.3 acres on the Lime fire, 1.4 acres on the Miners fire, and 1.2 acres on the Slide fire. Seed would be provided from the Shasta-Trinity native seed cache, but funds are requested to pay for the labor to implement this treatment.

Noxious Weed Removal Treatments

The South Fork Mountain diffuse knapweed population is the highest priority noxious weed population on the west side of the Shasta Trinity National Forest. Treatment has occurred annually since 2002 over the entire ridgetop portion of the population, with the exception of 3 parcels of private lands (Wrench/Glass property, Miller Place, and River Spirit property). Over \$***** has been invested in treating this population in an effort to keep the population restricted to South Fork Mountain and to reduce density and size of the population. Treatments have been

successful over the past 3 years and we have documented fewer individuals and eradication of selected subpopulations. Environmental analysis has not been completed for herbicide use on the Shasta-Trinity National Forest and treatments are restricted to manual pulling. Despite longer timeframes to expect treatment success, the species will show positive results from this method.

Planned retreatment of the South Fork population of diffuse knapweed did not occur because of the duration of the Lime fire in 2008. Thorough treatments in 2009 are key to bringing numbers back to pre-2008 levels and to avoid a dramatic increase in numbers after 2008. The population is well documented and there are well-established agreements for annual treatment. Money that was committed for the 2008 treatment will remain in place and will be used for 2 weeks of treatment.

Funding for an additional 2 weeks of treatment (\$*****) would allow for a thorough treatment at the beginning of the season as well as 2 additional follow up pulling of resprouts that typically occur after August 1. Follow-up treatments in mid-late August, combined with thorough removal of most or all roots and rosettes have proven enormously successful in reducing numbers of plants over the last 2 years in this populations.

Private Land Weed Removal

Treatment of the Miller Place and the Wrench property would allow for the near complete treatment of the diffuse knapweed infestation on South Fork Mountain. Treatments on National Forest lands alone will be effective in reducing existing population densities and introductions onto disturbed soils on dozer lines, but will do nothing to reduce the seed source on these adjacent private lands. These properties are key to increasing the overall effectiveness of knapweed removal on National Forest lands, combined with monitoring and seeding and mulching dozer lines.

Treatment would consist of handpulling knapweed plants on the Wrench property by Forest Service force account personnel (landowner request) and either handpulling or herbicide treatment by contract crews on the Miller Place. Any herbicide treatment would be performed under agreement and oversight of the California Department of Food and Agriculture. Depending on availability of Shasta-Trinity National Forest funding, up to 2 weeks of work would occur in mid-summer followed by up to 2 weeks of follow-up treatment in late summer to remove resprouts and late bloomers.

Completion of treatments on private lands is based on getting approval to use federal funds via a Wyden Amendment agreement. Without private land treatments, the treatment on National Forest system lands would be compromised and less effective.

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TREATMENT COSTS

	Units	Unit Cost	# of Units	BAER \$	Other \$
Land Treatments					
Seeding Dozer Lines, Safety Zones, and Serpentine Outcrops	acres	*****	36	*****	*****
Mulching Dozer Lines and Safety Zones	acres	*****	26	*****	*****
Noxious Weed Removal-Lime West	acres	*****	100	*****	*****
TOTAL				*****	*****
Monitoring					
Noxious Weed Detection Surveys	miles	*****	44	*****	*****
SUBTOTAL				*****	*****
TOTAL ALL LINE ITEMS				*****	*****