

**Survey and Manage
Management Recommendation Amendments
For
Fuel Hazard Reduction Treatments
Around At-Risk Communities**

Group 1 – Certain Fungi, Lichens, Bryophytes, Vascular Plants

Fungi: *Cantharellus subalbidis*, *Clavariadelphus occidentalis*, *Clavariadelphus sachalinensis*, *Gomphus bonarii*, *Gomphus clavatus*, *Gomphus kauffmanii*, *Helvella crassitunicata*, *Mycena overholtsii*, *Otidea leporina*, *Ramaria rubripermanens*, *Sowerbyella rhenana*, *Spathularia flavida*, *Tremiscus helvelloides*

Lichens: *Bryoria tortuosa*, *Dendroscopula intricatulum*, *Peltigera pacifica*, *Ramalina thrausta*, *Usnea longissima*

Bryophytes: *Ptilidium californicum*, *Schistostega pennata*, *Tetraphis geniculata*

Vascular Plants: *Cypripedium fasciculatum*, *Eucephalus vialis*, *Botrychium montanum*

MR Amendments for Fuel Hazard Reduction Treatments Around At-Risk Communities

Table of Contents

Introduction	
Limited Application.....	3
Amendments	4
Additional Management Flexibility Intended	4
Species Addressed.....	4
Glossary	5
Recording sites in ISMS	5
Monitoring	6
Species-Specific MR Amendments	
Fungi	7
Lichens	13
<i>Bryoria tortuosa</i>	14
<i>Dendroscopium intricatum</i>	17
<i>Peltigera pacifica</i>	20
<i>Ramalina thrausta</i>	22
<i>Usnea longissima</i>	24
Bryophytes	26
<i>Ptilidium californicum</i>	27
<i>Schistostega pennata</i>	29
<i>Tetraphis geniculata</i>	31
Vascular Plants	
<i>Cypripedium fasciculatum</i>	34
<i>Eucephalus vialis (Aster vialis)</i>	37
<i>Botrychium montanum</i>	39

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Introduction

The enclosed amendments were developed to apply to the National Fire Plan's highest priority fuels treatment areas – those around at-risk communities and three municipal watersheds located in short fire return interval areas. The application of these amendments is limited to specific geographic areas and fuels conditions because by quantifying and understanding the scope and intensity of potential effects to Survey and Manage (S&M) species, taxa specialists were able to develop Management Recommendations (MRs) that appropriately balance risks to individual site occupancies and the need to meet overall species persistence objectives.

Limited Application – The following amendments to 24 S&M Management Recommendations apply only to fuel reduction activities meeting all three of the following:

1. The activity is conducted to meet high-priority objectives of the National Fire Plan.
2. The activity is within 1-mile (in Oregon and Washington) and 1 ½ miles (in California) of at-risk communities identified in the August 2001 Federal Register, for the purpose of providing for protection of that community and appurtenant improvements, or is within the municipal watershed of the communities of The Dalles, Dufur, and Ashland (all in Oregon).
3. The activity is located within stands in fire regimes 1, 2, and 3A in condition classes 2 or 3 (have missed two or more natural fuel-reducing fire events). (Fire regime 3A is a subdivision of fire regime 3, and includes stands where the natural fire return interval is between 35-50 years. Collectively, fire regimes 1,2 and 3A describe those stands where the natural fire return interval is less than 50-years).

Fuels treatments not meeting all of the above three conditions should rely on existing MRs. Attachment 4 displays general maps of the communities to which these MRs apply. Use these maps, the August 2001 Federal Register, and your fire regime layer or local information to determine which mapped communities are covered by these MR amendments. For California, the map is intended to show the boundary of communities named within the Federal Register as well as related areas where housing density exceeds

1 house per 5 acres (“urban” and “interface” areas). Local adjustments to this boundary to reflect recent community growth are appropriate, if they conform to the housing density indicated above. Application of the enclosed MRs is then limited to a 1 ½ mile radius from the community boundary. The mapped 1 ½ mile radius surrounding the communities is an approximation of the area to which the MRs apply, and the field unit should determine the 1 ½ mile delineation of this buffer on the ground. The Oregon and Washington maps include named communities as well as more rural areas, with the 1 mile buffer included in the mapped areas. These MR amendments apply to communities-at-risk within the yellow and red shaded areas on the WA map, and the pink-shaded areas on the OR map.

Amendments - The enclosed documents do not stand alone, but are to be used as “amendments” to existing Management Recommendations (MRs), added at the section “Management Within Habitat Areas”. Where there are no existing MRs, the attached documents constitute additional information for use in determining how to manage known sites. This additional information will be incorporated into MR documents as they are revised or developed in the future.

Additional Management Flexibility Intended – The additional flexibility provided in these amendments is authorized by the S&M S&G that specifies that for Management Recommendations “in high fire frequency areas such as east of the Cascades or in the Klamath provinces, specific consideration should be given to the acceptability of the use of prescribed fire in known sites to reduce the risk of future large-scale or high intensity fire, even if it entails some risk to individual site occupancy” (S&M S&Gs pg. 20). The S&M ROD highlights the need to integrate S&M requirements with National Fire Plan priorities, and references this S&G as one tool to accomplish this (S&M ROD pg. 12).

For fuels management treatments within 1 to 1 ½ miles around at-risk communities, the enclosed amendments are intended to provide more options or flexibility in and around S&M known sites. In some cases, these MR amendments allow for substantially increased risk to S&M site persistence within 300 feet of structures and developments. Where the 300 feet parameter is addressed in these amendments, this refers specifically to those S&M sites located within the critical first 300 feet of structures and developments.

The use of these amendments is optional. Sites should be managed according to either these MR amendments or the existing MRs.

Species Addressed – Approximately 40 species will eventually be addressed regarding fuels treatments and communities-at-risk, with 24 of those included here:

Fungi: *Cantharellus subalbidis*, *Clavariadelphus occidentalis*, *Clavariadelphus sachalinensis*, *Gomphus bonarii*, *Gomphus clavatus*, *Gomphus kauffmanii*, *Helvella crassitunicata*, *Mycena overholtsii*, *Otidea leporina*, *Ramaria rubripermanens*, *Sowerbyella rhenana*, *Spathularia flavida*, *Tremiscus helvelloides*

Vascular Plants: *Cypripedium fasciculatum*, *Eucephalus vialis*, *Botrychium montanum*

Lichens: *Bryoria tortuosa*, *Dendriscoaulon intricatum*, *Peltigera pacifica*, *Ramalina thrausta*, *Usnea longissima*

Bryophytes: *Ptilidium californicum*, *Schistostega pennata*, *Tetraphis geniculata*

Glossary – Terminology in the MR amendments conforms to the S&M Glossary, Exhibit C of the S&M ROD, January 2001. Specifically that glossary includes references to two uses of the term “site”:

Site (as used in occupied site) – The location where a specimen or population of the target species (taxonomic entity) was located, observed, or presumed to exist (occasionally used as a local option to pre-disturbance surveys for certain vertebrates) based on indicators described in the Survey Protocol or Management Recommendation. Also, the polygon described by connecting nearby or functionally contiguous detections at the same location.

Site (as used in manage known sites) – The occupied site plus any buffer needed to maintain the habitat parameters described in the Management Recommendation.

To distinguish between these two definitions in the amendments below, we attempted to precede “site” with the adjectives “occupied” or “managed”, to distinguish whether the phrase applies only to the location of the species, or to the location and an applicable buffer, respectively.

Recording sites in ISMS (Interagency Species Management System) – All species sites within fuels treatment areas will be recorded in ISMS as currently required. An additional entry will be made in ISMS by the field, depending upon whether low risk or high risk portions of the enclosed MRs are applied. Enter the risk category applicable to each site, and the decision date, once the location of specific treatments is known (e.g. most logically when the NEPA decision is signed). Code the entry as follows:

Low risk: These refer to treatments identified in the MR amendments as acceptable, (low or low-moderate risk), applicable anywhere within the 1 to 1 1/2 mile radius around the community.

High risk: These refer to treatments identified in the MR amendments as acceptable, (high or moderate-high risk), and are applicable only to limited areas, such as sites within the critical 300' zone and sites managed under percentage or parameter-driven exceptions to the low risk treatments (such as the 10% high risk treatments allowed for *Cypripedium fasciculatum*).

Only enter the above fields where an S&M site is managed according to these fire MR amendments.

Monitoring – The following monitoring requirements pertain to the application of these MRs. This monitoring is needed to confirm that expected risk levels are not being significantly exceeded, to confirm expected species site effects, and to provide experience upon which to base the expansion of these or similar MRs to other priority fuels treatment areas. Monitoring sections within the species-specific amendments may suggest parameters to be examined or considered when conducting the following monitoring.

1. Implementation monitoring of these MRs will happen during routine Forest and District staff post-NEPA or post-activity monitoring of completed projects. The results of the application of these MRs, i.e. did the activity comply with the Management Recommendations, will be specifically addressed and documented to project files. In addition to providing specific information about MR application to the local unit, such documentation will be available as needed for items 2 and 3 below.
2. When activities are selected for monitoring as part of the annual range-wide implementation monitoring efforts coordinated by the Interagency Monitoring Program Manager, application of these MRs will be specifically examined and documented on at least a representative sample of species sites within the project area.
3. The Interagency Survey and Manage Program Manager with the help of taxonomists will monitor the frequency of application of these MRs as evidenced by entries in the ISMS system as described in the section above, and implement a systematic sampling and field examination as soon as a significant number of sites of one species is affected. Since specific monitoring parameters differ by species depending upon rarity, habitat, available knowledge, and number of sites affected, such parameters are not specified here but will be designed as needed. Such monitoring will include examination of documentation described in steps 1 and 2 above, will address any emphasis areas specified in the species-specific amendments below, and may require affected administrative units to make specific field visits using project resources.

Species-Specific MR Amendments

FUNGI

The following briefly describes habitat information for 4 sets of fungus species. Following this description is the Management Recommendation amendment applicable to all of the fungus species mentioned below.

Species specific habitat information

Clavariadelphus occidentalis, *Clavariadelphus sachalinensis* - Fungi

Clavariadelphus species are presumed to be ectomycorrhizal with conifer hosts. *C. occidentalis* has been documented from 17 sites since 1996, often in association with PSME at elevation 1180-4400 ft. *C. sachalinensis* has been documented from only 5 sites since 1996, often in association with PSME at elevation 2100-3200 ft. A review of the current ISMS database suggests that this group of ectomycorrhizal fungi is not well distributed geographically, at least insofar as is apparent from surveys completed to date. Because this group of fungi is closely associated with tree roots, the potential for local extirpation through removal of, or damage to, host trees is high. As range-wide distribution is unknown, we have no assurance that these species would persist across the landscape were they to be extirpated locally.

Threats to *C. occidentalis* and *C. sachalinensis* include activities that disturb the soil and litter layer. Several recent studies have examined the impact of both wildland and prescribed fire on ectomycorrhizal fungi communities (Penttila, R. and H. Kotiranta, 1996; Baar, J. et al. 1999; Visser, S. 1995; McIver, J.D. and L. Starr, 2000). Impacts to ectomycorrhizal fungi from fire are highly varied depending on fuel volumes, local burning conditions and fire intensity among other factors. However, most evidence indicates that higher fire intensity is associated with greater long-term damage to ectomycorrhizal fungi. High intensity fires may kill forest stands and greatly affect ground cover and deeper soil conditions. Lower intensity fires may be much less disruptive to soil integrity underneath burned surfaces, where most ectomycorrhizal fungi reside (Jonsson, L. et al. 1999). Low intensity prescribed fire may be beneficial, contributing to species persistence in those ecosystems with historically short fire return intervals (e.g. eastern Cascades).

Known fungi sites are defined by the presence of reproductive structures (mushrooms, truffles, conks, etc); beneath these structures lies a complex system of microscopic cells associated with living plant parts, wood, or soil. The extent of an individual fungus individual cannot be determined by the size of the reproductive structure alone because ectomycorrhizal fungi form symbiotic associations with the fine root systems of plants, and grow out into the soil matrix. Estimates of diameter sizes for ectomycorrhizal fungal individuals range up to 20 meters (Dahlberg and Stenlid 1995, Bonello et al. 1998).

Individuals may remain undetected when reproductive structures are not formed, for example, when climatic conditions preclude mushroom formation. In addition, fungi are often patchily distributed. Even if we have knowledge of a known site, we have no method to determine how much of the surrounding habitat is occupied.

National Fire Plan fuels treatments should provide for a low risk to the persistence of the above species by avoiding mechanical treatments resulting in compaction of soil, or damage to or removal of host trees. We recommend establishment and maintenance throughout Fire Plan activities of diverse intermingled habitat patches, with avoidance of high intensity thinning and/or burning, the objective of which is to create a landscape-wide patchy burn pattern. We accept some short-term risks for and impacts to species in order to better manage for long-term benefits contributing to species persistence and habitat retention.

Gomphus bonarii*, *Gomphus clavatus*, *Gomphus kaufmanii*, *Cantharellus subalbidus*, *Ramaria rubripermanens - Fungi

A review of the current ISMS database suggests that this group of ectomycorrhizal fungi is fairly well distributed geographically, from Washington to California. *Gomphus bonarii*, a false chanterelle, has been documented from 18 sites since 1996 in forests where *Abies* and other conifer species are a component, at elevations from 1100-6170 ft. *Gomphus clavatus*, “pig’s ears”, has been documented from 13 sites since 1996 in forests where PSME, *Tsuga*, and/or *Abies* are components, at elevations from 1050-4620 ft. *Gomphus kaufmanii*, a false chanterelle, has been documented from 17 sites since 1996 in many conifer habitats, at elevations from 500-6000 ft. *Cantharellus subalbidus*, a white chanterelle, is abundant enough in the mid-portion of its range (Oregon) so that persistence is not now considered to be a problem. On the edges of its range where surveys for it have apparently been not quite so widespread (Washington and California) there are fewer collections known: about 22 from Washington and fewer than 10 from California. *Ramaria rubripermanens* likewise appears to be fairly abundant where documented in Oregon, while both Washington and California have only a few known sites each.

Because this group of fungi is closely associated with tree roots, the potential for local extirpation through removal of, or damage to host trees is high. Range-wide distribution is probably currently sufficient to maintain persistence within Northwest Forest Plan area. Threats to these species include activities that disturb the soil and litter layer. Several recent studies have examined the impact of both wildland and prescribed fire on ectomycorrhizal fungi communities (Penttila, R. and H. Kotiranta, 1996; Baar, J. et al. 1999; Visser, S. 1995; McIver, J.D. and L. Starr, 2000). Impacts to ectomycorrhizal fungi from fire are highly varied depending on fuel volumes, local burning conditions and fire intensity among other factors. However, most evidence indicates that higher fire intensity is associated with greater long-term damage to ectomycorrhizal fungi. High intensity fires may kill forest stands and greatly affect ground cover and deeper soil conditions. Lower intensity fires may be less disruptive to soil integrity underneath

burned surfaces where most ectomycorrhizal fungi reside (Jonsson, L. et al. 1999). Low intensity prescribed fire may be beneficial in some cases, contributing to species persistence in those ecosystems with historically short fire return intervals (e.g. eastern Cascades).

Known fungi sites are defined by the presence of reproductive structures (mushrooms, truffles, conks, etc); beneath these structures lies a complex system of microscopic cells associated with living plant parts, wood, or soil. The extent of an individual fungus individual cannot be determined by the size of the reproductive structure alone because ectomycorrhizal fungi form symbiotic associations with the fine root systems of plants, and grow out into the soil matrix. Estimates of diameter sizes for ectomycorrhizal fungal individuals are from 1 meter to over 20 meters (Dahlberg and Stenlid 1995, Bonello et al. 1998). Individuals may remain undetected when reproductive structures are not formed, for example, when climatic conditions preclude mushroom formation. In addition, fungi are often patchily distributed.

***Helvella crassitunicata*, *Sowerbyella rhenana*, *Spathularia flavida*,
*Tremiscus helvelloides*** - Fungi

A review of the current ISMS database suggests that this group of fungi, presumed to be ectomycorrhizal, might not be well distributed. *Helvella crassitunicata*, an elfin saddle, has been documented from only 3 sites since 1996, from mixed conifer forests, at elevation 4300 ft. *Sowerbyella rhenana*, a small cup fungus, has been documented from 36 sites since 1996, often in old-growth PSME forests, at elevations from 900-3100 ft. *Spathularia flavida*, an earth tongue, has been documented from 13 sites since 1996, in forests where PSME, *Abies*, and other conifers are components, at elevations from 2700-5200 ft. *Tremiscus helvelloides*, a jelly fungus, has been documented from 20 sites since 1996, in many conifer habitats, at elevations from 800-4000 ft. To some degree, all of these species occur in forest litter or humus. The potential for local extirpation through removal of, or damage to host trees, substrate, or litter is high. Range-wide distribution may not be sufficient to maintain persistence within the Northwest Forest Plan area.

Known fungi sites are defined by the presence of reproductive structures (mushrooms, truffles, conks, etc); beneath these structures lies a complex system of microscopic cells associated with living plant parts, wood, or soil. The extent of a single fungus individual cannot be determined by the size of the reproductive structure alone because ectomycorrhizal fungi form symbiotic associations with the fine root systems of plants, and grow out into the soil matrix. Estimates of diameter sizes for ectomycorrhizal fungal individuals are from 1 meter to over 20 meters (Dahlberg and Stenlid 1995, Bonello et al. 1998). Individuals may remain undetected when reproductive structures are not formed, for example, when climatic conditions preclude mushroom formation. In addition, fungi are often patchily distributed.

Several recent studies have examined the impact of both wildland and prescribed fire on ectomycorrhizal fungi communities (Penttila, R. and H. Kotiranta, 1996; Baar, J. et al.

1999; Visser, S. 1995; McIver, J.D. and L. Starr, 2000). Impacts to ectomycorrhizal fungi from fire are highly varied depending on fuel volumes, local burning conditions and fire intensity, among other factors. However, most evidence indicates that higher fire intensity is associated with greater long-term damage to ectomycorrhizal fungi. High intensity fires may kill forest stands and affect ground cover and deeper soil conditions. Lower portions of organic layers (where most ectomycorrhizal fungi reside), underneath burned surfaces may remain mostly intact after low intensity fires (Jonsson, L. et al. 1999).

Otidea leporina, Mycena overholtsii - Fungi

Otidea leporina and *Mycena overholtsii* are saprophytic wood-decay fungi. *O. leporina* has been documented from 50 sites since 1996, at elevations from 50-4350 ft. *M. overholtsii* has been documented from 46 sites since 1996, at elevations from 2000-6000 ft., fruiting in spring near melting snow banks. A review of the current ISMS database suggests that this group of saprophytic fungi is fairly well distributed geographically, from Washington to California. Because *Mycena overholtsii* is closely associated with downed wood, and *Otidea leporina* is associated with downed wood and litter, the potential for local extirpation could be high where downed wood, large woody debris and litter are removed or destroyed. Range-wide distribution is probably currently sufficient to maintain persistence within the Northwest Forest Plan area.

Management within Habitat Areas (13 fungi species addressed above)

These Management Recommendation amendments are intended to manage for continued site occupancy in fuels treatment areas; they supplement existing Management Recommendations (Castellano and O'Dell 1997), and are intended to provide implementation flexibility for the National Fire Plan. Threats to the above species include activities that disturb the soil and litter layer. National Fire Plan fuels treatments should provide for a low risk to the persistence of the above species by avoiding mechanical damage that results in removal of downed wood or large woody debris.

Acceptable treatments (regardless of risk) within the critical first 300 feet surrounding developments and structures associated with a community:

- All necessary fuels treatments may occur; no specific known site management is needed.

Acceptable (low risk) treatments in the remaining 1 to 1½-mile fuel treatment zone include:

- **Broadcast Burning:** Light broadcast burning (low severity, low intensity) is acceptable within the managed site if average flame lengths are kept at or below 4 feet, if 60% canopy closure is maintained, and if duff layer and any large downed wood at the managed site are retained, or left as intact as possible.

- Hand lines: If a managed site occurs near a proposed hand line, construct the line between the site and the burn area whenever possible.
- Piling and Pile Burning: Piles should be located far enough from managed sites so that radiant heat does not disturb the site or burn the surrounding duff or large decayed woody debris.
- Thinning: Maintain shading and microsite conditions at the managed site by retaining at least 60% canopy cover. Exclude mechanized equipment from managed sites to minimize trampling and soil compaction, damage to host trees and large decayed woody debris.
- Pruning: Maintain shading and microsite conditions at the managed site by retaining at least 60% canopy cover. Exclude mechanized equipment from managed sites to minimize trampling, soil compaction, and damage to host trees.

Unacceptable (medium or high risk) treatments within the remaining 1-1.5 mile fuel treatment zone include:

- Foam: Avoid foam application within 100 feet of managed sites. [Evidence for estimating the average size of saprophytic fungi sites is lacking, but *Armillaria spp.*, for example, can be several acres in size. In addition, estimates of diameter sizes for ectomycorrhizal fungal individuals are from 1 meter to over 20 meters (Dahlberg and Stenlid 1995, Bonello et al. 1998)].
- Chipping, raking: Chipping and raking should not occur at managed fungi sites.
- Crushing, chopping, grinding or mowing: Understory fuels should not be disturbed in habitat around managed sites. Crushing, chopping, or mowing should not occur at managed sites.

When fuels treatment objectives cannot be accomplished within the above parameters, fire managers and/or botanists are encouraged to contact the Regional Mycologist. The Regional Mycologist may be able to offer more specific recommendations if information on proposed activities and timing are presented for their review.

Research, Inventory, and Monitoring Needs

Management for fungi should be dynamic enough to accommodate and incorporate new information. Knowledge about new sites (resulting from new ISMS and PNW data), and the monitoring of management treatments (fire and mechanical) will be essential for effective management of these species. Fungi presence, abundance and distribution may be influenced by parameters independent of treatments associated with fuels reduction. Monitoring, as described in the front of this attachment, should therefore emphasize the degree to which important habitat components were retained in treatment areas, such as

coarse woody debris remaining, amount of intact or lightly burned duff material by area or proportion of unit area, amount of canopy cover, and degree of soil compaction.

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LICHENS

Overview

The following information is applicable to all of the lichens covered in these MR amendments.

Lichen sensitivity to fire, heat, smoke, water, and air pollution

Because lichens and bryophytes obtain water and nutrients directly from the atmosphere they are much more sensitive to the effects of ambient smoke and heat than vascular plants. High temperatures have been documented to cause a range of negative effects upon epiphytic lichens (Romagni and Gries 1997). These affects range from direct mortality to impaired photosynthesis as a result of chlorophyll damage and possible destruction of the photobiont. Partially burned lichens can slow population recovery by occupying potential recolonization space (Romagni and Gries 2001).

Lichens and bryophytes are also well known for their sensitivity to air pollution particularly sulfur dioxide, nitrogen-based gaseous and acidic compounds, and fluorides (McCune & Geiser 1997). Pendant lichens and epiphytic cyanolichens tend to be the most air pollution-sensitive species. The impacts to lichens and bryophytes from short-term exposure to pollutants generated from forest fires are not known at this time.

Lichens and bryophytes are unique in their ability to withstand prolonged desiccation as well as their ability to rapidly recover to a physiologically active state. Lichens and bryophytes appear to be far less sensitive to heat and pollutants when they are dry and dormant, so watering of these species before or during burning would greatly increase risk to plants adjacent to the fire. Obviously consumption of a species or its substrate is a much more direct and immediate threat so use of water or foam in regaining control of a burn would be acceptable. It is assumed that careful project planning and implementation will ensure this situation is rarely encountered.

Bryoria tortuosa (G. Merr.) Brodo & D. Hawksw. in WA Eastern Cascades, OR Eastern Cascades, OR Klamath, CA Klamath, and CA Cascades Physiographic Provinces - Lichen

Introduction

Bryoria tortuosa prefers well-lit, open stands and is most frequently found on oaks and pines (Leshner et al. 2000). It is also known to occupy shrubs. On the Medford District BLM it is particularly common on white-leaf manzanita (*Arctostaphylos viscida*) in valley and foothill pine/oak communities. These communities that represents the primary habitat for *B. tortuosa*, are historically adapted to frequent, low-intensity fire. Over the long term, there may be a beneficial affect to *B. tortuosa* of re-introducing fire into these communities by maintaining habitat structural components that this lichen requires. Broadcast burns would reduce stem densities, which would decrease competition to the large old pine and oaks that form a principle substrate for *B. tortuosa*. Prescribed fire would also reduce invasion from less desirable substrate species such as Douglas-fir and white fir, which are more susceptible to low-moderate intensity fires, particularly when the trees are young. Sites in other types of plant communities may not benefit from broadcast burning.

The response of white-leaf manzanita to fire and its relationship to *B. tortuosa* is more complex. White-leaf manzanita is readily killed by fire. The large, old shrubs that support *B. tortuosa* would be particularly susceptible to burning because of abundant branch die-back and shredding bark accumulation together with the flammable oils and terpenes of the leaves. This species of manzanita regenerates principally by germination of heat-scarified seed. Dense stands of manzanita generally recover within three to four years following a burn and reach sexual maturity by about the tenth year. Seed germination following fire is generally good although it is uncertain how well the heat intensity and duration incurred during a broadcast burn (and subsequent broadcast burns over time) would provide for seed scarification.

Management within Habitat Areas

Acceptable treatments (regardless of risk) within the critical first 300 feet surrounding developments and structures associated with a community, in the OR Klamath Province, all of Josephine and Jackson Counties, and Eastern Cascades Provinces on the Mt. Hood and Wenatchee National Forests only:

- All necessary fuels treatments may occur; no specific known site management is needed.

Acceptable treatments in the remaining 1 to 1½ mile fuel treatment zone:

Loss of some sites and/or individuals (by conducting moderate and high-risk fuels treatments) is acceptable within the remaining 1 to 1½ mile fuel treatment zone surrounding the designated communities-at-risk in the OR Klamath Province including all of Josephine and Jackson Counties, and Eastern Cascades Province on the Mt. Hood and Wenatchee National Forests only. In these areas, this species is locally abundant with high concentration of sites where *B. tortuosa* is sometimes

present in high numbers. However, continued persistence of this species requires that the following criteria be adhered to in selecting sites to be managed for:

1. Sites with numerous individuals should be conserved over those with only a few individuals.
2. Widely isolated sites should be retained over sites that are clustered and where loss of a site does not change overall distribution of the species.
3. Undisturbed sites should continue to represent the range of habitats and substrates upon which *B. tortuosa* occurs.
4. To the extent that it can be determined, undisturbed sites should reflect the historic range and habitats of the species.
5. All else being equal, sites in reserve allocations should be retained over sites in matrix or AMA.

For the remaining sites that are deemed necessary to maintain persistence of the species, including all sites (even those within 300') outside of the OR Klamath Province, Josephine and Jackson Counties, and the Eastern Cascades Province on the Mt. Hood and Wenatchee National Forests, acceptable (low risk) treatments include:

- **Broadcast burning:** Avoid occupied sites of *Bryoria tortuosa* where thalli are growing within or near the range of potential flame lengths. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke would not cause mortality to individuals. This species is most susceptible to injury when plants are moist and physiologically active. Any broadcast burn prescription should be specifically designed to retain the primary substrates for *B. tortuosa*. This generally consists of the large overstory trees although subordinate trees and shrubs may support thalli as well. If *B. tortuosa* is well established in the overstory, loss of subordinate trees supporting only a small proportion of the population would be acceptable.

Where shrubs (primarily white-leaf manzanita, *Arctostaphylos viscida*) provide a significant *B. tortuosa* substrate, representative patches of occupied shrubs sufficient to provide for recolonization of the area should be left undisturbed. These occupied sites should be buffered to a sufficient distance such that radiant heat and smoke would not cause mortality to individuals. Assuming that lichen abundance is correlated with the oldest age-class of shrubs, then these would be the shrubs that should be targeted for retention. In these cases, the prescription for the general area should encourage eventual recovery of the site to the current shrub species to provide for persistence of the *B. tortuosa* population.

- **Piling and Pile burning:** Slash piles should be located far enough from occupied sites that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.

- Hand or Dozer Lines: Line construction should be positioned away from occupied sites.
- Foam: Occupied sites should not be watered at all, particularly not with fire-retardant foam, before or during prescribed burning activities. If wet lines are to be used, care should be used to avoid *B. tortuosa* thalli.
- Thinning: Retain the large overstory trees with *B. tortuosa*. Where *B. tortuosa* is well distributed in the overstory trees, loss of isolated individuals on suppressed or subordinate trees is acceptable.
- Pruning: In small, isolated populations, trees with *B. tortuosa* should not be pruned. Pruning, otherwise, is not a concern.
- Crushing: No limitations; crushing of fuels is not anticipated to affect this species.
- Chopping/Grinding/Mowing, Piling, and Chipping: Where shrubs (primarily white-leaf manzanita, *Arctostaphylos viscida*) provide a significant *B. tortuosa* substrate, well-distributed areas with the oldest age-class or largest shrubs with *B. tortuosa* should not be impacted. In such areas, the fuels reduction prescription should encourage diverse age-classes of the current shrub species rather than a site conversion to another habitat type or other shrub species. Where this species is well distributed in the overstory trees designated for retention, loss of isolated individuals on suppressed or subordinate trees and shrubs is acceptable.
- Raking: Raking of fuels is not anticipated to affect this species as long as it does not result in increased mortality of trees or shrubs with *B. tortuosa*.

Research, Inventory, and Monitoring Needs

Where burning is to occur within or near occupied sites of *B. tortuosa*, at least representative sites should be included in the monitoring described in the front of this attachment, to determine direct mortality to thalli and evaluate the adequacy of the applied buffer and burning conditions.

Dendroscocaulon intricatum (Nyl.) Henssen - Lichen

Introduction

In the Northwest Forest Plan area, *Dendroscocaulon intricatum* occurs in two distinct habitat types. In the northern part of its range it occurs in mesic to moist forests in the upper Western Hemlock and lower Pacific Silver Fir Zones in the western Cascades. In the southern part of its range *D. intricatum* occurs in open-grown conifer and mixed conifer/deciduous stands. Although sites are known throughout nearly the entire latitudinal range of the Northwest Forest Plan area, only in Jackson and Josephine Counties in Southwest Oregon are sites known to be locally abundant.

Sites of *D. intricatum* in fuels condition class 3, where oak habitat is being overtopped by Douglas-fir are already at risk due to loss of substrate and habitat conditions. These areas would be preferred areas for treatment since fuels reductions has the potential to not only reduce fuel loads but also maintain or enhance future habitat for this species as well.

On oaks, *D. intricatum* appears to occupy primarily the boles and occasionally the larger branches. What appears to be its most common substrate are young black oak (*Quercus kelloggii*) trees, about 4 - 6" diameter at breast height, which have developed moderately fissured to platy bark textures. Key habitat components at these sites appear to be: a) an open understory for good air circulation; b) a Douglas-fir canopy for air moisture retention in dry seasons; and c) an understory of oaks or tanoaks (Stone Pers. Comm. 2001). Although Douglas-fir presence may be moderating the microclimatic conditions for *D. intricatum*, over time the conifers will overtop and kill many or most of the oaks. This reduction and/or loss of oak substrate from conifer encroachment has been observed on the BLM's Medford District (Wineteer Pers. Comm. 2001). The small oaks that represent the preferred substrate for *D. intricatum* will also not remain small forever so maintenance of diverse size classes of oaks would logically benefit this lichen.

There may be a moisture gradient that limits the distribution in some drier or more open oak communities. Therefore, Douglas-fir may be more important in providing site moderation for *D. intricatum* on dry sites than in relatively moist areas. It is also possible that enhanced moisture conditions actually facilitate the production of the branched "dendroscocauloid" photomorphs of the parent cyanolichen since this species is considered by some to be an environmentally influenced form of other lichen species.

Management within Habitat Areas

Acceptable treatments (regardless of risk) within the critical first 300 feet surrounding developments and structures associated with a community:

within Josephine and Jackson Counties, Oregon:

- All necessary fuels treatments may occur; no specific known site management is needed.

within the Oregon Klamath Province outside of Josephine and Jackson Counties:

- Follow recommendations for the remaining 1 to 1½ mile fuel treatment zone below;

within all other areas:

- Follow existing Management Recommendation (parameters below do not apply.)

Acceptable treatments in the remaining 1 to 1½ mile fuel treatment zone:

Loss of some sites and/or individuals is acceptable within Josephine and Jackson Counties, Oregon. Since the 2001 ROD (USDA & USDI 2001), when there were 67 known sites of *D. intricatulum*, there have been over 150 new sites identified, the vast majority of which are on the Medford District of the BLM. Therefore, at this point in time, the only area where sites can be identified where a risk of site loss (by conducting moderate and high-risk fuels treatments) would not result in a risk to continued species persistence is in Jackson and Josephine Counties in Southwest Oregon. Persistence of this species in this area should not be a concern as long as the following thresholds are adhered to:

1. Sites with numerous individuals should be conserved over those with only a few individuals.
2. Widely isolated sites should be retained over known sites that are clustered and where loss of a known site does not change overall distribution of the species.
3. Sites retained should continue to represent the range of habitats and substrates upon which *D. intricatulum* occurs.
4. To the extent that it can be determined, retained sites should reflect the historic range and habitats of the species.
5. All else being equal, sites in reserve allocations should be retained over sites in matrix or AMA.

For the remaining sites in Josephine and Jackson Counties, and for all sites (even those within 300') in the Oregon Klamath Province outside of Josephine and Jackson Counties, acceptable (low risk) treatments include:

- Broadcast Burning: Prescriptions should be designed to maintain or improve the habitat for this species. Sites of *D. intricatulum* should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species is most susceptible to injury when plants are moist and physiologically active.
- Piling and Pile Burning: Because the smoke and radiant heat could kill lichens low on the boles and branches of colonized oaks, piles should be placed far enough away from them to reduce heat and smoke, and to not alter light regime and air flow.

- Hand or Dozer Lines: Line construction should be positioned away from occupied sites. Avoid damaging roots and boles of colonized trees.
- Foam: Areas with *D. intricatum* should not be watered at all, particularly not with a wetting agent, before or during prescribed burning activities. If wet lines are to be used, care should be used to avoid *D. intricatum* thalli. Ensure that no foam would drip or blow onto nearby colonized trees.
- Thinning: Thinning should only occur at occupied sites if the oaks are at risk of being over topped by conifers and only then in relatively moist areas where the conifer presence is not considered necessary to maintain the microsite conditions for *D. intricatum*. Substrates with *D. intricatum* should not be thinned or damaged. Thinning prescriptions would ideally provide for future substrate, specifically smaller diameter oaks.
- Pruning: Avoid pruning of oaks. Pruning of oak branches could unwittingly remove thalli, and potentially alter the humidity and other microsite conditions. If pruning seems necessary, ensure that no colonized branches are pruned or damaged in the process.
- Crushing: Avoid crushing in or immediately around occupied sites to avoid damage to the host trees.
- Chopping/Grinding/Mowing: Chopping, grinding, and mowing should not directly impact colonized trees. These activities could destroy colonized oaks in smaller diameter classes, as well as potential future substrate.
- Chipping: Do not expel chips directly at colonized oaks, potentially damaging the lichens or substrate. Point the chip effluent and chip pile away from occupied or potentially occupied substrates.
- Raking: Unless the rake damages the thalli on the oaks, or damages the oak roots and kills its substrate, raking should have a neutral effect. Be careful to minimize any mechanical damages from any activity.

For all sites outside of the Oregon Klamath Province, and Josephine and Jackson Counties (even those within the 300' zone), follow the existing Management Recommendation.

Research, Inventory, and Monitoring Needs

Where burning or thinning is to occur in or near occupied sites of *D. intricatum* at least representative sites should be included in the monitoring described in the front of this attachment, to determine direct mortality to thalli and evaluate the adequacy of the applied buffer and burning conditions or thinning regime.

Peltigera pacifica Vitik. - Lichen

Since there is no Management Recommendation for this species, the following constitutes additional information to be used with professional judgment, Appendix J2 (NFP FSEIS 1994), and appropriate literature.

Introduction

This species occurs primarily on rotten logs and humus, occasionally on lower boles of trees in moist, closed canopy stands. Detailed habitat information from the Air Quality database shows that it occurs in: old growth Douglas-fir and western red cedar stands; red alder stands; high elevation stands of subalpine fir (*Abies lasiocarpa*); on a rocky slope dominated by sedum, ferns; and in two 80 year old stands of Douglas-fir (USDA 1998). Because the Air Quality data was collected on a systematic grid, this should provide a reasonable estimate of the range of habitats on the National Forests that were sampled. It occurs mostly at low to moderate elevations but has been reported up to 4900'. The habitat for known sites of this species does not appear to be consistent with fire regimes 1, 2, or 3A although some occupied sites may be adjacent to areas within these fire regimes.

Management within Habitat Areas

Acceptable (low risk) treatments in the 1 to 1½ mile fuel treatment zone (including the critical first 300 feet surrounding developments and structures associated with a community):

- **Broadcast burning:** Broadcast burning should not occur within occupied sites. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.
- **Piling and Pile burning:** Burn piles should be located away from occupied sites so that radiant heat and smoke is minimized. Occupied substrate for *P. pacifica* should not be piled.
- **Lines (hand/dozer):** Hand and dozer line construction should be positioned away from occupied *P. pacifica* sites.
- **Foam:** Areas with *P. pacifica* should not be watered at all, particularly not with a wetting agent, before or during prescribed burning activities. If wet lines are to be used, care should be used to avoid *P. pacifica* thalli.
- **Thinning:** Occupied sites should be buffered sufficiently to protect thalli of *P. pacifica* and their substrate and to maintain current microsite conditions.
- **Pruning:** In areas where the lower canopy branches are providing significant microsite moderation, pruning should not be done at occupied sites.

- Crushing: Understory fuels should not be disturbed in high quality habitat in and around occupied sites. Crushing should not occur in occupied sites.
- Chopping/Grinding/Mowing: Understory fuels should not be disturbed in high quality habitat around occupied sites. Chopping, grinding, or mowing should not occur in and around occupied sites.
- Chipping: Substrate for *P. pacifica* should not be chipped in and adjacent to the occupied site.
- Raking: Understory fuels should not be disturbed in high quality habitat around occupied sites. Raking should not occur at occupied sites.

Ramalina thrausta (Ach.) Nyl. - Lichen

Since there is no Management Recommendation for this species, the following constitutes additional information to be used with professional judgment, Appendix J2 (NFP FSEIS 1994), and appropriate literature.

Introduction

Habitat requirements for this species in the Northwest Forest Plan Area is not well understood. In our area, this lichen is found in moist low-elevation conifer stands usually with a hardwood component. In the Air Quality database, it is reported from several old-growth Douglas-fir stands, usually with moist site characteristics; occasionally it was found in riparian situations (USDA 1998). One of these is a 14 year-old stand, where it had undoubtedly blown in from a nearby colonized site. It was also reported in a 30 year-old thinned stand with remnant large Douglas-fir present (USDA 1998). This species is considered to be hygrophytic in British Columbia, and is best developed when growing in close proximity to standing water or wetlands (Goward 1999), however recent sites in Oregon suggest that it is not strictly riparian (A. Ruchty, pers. comm.).

Management within Habitat Areas

Acceptable (low risk) treatments in the 1 to 1½ mile fuel treatment zone (including the critical first 300 feet surrounding developments and structures associated with a community):

- **Broadcast burning:** Broadcast burning should not occur within occupied sites. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.
- **Piling and Pile Burning:** Pile and burn slash away from the drip-line of trees and shrubs with *R. thrausta*. If shrubs provide a significant substrate, the oldest age-class or largest shrubs should not be disturbed. Radiant heat and smoke could kill or damage *R. thrausta* low in the canopy. Smoke could also potentially affect individuals higher up in the canopy. Destruction and piling of colonized substrate (i.e. branches) would obviously be detrimental to *R. thrausta*.
- **Hand and Dozer Lines:** Ensure that the dozer- and hand-constructed firelines are situated far enough away from colonized trees or shrubs that they pose no direct threat of physical damage to the individuals or substrates. Dozers or hand-line crews could break off colonized limbs or otherwise damage the substrate trees.
- **Foam:** Areas with *R. thrausta* should not be watered at all, particularly not with a wetting agent, before or during prescribed burning activities. If wet lines are to be used, care should be taken to avoid *R. thrausta* thalli. Ensure that no foam would drip or blow onto nearby colonized trees. Moistened lichens will be at increased sensitivity to heat and smoke damage regardless of a wetting agent. In addition, it

is unknown what the affect of wetting lichens is upon metabolic activities during atypical times of year, specifically when it is very hot.

- Thinning: Any thinning prescription should be specifically designed to retain the overstory trees with *R. thrausta*. Thinning should not alter the microhabitat at occupied sites.
- Pruning, Crushing, Chopping/Grinding/Mowing, Piling, Chipping, Raking: Avoid directly impacting the lichens or their substrate. This includes removal of colonized and adjacent substrates as well as mechanical damage to same.

Usnea longissima in California and in Curry, Josephine, and Jackson Counties, OR
- Lichen

Since there is no Management Recommendation for this species, the following constitutes additional information to be used with professional judgment, Appendix J2 (NFP FSEIS 1994), and appropriate literature.

Introduction

Usnea longissima is Red-listed in California, where it is rare (California Lichen Society Web Page 2000). Due to a combination of anthropogenic influences such as habitat alteration and air quality degradation, *U. longissima* has declined significantly throughout its global range (Esseen et al.1981). This once-common circumboreal species is now considered endangered in many areas of Europe and Scandinavia (Ahti 1977).

Habitat for *U. longissima* is only doubtfully within Fire regimes 1, 2, or 3A. This species continues to have very few known sites in California, and Curry, Josephine and Jackson Counties in Oregon.

Management within Habitat Areas

Acceptable (low risk) treatments in the 1 to 1½ mile fuel treatment zone (including the critical first 300 feet surrounding developments and structures associated with a community):

- **Broadcast burning:** Broadcast burning should not occur within occupied sites. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.
- **Piling and Pile burning:** Pile and burn slash away from the drip-line of trees and shrubs with *U. longissima*. If shrubs provide a significant substrate the oldest age-class or largest shrubs should not be disturbed. Radiant heat and smoke could kill or damage plants low in the canopy. Smoke could also potentially affect individuals higher up in the canopy. Destruction and piling of colonized substrate (i.e. branches) would obviously be detrimental to *U. longissima*.
- **Hand or Dozer Lines (hand/dozer):** Ensure that the dozer hand lines are situated far enough away from colonized trees to pose no direct threat. The biggest risk from this activity is physical damage to the individuals or substrates. Dozers or handline crews could break off colonized limbs or otherwise damage the substrate trees.
- **Foam:** Areas with *U. longissima* should not be watered at all, particularly not with a wetting agent in fire-retardant foam, before or during prescribed burning activities. If wet lines are to be used, care should be taken to avoid *U. longissima* thalli. Ensure that no foam would drip or blow onto nearby colonized trees. Moistened lichens will be at increased sensitivity to heat and smoke damaged,

regardless of a wetting agent. In addition, it is unknown what the affect of wetting lichens is upon metabolic activities during atypical times of year, specifically when it is very hot.

- Thinning: Do not thin in or around the occupied site for a distance sufficient to maintain habitat conditions within the site.
- Pruning, Crushing, Chopping/Grinding/Mowing, Piling, Chipping, Raking: Avoid direct impacts to the lichens or their substrates. This includes damage or removal of colonized and adjacent substrates.

BRYOPHYTES

Overview

The following information is applicable to all of the bryophytes covered in these MR amendments.

Bryophyte sensitivity to fire, heat, smoke, water, and air pollution

Because lichens and bryophytes obtain water and nutrients directly from the atmosphere they are much more sensitive to the effects of ambient smoke and heat than vascular plants. High temperatures have been documented to cause a range of negative effects upon epiphytic lichens (Romagni and Gries 1997). These affects range from direct mortality to impaired photosynthesis as a result of chlorophyll damage and possible destruction of the photobiont. Partially burned lichens can slow population recovery by occupying potential recolonization space (Romagni and Gries 2001).

Lichens and bryophytes are also well known for their sensitivity to air pollution particularly sulfur dioxide, nitrogen-based gaseous and acidic compounds, and fluorides (McCune & Geiser 1997). Pendant lichens and epiphytic cyanolichens tend to be the most air pollution-sensitive species. The impacts to lichens and bryophytes from short-term exposure to pollutants generated from forest fires are not known at this time.

Lichens and bryophytes are unique in their ability to withstand prolonged desiccation as well as their ability to rapidly recover to a physiologically active state. Lichens and bryophytes appear to be far less sensitive to heat and pollutants when they are dry and dormant, so watering of these species before or during burning would greatly increase risk to plants adjacent to the fire. Obviously consumption of a species or its substrate is a much more direct and immediate threat so use of water or foam in regaining control of a burn would be acceptable. It is assumed that careful project planning and implementation will ensure this situation is rarely encountered.

Ptilidium californicum (Aust.) Underw. - Bryophyte

Introduction

Ptilidium californicum occurs primarily on the lower boles of large conifers. The limited habitat records in ISMS suggest that white fir (*Abies concolor*) is the principle substrate but it also occurs on Douglas-fir (*Pseudotsuga menziesii*) and occasionally on chinquapin (*Chrysolepis chrysophylla*). On the Illinois Valley Ranger District of the Siskiyou National Forest it has also been found in California on decay class 3 and 4 rotten logs, conifer stumps and snags. The majority of the sites in northern California occur within mixed-conifer stands between moderate to high elevations, mostly between 4000-5000'. Except possibly for the sites on the Rogue River National Forest, all of the known sites are mapped as being in areas that have missed at least two fire cycles, however this is probably an artifact of the coarse scale of the mapping since this species' ecological requirements would not be generally consistent with a high fire-return frequency.

Management within Habitat Areas

Acceptable (low risk) treatments in the 1 to 1½ mile fuel treatment zone (including the critical first 300 feet surrounding developments and structures associated with a community):

- **Broadcast burning:** Broadcast burning should not occur within occupied sites. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.
- **Piling and Pile burning:** Piles should be located far enough from occupied sites so that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active. Care should be used when gathering material in the vicinity of a managed site to prevent mechanical injury to the boles of the trees with individuals. Understory vegetation in the immediate vicinity of the occupied site should be left intact to protect the microclimate.
- **Hand and Dozer Lines:** Line construction should be positioned away from occupied *P. californicum* sites.
- **Foam:** Occupied sites of *P. californicum* should not be watered at all, particularly not with fire-retardant foam, before or during prescribed burning activities. If wet lines are to be used, care should be used to avoid *P. californicum* plants.
- **Thinning:** Trees should be felled away from the occupied site to avoid physical damage to occupied sites. Occupied sites should be buffered, as necessary, to maintain microclimatic conditions.
- **Pruning:** Maintain microclimatic conditions at occupied site and avoid mechanical injury.

- Crushing and Chopping, Grinding, Mowing: Buffer occupied sites from any crushing, chopping, grinding, or mowing of stumps, snags, or rotten logs that might alter microclimatic conditions.
- Chipping: Occupied sites should be protected from direct impact of flying chips.
- Raking: Raking is unlikely to disturb sites if rotten logs and stumps are avoided.

Schistostega pennata (Hedw.) Web. & Mohr - Bryophyte

Introduction

Schistostega pennata forms small tufts from a thin luminous protonemal mat on loose mineral soil in crevices of root wads of fallen trees. Because of the unique features of the protonemal mat *S. pennata* is capable of surviving in areas with very limited light. Changes in light intensity or the damage to mineral soil on the root wads would lead to the loss of individuals. At the present time there have been no records of *S. pennata* occurring on charred substrates. Recent literature (Ignatov et al. 2001) suggests that *S. pennata* may rely on insects, spiders, mites, birds, mice and/or frogs for spore dispersal.

Management within Habitat Areas

Acceptable (low risk) treatments in the 1 to 1½ mile fuel treatment zone (including the critical first 300 feet surrounding developments and structures associated with a community):

- **Broadcast burning:** Broadcast burning should not occur within occupied sites. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.
- **Piling and Pile burning:** Piles should be located well away from occupied sites so that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active. Care should be used when gathering material in the vicinity of a managed site to prevent mechanical injury to the root-wads with individuals. Mechanical equipment and foot traffic should be kept away from occupied sites to avoid disturbance to the mineral soil substrate and minimize impact to the root wad.
- **Hand and Dozer Lines:** Line construction should be positioned away from *S. pennata* sites.
- **Foam:** Occupied sites should not be watered at all, particularly not with fire-retardant foam, before or during prescribed burning activities. If wet lines are to be used, care should be used to avoid buffered occupied sites.
- **Thinning:** Trees should be felled away from the occupied site to avoid physical damage to occupied sites. Occupied sites should be buffered, as necessary, to maintain microclimatic conditions. The current Management Recommendations call for maintaining 70% canopy closure, which was mandated in the 1994 ROD when this species was categorized as a “protection buffer” species. This standard is no longer considered relevant (many sites have less than 70% cover naturally). Buffer widths and canopy closure are currently considered to be very site specific. Upland sites may require a large buffer with an intact canopy for persistence while sites associated with wetlands may not require any buffer beyond protecting the occupied site.

- Pruning: Use of machinery and foot traffic should be avoided at occupied sites to reduce damage to the root wad. Avoid pruning immediately adjacent to the occupied site.
- Crushing: Crushing should not occur at or immediately around occupied sites.
- Chop/Grind/Mowing: Chopping, grinding, or mowing should not occur at or around occupied sites.
- Chipping: Locate chipper well away from managed sites to minimize disturbance to the root wad through soil vibration. Avoid direct impact to the root wad by the dispersal of chips.
- Raking: Raking should not occur at or around occupied sites.

Tetraphis geniculata Girg. ex Milde - Bryophyte

Introduction

Tetraphis geniculata occurs on the cut or broken ends, or lower sides of larger (usually over 15 inches in diameter in Oregon and Washington), decay class three, four and five rotted logs and stumps. In northern California *T. pellucida* is found on large redwood logs and stumps along the coast. Assuming *T. pellucida* and *T. geniculata* are sympatric, *T. geniculata* may be restricted to sites where there is enough large (over 20 inches in diameter) coarse woody material in microsites with high humidity. The moist habitat for this species would not fall into a fire regime 1, 2, or 3A.

Management within Habitat Areas

Acceptable (low risk) treatments in the 1 to 1½ mile fuel treatment zone (including the critical first 300 feet surrounding developments and structures associated with a community):

- **Broadcast burning:** Broadcast burning should not occur within occupied sites. The occupied site(s) should be buffered to a sufficient distance such that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active.
- **Piling and Pile burning:** Piles should be located well away from occupied sites so that radiant heat and smoke will not cause mortality to individuals. This species would be most susceptible to injury when plants are moist and physiologically active. Care should be used when gathering material in the vicinity of an occupied site to prevent mechanical injury to the rotten logs or stumps with individuals.
- **Hand and Dozer Lines:** Line construction should be positioned away from occupied *T. geniculata* sites.
- **Foam:** Occupied sites of *T. geniculata* should not be watered at all, particularly not with a fire-retardant foam, before or during prescribed burning activities. If wet lines are to be used, care should be used to avoid *T. geniculata* plants.
- **Thinning:** Trees should be felled away from the occupied site to avoid physical damage to occupied sites. Occupied sites should be buffered, as necessary, to maintain microclimatic conditions.
- **Pruning:** Avoid pruning that would alter the microclimate at the occupied site.
- **Crushing:** Avoid crushing in or around the occupied site to reduce damage to the site, and leave large all rotten logs and stumps in the immediate vicinity of the occupied site.

- Chopping/Grinding/Mowing: Do not chop, grind, or mow in or around the occupied site; leave large all rotten logs and stumps in the immediate vicinity of the occupied site.
- Chipping: Locate chipper well away from occupied sites to minimize disturbance to rotten logs and stumps. Do not pile chips on top of, or next to, rotten logs or stumps. Leave all rotten logs and stumps in the immediate vicinity of the occupied site.
- Raking: Avoid disturbing the occupied site, otherwise no adverse affect is anticipated.

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VASCULAR PLANTS

Cypripedium fasciculatum (Vascular Plant)

The following supplements the existing management recommendations of December 1998. Although the existing MR covers only a portion of the species range, this supplement applies to National Fire Plan projects proposed within and adjacent to identified communities at risk throughout the range of *CYFA* within the NWFP area.

Management within Habitat Areas

Acceptable treatments (regardless of risk) within the critical first 300 feet surrounding developments and structures associated with a community:

- All necessary fuels treatments may occur; no specific known site management is needed.

Acceptable (low risk to the species) treatments in the remaining 1 to 1½ mile fuel treatment zone (since this is an “uncommon” species, an acceptable risk can be achieved by applying the following):

10% of the sites located in this zone require no known site protection; all necessary fuel treatments may occur.

For at least 90 percent of the *CYFA* sites within the project area, apply the following recommendations:

- **Broadcast Burning:** Low severity/low intensity broadcast burning is acceptable within the managed site. Manage for low severity/low intensity fire by keeping average flame length below 4 feet, retaining sufficient shrub and/or canopy cover so that *CYFA* plants are not exposed to more than intermittent direct solar radiation, and retaining soil cover (duff) around occupied sites. Remove heavy fuels (pull back) from managed sites in order to avoid consumption of the duff layer during the burn. Fall burns are recommended. Pruning of canopy trees may be done prior to ignition to reduce the risk of crowning (see piling and pile burning and pruning below). Care must be taken when burning in the spring to avoid trampling or other mechanical disturbance to *CYFA* individuals. If the managed site is located in the bottom of the draw, control heat intensity at the managed site by lighting fire from the top down and burning in stages out from the line. If necessary, a hand or black line may be placed around an occupied site to protect the duff around plants.
- **Hand or dozer lines:** Maintain the duff layer within managed sites. Provide a buffer around the occupied site commensurate with the width of the line. Hand-line can be placed as close as 5 meters (15 feet) from the perimeter of the site. Dozer line should generally be a minimum of 20 meters (65 feet) from the site perimeter.

- Piling and Pile Burning: Keep dozers off the managed site. Locate piles, considering slope and aspect, far enough from the occupied site that radiant heat does not disturb the occupied site or burn duff, and trampling of the occupied site does not occur. Locate piles far enough away from trees such that heat generated does not damage tree crowns important for maintaining microsite conditions.
- Thinning: Maintain shading and microsite conditions at the managed site by retaining sufficient shrub and/or canopy cover so that CYFA plants are not exposed to more than intermittent direct solar radiation. Special care should be taken to avoid mechanical damage from trampling and soil compaction when treatments occur during the spring and summer growing season. Avoid disturbing individual plants or the duff layer around individual plants when yarding or skidding materials on the ground. Exclude mechanized equipment from managed sites.
- Pruning: Maintain shading and microsite conditions at the managed site by retaining sufficient shrub and/or canopy cover so that CYFA plants are not exposed to more than intermittent direct solar radiation. Avoid mechanical damage such as trampling and soil compacting. Special care should be taken to avoid mechanical damage from trampling and soil compaction when treatments occur during the spring and summer growing season (February 15 – August 1).
- Chipping, raking: Keep mechanized equipment out of managed sites. Material can be hand pulled from the managed site to a chipper located outside. Chips should be directed away from the managed site as well. Any activity within the occupied site should take place outside the growing season (February 15 - August 1) to avoid trampling of plants.

Unacceptable (medium or high risk to the species) treatments within the remaining 1-1.5 mile fuel treatment zone include:

- Crushing, chopping, grinding, or mowing: It is unknown how these activities could be designed to create low risk to site persistence. It is expected that these activities have the potential to increase burn duration of fuels left on the ground. This would increase burn severity and have a negative effect. Do not conduct within managed sites.

Other (unknown risk) treatments:

- Foam surfactant: Avoid applying foam directly on CYFA plants. With ground application, avoid trampling of plants during the spring/summer growing period (February 15 - August 1).

Research, Inventory, and Monitoring Needs

The monitoring described at the front of this attachment should include monitoring of retained duff for broadcast burning projects and percent canopy cover for thinning and pruning projects in all regular post-project implementation monitoring.

Eucephalus vialis (*Aster vialis*) (Vascular Plant)

The following supplements the original Management Recommendation developed by Wogan in 1998 and applies to the entire range of the species within the NWFP area.

Management within Habitat Areas

Acceptable treatments (regardless of risk) within the critical first 300 feet surrounding developments and structures associated with a community:

- All necessary fuels treatments may occur; no specific known site management is needed.

Acceptable (low risk to the species) treatments in the remaining 1 to 1½ mile fuel treatment zone:

- **Broadcast Burning:** Low intensity/low severity broadcast burning is acceptable within the occupied site. Manage for low severity/low intensity fire by keeping average flame lengths below 4 feet and removing heavy fuels from the occupied site. Avoiding prescribed burning during the growing season (June 1 – October 1) is recommended; early spring burns and fall burns, after senescence, are preferable. Noxious weeds pose a serious threat for this species. Attempt to conduct activities in a manner and season that minimizes noxious weed spread to occupied sites.
- **Hand or dozer lines:** Maintain soil integrity around occupied sites. Provide a buffer around the occupied site commensurate with the width of the line. Hand-line can be placed as close as 5 meters (15 feet) from the perimeter of the population if the locations of individual plants are known. Dozer line should generally be a minimum of 20 meters (65 feet) from the occupied site perimeter.
- **Piling and Pile Burning:** Hand-pile material and keep mechanized equipment off the occupied site. Locate piles, considering slope and aspect, far enough away from the managed site so that heat does not disturb the occupied site or burn duff, and trampling of the occupied site does not occur. Keep mechanized equipment away from occupied sites.
- **Thinning:** Canopy cover at the managed site may be reduced down to 50 to 75 percent. Special care should be taken to avoid mechanical damage from trampling and soil compaction when treatments occur during the spring and summer growing season. Avoid disturbing individual plants or the soil around individual plants when yarding or skidding materials on the ground near occupied sites. Exclude mechanized equipment from occupied sites.

- Pruning: Special care should be taken to avoid mechanical damage from trampling and soil compaction when treatments occur during the growing season (June 1 - October 1).
- Chipping, raking: Keep mechanized equipment off managed sites. Material can be hand pulled from within and around the occupied site to a chipper located away from the site. Chips should be directed away from the occupied site. Any activity within the managed site should take place after senescence (October 1) and before the growing period (June 1) to avoid trampling of plants.

Unacceptable (medium or high risk to the species) treatments within the remaining 1-1.5 mile fuel treatment zone include:

- Crushing, chopping, grinding, or mowing: It is unknown how these activities could be designed to create low risk to site persistence. It is expected that these activities have the potential to increase burn duration of fuels left on the ground. This would increase burn severity and have a negative effect.

Other (unknown risk) treatments:

- Foam surfactant: Avoid applying foam directly on *EUVI* plants. With ground application, avoid trampling of plants during the spring/summer growing period (June 1- October 1).

Research, Inventory, and Monitoring Needs

The monitoring described at the front of this attachment should include a component to check for invasion of noxious weeds that result from fuels treatments.

Botrychium montanum (Vascular Plant)

The following supplements the Management Recommendation for *Botrychium montanum* and applies to the species entire range within the Northwest Forest Plan area.

Management within Habitat Areas

Acceptable treatments (regardless of risk) within the critical first 300 feet surrounding developments and structures associated with a community:

- All necessary fuels treatments may occur; no specific known site management is needed.

Acceptable (low risk to the species) treatments in the remaining 1 to 1½ mile fuel treatment zone:

- **Broadcast Burning:** Low intensity and severity broadcast burning may be conducted to the outside perimeter of an occupied site, but not within the occupied site itself. Manage for low severity/low intensity fire by keeping average flame lengths below 4 feet. Precautions to protect individual plants may include removing heavy fuels away from the site perimeter, including ladder fuels, to reduce the likelihood that plants will be damaged from radiant heat, placing control lines away from plant locations, and directing foot traffic and mechanical equipment away from plants to avoid trampling. Burning outside the growing season, after September 15 and before May 1, before plants emerge, would provide the least risk.
- **Hand or dozer lines:** Avoid soil disturbance and minimize risk of non-native invasive species affecting *BOMO* populations by maintaining a buffer around occupied sites where no lines will be constructed. The size of the buffer can be commensurate with the width of the line. Hand-line can be placed as close as 5 meters (15 feet) from the perimeter of the population if the locations of individual plants are known. Dozer line should generally be a minimum of 20 meters (65 feet) from the occupied site perimeter.
- **Piling and Pile Burning:** Locate piles far enough away from the site so that plants are not affected by heat. Limit activities within the occupied site to hand pulling of fuels, avoiding individual plants or piling outside the growing season (after September 15 and before May 1) so that trampling does not occur. Due to the soil disturbance which would result from grapple and dozer piling, equipment should be not be used within the occupied site.
- **Thinning:** Maintain interior forest microclimates essentially as described in the existing Management Recommendation. Because of the moisture needs of this

plant establish an unthinned buffer of 1 to 2 tree heights (use tree height potential), depending upon aspect and other conditions. Yarding material through the buffer may take place but no ground disturbance should occur within the occupied site.

- Pruning: Limit pruning as necessary to avoid affecting microclimate at the occupied site. Avoid individual plants or prune outside the growing season (after September 15 and before May 1) to avoid trampling plants.
- Chipping, raking: Material may be hand-pulled from within the occupied site area to a chipper located outside. Chips should be directed away from the occupied site. To avoid trampling plants, work should be done outside the growing season (after September 15 and before May 1). Avoid raking within the occupied site.
- Crushing, chopping, grinding, or mowing: Establish a no-treatment buffer around the occupied site sufficient to avoid soil and duff disturbance within and near the occupied site, to maintain the microclimate at the occupied site, and to preclude non-native invasive species from becoming established near the site.
- Foam surfactant: Foam line can be placed immediately adjacent to the perimeter of the occupied site provided that the location of individual *BOMO* plants are known and that they are not covered with foam. With ground application, care should be taken not to trample plants.

Research, Inventory, and Monitoring Needs

The monitoring described in the front of this attachment should include a component to check that non-native invasive vegetation does not establish on lines that are constructed for fuels treatments.