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Botanical Resources and Non-Native Invasive Species Report

Westside Fire Recovery

Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts
Klamath National Forest
Siskiyou County, California

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Executive Summary

The Westside Fire Recovery Project Botany Biological Assessment, Biological Evaluation, Survey and Manage Review, Noxious Weed Risk Assessment, and Pre-field documents: Appendices A-1, A-2, and A-3 are summarized in this report. The purpose of this document is to evaluate the Westside Fire Recovery Project in sufficient detail to determine its effects on Endangered, Threatened, Proposed, Candidate, Sensitive, and Survey and Manage plant species as well as determine the risk of introducing or spreading Noxious Weed species. Unique botanical areas of concern are also addressed.

Methodology

An office pre-field review was conducted to determine if the Project is within the range of any federally listed, Threatened, Endangered, Proposed, Candidate, Sensitive, or Survey and Manage botanical species for the Klamath National Forest, and if suitable habitat is present within the proposed Project area. Additionally, the review indicated whether any populations of species of concern are known to be present within the Project area. All species listed for the Forest were considered in this review (USFWS 2104, USDA 2013).

Due to the expedited Project time frame, need to conduct surveys during appropriate times for identification (typically when blooming), and the obligation to assess the condition of known populations, it was unfeasible to conduct unit surveys in search of un-known populations of Sensitive species. Surveys to evaluate the status of known populations within Project activity areas will be conducted in the spring and summer of 2015 during appropriate times for identification. If populations are located within treatment areas and the habitat in its current state is likely to be negatively impacted by the proposed action, a project design feature intended to protect Sensitive species populations from a declining trend in viability. Due to the ephemeral appearance of fruiting structures, and the expedited time frame of the Westside Fire Recovery project, surveys for Sensitive fungal species were not practical. Sensitive fungi habitat in the Project area would be protected through the incorporation of Project design features associated with Forest Plan Standards and Guidelines for the Aquatic Conservation Strategy and woody material retention associated with wildlife habitat and soil stability and productivity. See Aquatic Conservation Report in project record.

The Bureau of Land Management and Forest Service have adopted standards and guidelines for the management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl, commonly known as the Northwest Forest Plan (NWFP). The NWFP includes measures for management of known sites, site-specific pre-habitat disturbing surveys, and/or landscape scale surveys for about 400 rare and/or isolated species. These species are grouped into six categories based on level of rarity, ability to reasonably and consistently locate occupied sites during pre-disturbance surveys, and the level of information known about the species or group (Table S-1). The standards and guidelines for these mitigation measures are known as Survey and Manage (SandM).

Table S- 1: Requirements for Survey and Manage categories.

Category	Relative Rarity	Pre-disturbance surveys	Manage all known sites	Strategic surveys
A	Rare	Yes	Yes	Yes, not required for NEPA
B	Rare	No	Yes	Yes, NEPA requirement
C	Uncommon	Yes	High-priority only	Yes, not required for NEPA
D	Uncommon	No	High-priority only	Yes, not required for NEPA
E	Rare	No	Yes	Yes, not required for NEPA
F	Uncommon	No	No	Yes, not required for NEPA

To be in compliance with Survey and Manage direction pre-disturbance surveys will be conducted for Category A and C species in project activity units where known sites and suitable habitat are still present. Known occurrences within the Project area of Category B and E species and high-priority populations of Category D species will be protected for continued persistence at the site. If suitable habitat is present at known locations but known occurrences cannot be found, habitat elements will be protected to maintain the viability of the site. Project design features incorporated into the project for the protection of botanical species can be found in chapter 2.

The Klamath National Forest has a list of weeds that are being tracked and managed (appendix B of the Botanical Resources and Non –native Invasive Species report). There are a total of 30 high priority weeds on the list and fifteen species of moderate and low priority. A high priority weed species is one that is of important local management concern because of its currently limited distribution on the Forest, highly invasive nature, and demonstrated potential to displace large geographic areas of native plant communities. For this project, the risk analysis will only evaluate the likelihood for introducing and spreading high and moderate priority species. The low priority species present in the project area will not be considered in the analysis because it is of lesser concern on the Forest and is not considered an issue locally.

The invasive species risk assessment was completed to determine the risk of introducing and/or spreading non-native invasive species associated with the project. For projects having a moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation (FSM 2903.04).

Based on site visits and RAVG data the following assumptions about habitat condition are made:

- areas characterized by high severity burns experienced 75 percent or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris;
- areas characterized by moderate severity burns experienced 50-75 percent vegetation mortality, substantial reduction in canopy and understory cover, as well as duff layers and large woody debris; and
- areas characterized by no or low severity burns experienced 0-50 percent vegetation mortality and a reduction in fuel loading.

Analysis Indicators

- Threatened, Endangered, Proposed, and Candidate Species: Likelihood of jeopardizing the continued existence of Threatened, Endangered, Proposed, or Candidate species populations.
- Sensitive Species: Trend of Sensitive species population viability measured as increasing, declining, or static.
- Survey and Manage Species: Compliance with Survey and Manage guidelines as defined by the 2001 Record of Decision.
- Non-native Invasive Species: Risk of introducing and/or spreading non-native invasive species measured by a rating of high, moderate or low risk.

Assumptions specific to Botanical Species of Concern

- Analysis is based on spatial population records only, field visits to known sites were not conducted prior to analysis;
- Botanical species of concern located in areas burned at moderate-high intensity, as indicated by RAVG data and salvage and site preparation and planting unit selection criteria, are assumed to be extirpated;
- Habitat located in areas burned at moderate-high intensity, as indicated by RAVG data and salvage unit criteria, are no longer expected to support viable populations of botanical species of concern (except *Thermopsis robusta* which prospers following disturbance);
- Strategic surveys for Survey and Manage Category B fungi are assumed to be complete (pending acceptance of the Draft Document by the Regional Ecosystem Office); and
- Survey and Manage guidelines will be used to analyze effects on botanical species that fall under both Sensitive and Survey and Manage categories because they provide for a more protective management strategy.

Assumptions specific to Non-native Invasive Species (NNIS)

- Analysis is based on spatial population records only, field visits to known sites were not conducted prior to analysis;
- Not all existing NNIS infestations are currently mapped;
- Existing NNIS infestations were spread during the 2014 fires and associated suppression efforts;
- It’s likely that new NNIS infestations were introduced during the 2014 fires and associated suppression efforts that are presently undetected;
- Roadside NNIS infestations are expected to continue to spread along road systems regardless of project activities;
- Inclusions of privately owned lands within the project boundary may contain infestations of NNIS that will spread to National Forest System lands regardless of Forest actions and/or efforts at prevention and control; and
- Once established, NNIS infestations are likely to persist long term.

Spatial and Temporal Context

The analysis area for botanical species of concern and non-native invasive species is the project area because it is the most relevant to changes to population viability and the risk of spread within the Project area. The temporal bounding for botanical species of concern and non-native invasive species will be less than five years for the short-term and greater than five years for long-term effects. Temporal bounding were chosen to account for species recovery times, seed dormancy and germination requirements, and the difficulty of identifying biennial and perennial vegetative life stages (rosettes).

Affected Environment

The Westside Fire Recovery project area is composed of the Beaver Fire (Subpart A), Happy Camp Complex (Subpart B), and Whites Fire (July Complex) (Subpart C) which all occurred on the Klamath National Forest during the summer of 2014. These fires resulted in a mosaic pattern of vegetation from the variety of burn intensities that occurred across the Project area.

Modification of the forest structure and composition as a result of fire intensity, duration, and suppression efforts has had a profound effect on microclimate characteristics such as air temperature, relative humidity, and soil temperature and moisture, which could, in turn, result in adverse impacts to native plant communities. In moderate and high burn severity areas, microclimate characteristics commonly associated with habitat for species of concern have likely been lost, however these areas also provide the opportunity for the unique and less frequent elements of the California flora known as fire followers to come to life and establish a seed bank that will persist waiting for the next event. These areas are also more vulnerable to invasion by noxious weeds due to the lack of ground cover that often acts as a barrier to establishment to non-native invasive species. Areas that experienced no or low burn severity may provide refugia for native species, and act as a seed source from which dispersal into the more intensely burned areas can occur.

Species of Concern

There are no known populations of Federally-listed threatened, endangered, proposed, or candidate species within the Project area; however, suitable habitat is present within subpart A for the Endangered lily, *Fritillaria gentneri.* Suitable habitat and/ or confirmed populations of 3 Sensitive species and 17 Survey and Manage species are present in the project area. A list of these species and the number of populations assumed alive within the project area is displayed below in Table S-2.

Table S- 2: List of Sensitive and Survey and Manage botanical species known to be present in the Westside Fire Recovery project area.

Scientific Name	Status	Type	Populations In Project Area
Albatrellus flettii	Survey and Manage-B	Fungi	1
Alpova olivaceotinctus	Survey and Manage-B	Fungi	1
Cantharellus subalbidus	Survey and Manage-D	Fungi	2
Choiromyces alveolatus	Survey and Manage-B	Fungi	1
Cypripedium fasiculatum	Sensitive, Survey and Manage-C	Vascular plant	30
Cypripedium montanum	Sensitive, Survey and Manage-C	Vascular plant	23
Eriogonum hirtellum	Sensitive	Vascular plant	6
Erythronium hendersonii	Sensitive	Vascular plant	2
Gomphus clavatus	Survey and Manage-F	Fungi	1
Marsmius applanatipes	Survey and Manage-B	Fungi	1
Mycena tenax	Survey and Manage-B	Fungi	1
Otidea leporina	Survey and Manage-D	Fungi	2
Phaeocollybia californica	Survey and Manage-B	Fungi	1
Phaeocollybia fallax	Survey and Manage-D	Fungi	1
Phaeocollybia gregaria	Survey and Manage-B	Fungi	1
Phaeocollybia olivacea	Sensitive, Survey and Manage-E	Fungi	3
Ptilidium californicum	Survey and Manage-A	Bryophyte	4
Ramaria abietina	Survey and Manage-B	Fungi	1
Thermopsis robusta	Sensitive	Vascular plant	1
Tremiscus helvelloides	Survey and Manage-D	Fungi	2

Unique Botanical Areas of Concern

Lake Mountain Special Interest Area

This special interest area is composed of 100 acres and is the northern most known location of Foxtail pine. It is home to at least 6 different conifer species including: western white pine, foxtail pine, Shasta red fir, white fir, mountain hemlock, and Jeffrey pine. Such assemblages of high-elevation conifers are rare throughout California and are restricted to the Klamath-Siskiyou Mountains. Project design features have been incorporated into the *Westside Fire Recovery Environmental Impact Statement* in order to maintain foxtail pine snags within this Special Interest Area. The retention of foxtail pine snags is important in order to protect the unique features for which this Special Interest Area was designated.

Cultural Plant Collecting Area

The Cold Creek springs area within subpart B of the Project area is an important resource for *Adiantium aleuticum* which is frequently utilized by local Tribes for basket weaving and botanical remedies (Lloyd 1964). The maintenance and perpetuation of cultural botanical resource is required by Forest Standard and Guidelines (6-21). There are 6 units located in the

Cold Creek springs area that may affect the continued viability of this resource. Project design features have been incorporated into the *Westside Fire Recovery Environmental Impact Statement* in order to continue to ensure its preservation and continuation.

Non-native Invasive Species

Twelve non-native invasive species are present within the project area. Of these, 7 are considered to be high priority, 4 are considered to be moderate priority and 1 is considered to be low priority on the Forest. The current risk of introduction and/or spread of NNIS is high due to the numerous NNIS populations present in and adjacent to the project area, the high level of disturbance from the 2014 fires which created habitat conditions that are extremely vulnerable to NNIS invasion, and the probability that the substantial use of the project area for recreation, wood cutting, and hunting will vector NNIS propagules into these vulnerable areas. A list of NNIS species, there Forest priority, number of populations, and acres of infestations in the project area are displayed below in Table S-3.

Table S- 3: List of Non-native Invasive species known to be present in the Westside Fire Recovery project area.

Scientific Name	Forest Priority	Populations in Project area	Acres In Project area
Cardaria chalepensis	Moderate	4	2.5
Cardaria draba	Moderate	1	0.1
Centaurea maculosa	High	22	13.6
Centaurea pratensis	High	2	1.1
Centaurea solstitialis	Moderate	17	264.5
Centaurea squarrosa	High	5	0.9
Cirsium vulgare	Low	3	0.7
Cytisus scoparius	High	21	66.7
Euphorbia esula	High	55	28.6
Isatis tinctoria	Moderate	53	614.4
Lepidium latifolium	High	11	2.4
Tribulus terrestris	High	1	0.1

Environmental Consequences

Interactions between the project activities and the potential effects to botanical resources are discussed in detail in the Westside Fire Recovery project Botanical Resources and Non-native Invasive Species report and summarized here.

Alternative 1

Direct Effects and Indirect Effects

Threatened, Endangered, Proposed and Candidate Plant Species

There will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species because no populations are currently known within the Project area. Suitable habitat is present for *Fritillaria gentneri* within subpart C of the project area and will be surveyed for the presence of this species during appropriate times for identification. If populations are located, there would still be no direct or indirect effects because flag and avoid project design features will be incorporated that would protect newly discovered populations. Subsequently, there is no likelihood of jeopardizing the continued existence of TEPC species.

Sensitive Vascular Plants

There would be no direct effect to the three Sensitive botanical species located in the project area: *Eriogonum hirtellum*, *Erythronium hendersonii*, and *Thermopsis robusta*.

Indirect effects to *E. hirtellum* would be the adverse effects of increased competition from early seral species that were stimulated to germinate by the fire. Added competition in the short-term would cause a declining trend in population viability; however, the long-term trend in population viability would likely remain static as competition balances out.

Erythronium species have been reported to benefit from wildfire. Unfortunately, E. *hendersonii* populations are not within areas that burned during the 2014 fires and may be indirectly affected by not receiving the benefits fire provides this genus through prescribed burning treatments. The short-term trend in population viability would remain static; however, without a disturbance event, stable environmental conditions may cause a declining trend in population viability in the long-term.

Disturbance is necessary for the spread and continued vigor of *T. robusta* populations, unfortunately the known population received little disturbance during the 2014 fires. Indirect effects may occur from the further development of canopy cover and a stable environmental condition which would hinder seed germination and decrease suitable habitat in the short term. However, future natural disturbance, especially in areas of fuel accumulation, would allow for the creation of new habitat in the long-term. Subsequently, there would be a declining trend in population viability until the next disturbance event which could create conditions that would allow for an increasing trend in population viability.

Sensitive Bryophytes, Lichens, and Fungi

There would be no direct or indirect effects to Sensitive bryophyte, lichen or fungi species because none are known within the project area. Suitable habitat within none to moderately burned areas may be present. Indirect effects to suitable habitat for Sensitive bryophytes, lichens, and fungi are described below.

Heavy fuel loading from the accumulation of dead, burnt snags and debris from the 2014 fires is likely to have an indirect negative effect on potential habitat for Sensitive bryophyte, lichen, and fungal species by creating conditions conducive to high severity wildfire in the future.

Sedimentation of springs and headwater streams may have a negative indirect effect on the aquatic habitat for the sole Sensitive Lichen species causing a declining trend in potential population viability (see Hydrology report).

Sensitive ectomycorrhizal fungi rely on the presence of a live host trees for their continued existence and forest re-establishment in severely burned areas may be delayed due to the loss of cone-bearing trees thereby indirectly postponing Sensitive ectomycorrhizal fungal re-

colonization. This would cause a decline in potential population viability because the recovery time for suitable habitat would be hindered.

Survey and Manage Vascular Plants, Bryophytes, Lichens and Fungi

There would be no direct effects to Survey and Manage vascular plant, bryophyte, lichen and fungi species or habitat therefore the project would be in compliance with Survey and manage regulations.

Suitable habitat and known populations may be indirectly affected under alternative 1; however, these indirect effects will not affect compliance with Survey and Manage regulations. Downed woody debris would provide protected safe site for seed germination indirectly benefiting plant community composition. Standing burnt trees would provide perches for seed dispersing birds, but may also fall on populations damaging them and blocking germinating seeds and emerging seedlings. Re-forestation may be delayed in severely burned areas due to the loss of cone-bearing trees thereby indirectly postponing Survey and Manage mycorrhizal fungal recolonization. Accumulation of dead trees would generate high fuel loads creating conditions conducive to high severity wildfire which would cause a negative indirect effect to Survey and Manage species.

Non-native Invasive Species

There would be no direct effect to Non-native Invasive species from project activities.

Existing NNIS populations would continue to spread at their current or higher rates due to the disturbance from the 2014 fire and suppression efforts, the subsequent habitat vulnerability, and the numerous non-project dependent vectors that are present in or utilize the project area.

The risk of introduction and/or spread of NNIS under this alternative is high due to the numerous NNIS populations present in and adjacent to the project area, the high level of disturbance from the 2014 fires which created habitat conditions that are extremely vulnerable to NNIS invasion, and the probability that the substantial use of the project area for recreation, wood cutting, and hunting will vector NNIS propagules into these vulnerable areas.

Cumulative Effects

There are no cumulative effects for Threatened, Endangered, Proposed, or Candidate species, because there will be no direct or indirect effects.

All activities and factors listed in Appendix C could have additional effects to Sensitive, Survey and Manage, and Non-native invasive species populations in the project area when added to alternative 1. On-going and future foreseeable Forest projects have been and will be evaluated for effects to Sensitive, Survey and Manage and Non-native Invasive species. Project design features have been incorporated into these past projects to limit their effects on Sensitive, Survey and Manage and Non-native Invasive species populations. It is expected that because of these evaluations and the inclusion of project design features, cumulative effects from Forest projects will have a neutral effect on population viability trends for Sensitive species, on Forest compliance with Survey and Manage regulations, and on the risk of introducing and/or spreading NNIS.

Projects on private lands are not required to protect Sensitive botanical species, and subsequently actions on private lands may lead to a localized downward trend in population viability for these species. If that is the case, on-going and future foreseeable projects on private lands would have a declining cumulative effect on population viability trends for Sensitive species. However,

without knowing how many species and/or populations are present, how many may be effected, and how project activities will affect habitat conditions it is difficult to determine how potential effects from private actions would cumulatively influence population viability trends for Sensitive botanical species.

Forest compliance with Survey and Manage regulations requires pre-disturbance surveys for habitat-disturbing projects (Category A and C species only), and the management of known and high-priority sites for continued persistence. On-going and future foreseeable Forest projects would not cumulatively affect Survey and Manage botanical species and would comply with regulations if project design features structured to protect Survey and Manage populations and associated habitats are implemented. Additionally, on-going and future foreseeable projects on private land that affect Survey and Manage botanical species would have no effect on whether the Westside Fire Recovery project is in compliance with these regulations since they pertain only to Forest occurrences and lands. Therefore, the project would continue to comply with Survey and Manage regulations regardless of cumulative actions on Forest or private lands.

There are 8 grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations in the project area. Livestock mainly transport NNIS propagules on their fur or through ingestion. Many NNIS have barbed or prickly seeds that readily adhere to animal fur and may potentially be transported long-distance and/or fall off in areas that are currently weed-free. Since many NNIS seeds can pass through the stomach unaffected, ingested seeds may also introduce NNIS to new areas once they are expelled. The added cumulative effects of grazing to Alternative 1 would likely increase the risk of NNIS introduction and spread.

Projects on private lands are not required to mitigate for the spread and/or introduction of NNIS species which could also increase negative cumulative effects to NNIS populations and subsequently raise the risk rating.

The BAER team analyzed the project area and prescribed emergency treatments to help limit the introduction and spread of NNIS from the 2014 fires and suppression activities. Emergency treatments will take place in the first year following the fires (2015) and will include additional surveys for NNIS within the fire footprints and contingency areas as well subsequent hand removal of newly located infestations. These treatments will help control the introduction and spread of annual NNIS species, such as *Centaurea solstitialis.* Unfortunately, biennial and perennial species that have a rosette lifestage are difficult to locate in the first year because of their short stature, and may not be found during these surveys. The Forest Noxious Weed Detection and Treatment program would also continue to survey for and treat new populations that may be introduced or spread onto Forest lands through on-going and future foreseeable Forest and Private land projects; however, the cumulative risk for the introduction and spread of NNIS would remain high due to the particularly vulnerable condition of the habitat.

Alternative 2

Direct Effects and Indirect Effects

Threatened, Endangered, Proposed and Candidate Plant Species

There will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species because no populations are currently known within the Project area. Suitable habitat is

present for *Fritillaria gentneri* within subpart C of the project area and this area will be surveyed for the presence of *F. gentneri* during appropriate times for identification. If populations are located, there would still be no direct or indirect effects because flag and avoid project design features will be incorporated that would protect newly discovered populations. Subsequently, there is no likelihood of jeopardizing the continued existence of TEPC species.

Sensitive Vascular Plants

Eriogonum hirtellum:

Direct effects to *E. hirtellum* are unlikely because this species is restricted to bald serpentine outcrops and gravelly slope and ridges that typically have no overstory cover and very little understory vegetation. Due to the open characteristic of *E. hirtellum* habitat, equipment may be transported through the area which could potentially damage some individuals within the populations. *Eriogonum hirtellum* populations may be indirectly effected by increased competition from early seral species that were stimulated to germinate by the fire. In the short-term, these effects would have a declining effect on population viability as individuals are impacted. However, because effects would be minimal and to individuals and not the population as a whole, the long term trend in population viability would remain static.

Erythronium hendersonii:

Direct effects to *E. hendersonii* populations would be both beneficial and negative to population persistence. The removal of excess understory vegetation would provide a beneficial effect by opening up habitat and reducing light competition; and negative effects would occur to specific individuals and portions of the habitat where piles are burned. Project design features will mitigate effects to underground bulbs from pile burning; subsequently, this alternative would result in an increasing trend in population viability due to the beneficial impacts of fuels treatments on suitable habitat.

Thermopsis robusta:

Effects to this population would be both beneficial and negative. Use of the gravel pullout where this population occurs would provide a short term benefit by creating disturbance necessary for the creation of new suitable habitat and population expansion. However, vegetation recovery and encroachment would cause negative long-term effects on population viability. While there would be a short-term increasing trend in population viability due to use of the gravel pullout, overall there would be a declining trend in population viability until the next disturbance event that would again allow for an increasing trend in population viability.

Sensitive Bryophytes, Lichens, and Fungi

There would be no direct or indirect effects to Sensitive bryophyte, lichen or fungi species as a result of Alternative 2, because none are known within the project area. Suitable habitat within none to moderately burned areas may be present. Indirect effects to suitable habitat for Sensitive bryophytes, lichens, and fungi are described below.

Fuels treatments would provide an indirect, long-term benefit to suitable habitat by reducing excessive fuel loading and the potential for another high severity wildfire in the future which would cause an increasing trend in potential population viability through the maintenance and protection of suitable habitat.

Conifer planting associated with this alternative may indirectly benefit sensitive ectomycorrhizal fungi by increasing the speed at which severely burned areas are reforested. This would cause an increasing trend in potential population viability through the creation and restoration of suitable habitat.

Sedimentation of springs and headwater streams may have a negative indirect effect on the aquatic habitat for the sole Sensitive Lichen species. The risk of sedimentation would increase under this alternative in comparison to alternative 1, causing a more precipitous decline in potential population viability because suitable habitat would have a higher risk of degradation. However, legacy site restoration will reduce the risk of sedimentation in the Elk creek watershed resulting in a static trend in potential population viability in that specific watershed (see the Hydrology report).

Survey and Manage Plant Species

Cypripedium fasciculatum and Cypripedium montanum:

Eighteen *C. fasciculatum* and 16 *C. montanum* populations are present within activity units. These are both Category C species, and thus to be in compliance with Survey and Manage guidelines populations deemed high priority must be protected. High priority will be given to robust, healthy populations located in areas with intact suitable habitat present following the 2014 fires. Implementation of flag and avoid protection measures for high priority populations would result in very minimal direct effects to *C. fasciculatum* and *C. montanum* populations as well as compliance with required guidelines. This alternative is expected to provide a long-term benefit to *C. fasciculatum* and *C. montanum* populations and suitable habitat by reducing excessive fuel loading and the potential for a high severity wildfire.

Survey and Manage Bryophytes

Ptilidium californicum:

There are 2 populations of *P. californicum* located in in roadside hazard activity units. *Ptilidium californicum* is a Category A species, and thus to be in compliance with Survey and Manage guidelines all known sites must be protected. Implementation of flag and avoid protection measures would result in no direct effects to populations ensuring compliance with required guidelines.

Roadside treatments may indirectly effect *P. californicum* populations by creating small canopy openings adjacent to populations. This would be a short-term effect as larger canopy elements would be maintained and shading to the habitat would not be significantly reduced. The reduction in excessive fuels may indirectly benefit populations by reducing the risk of a future high severity wildfire.

Survey and Manage Fungi

Albatrellus flettii:

There is 1 *A. flettii* population located in an activity unit. *Albatrellus flettii* is a Category B species, and thus to be in compliance with Survey and Manage guidelines all known sites must be protected. Implementation of flag and avoid protection measures would result in no direct effects to this population ensuring compliance with required guidelines. Subsequently, there would be no likelihood of effecting this population. However, there is the likelihood that project

activities would beneficially affect suitable habitat by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event that would kill host trees and moisture requirements necessary for survival.

Otidea leporina:

There is 1. *O. leporina* populations located in an activity unit. *Otidea leporina* is a Category D species, and thus to be in compliance with Survey and Manage guidelines populations deemed high priority must be protected. Little is known about this species making it difficult to designate whether it is a high-priority population. If appropriate habitat components are present to support mycorrhizal and saprophytic fungi this population will be designated high-priority. Implementation of flag and avoid protection measures will result in no direct effects to this population as well as compliance with required guidelines.

Phaeocollybia californica and Phaeocollybia olivacea:

There is 1 population of *P. californica* and 2 populations of *P. olivacea* located in activity units. *Phaeocollybia californica* is a Category B species and *P. olivacea* is a Category E species which both require the protection of all known sites in order to be in compliance with Survey and Manage guidelines. Implementation of flag and avoid protection measures would result in no direct effects to these populations ensuring compliance with required guidelines. Project activities would beneficially affect suitable habitat by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event that would kill host trees and moisture requirements necessary for survival.

Tremiscus helvelloides:

There is 1 population of *T. helvelloides* located in an activity unit. *Tremiscus helvelloides* is a Category D species and thus to be in compliance with Survey and Manage guidelines high-priority populations must be protected. This population will be considered high priority if the habitat still provides adequate shade, moisture, and substrate necessary to support jelly fungi. Implementation of flag and avoid protection measures will result in no direct effects to this population as well as compliance with required guidelines. Prescribed burn treatments would have a beneficial indirect effect on these populations by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event.

Non-native Invasive Species

The project area is already highly susceptible to NNIS infestation regardless of project activities due to the numerous NNIS infestations already present, the vulnerability of the project area from the 2014 fires, and the high recreational use of the area. Project activities are not expected to increase invasion potential through the removal of canopy cover or duff layers because these elements were already lost during the 2014 fires.

In this alternative, the five risk factors combined have a **high** potential for NNIS introduction and spread within the project area when compared to alternative 1, due to the higher level of ground disturbing activities and increased vectors. Ground disturbance that includes the movement of soils contaminated with NNIS propagules, such as road and landing construction, grading, and treatment of watershed legacy sites, would directly contribute to the spread of these infestations. With extensive infestations occurring along roadways, dispersal distance may be increased through transport on recreational or project related vehicles and equipment. Helicopter logging in

areas infested with NNIS would increase the rate of spread because down drafts from rotor blades could displace weed seeds and disperse them over large distances. Water-tenders could also spread NNIS propagules through waterways when filling their tanks, allowing new infestations to establish downstream.

Project design features and mitigation measures would minimize these effects; however the risk would remain high due to the pre-existing condition. Continuation of the existing Forest weed monitoring and treatment would detect any new high-priority weed sites that may become established within the project area. Quickly treating these sites will limit new NNIS establishment.

Cumulative Effects

There are no cumulative effects for Threatened, Endangered, Proposed, or Candidate species, because there will be no direct or indirect effects.

All activities and factors listed in appendix C of the *Westside Fire Recovery project Environmental Impact Statement* could have additional effects to Sensitive, Survey and Manage, and Non-native invasive species populations in the project area when added to alternative 2. On-going and future foreseeable Forest projects have been and will be evaluated for effects to Sensitive, Survey and Manage and Non-native Invasive species. Project design features have been or will be incorporated into ongoing and future foreseeable Forest projects to limit their effects on Sensitive, Survey and Manage and Non-native Invasive species populations.

Sensitive species viability and persistence may be both beneficially and negatively affected by cumulative Forest projects. Project design features have been or will be incorporated into all on-going and future foreseeable Forest projects to limit negative effects on population viability trends. Consequently, the cumulative effect of Forest projects on Sensitive species would be expected to cause a short-term declining trend in population viability as individuals are lost, but would create a long-term increasing trend in population viability from the beneficial impacts of management activities on suitable habitat (i.e. fuel treatments, conifer planting, habitat creation, etc.).

Projects on private lands are not required to protect Sensitive botanical species, and subsequently actions on private lands may lead to a localized downward trend in population viability for these species. If that is the case, on-going and future foreseeable projects on private lands would have a declining cumulative effect on population viability trends for Sensitive species. However, without knowing how many species and/or populations are present, how many may be effected, and how project activities will affect habitat conditions it is difficult to determine how potential effects from private actions would cumulatively influence population viability trends for Sensitive botanical species.

Forest compliance with Survey and Manage regulations requires pre-disturbance surveys for habitat-disturbing projects (Category A and C species only), and the management of known and high-priority sites for continued persistence. On-going and future foreseeable Forest projects would not cumulatively affect Survey and Manage botanical species and would comply with regulations if project design features structured to protect Survey and Manage populations and associated habitats are implemented. Additionally, on-going and future foreseeable projects on private land that affect Survey and Manage botanical species would have no effect on whether the Westside Fire Recovery project is in compliance with these regulations since they pertain

only to Forest occurrences and lands. Therefore, the project would continue to comply with Survey and Manage regulations regardless of cumulative actions on Forest or private lands.

The five risk factors combined have a high potential for NNIS introduction and spread within the project area for Alternative 2, due to the high level of ground disturbing activities and increased vectors. Project design features and mitigation measures would minimize these effects; however the risk would remain high due to the pre-existing condition. On-going and future foreseeable projects would also implement mitigation measures aimed at reducing NNIS introduction and spread. Unfortunately, project design features cannot eliminate risk and it is expected that new NNIS infestations may still become established despite these mitigation measures. Consequently, on-going and future foreseeable Forest projects have the potential to elevate the cumulative risk of NNIS introduction and spread, resulting in a continued risk rating of high.

There are 8 grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations in the project area. Livestock mainly transport NNIS propagules on their fur or through ingestion. Many NNIS have barbed or prickly seeds that readily adhere to animal fur and may potentially be transported long-distance and/or fall off in areas that are currently weed-free. Since many NNIS seeds can pass through the stomach unaffected, ingested seeds may also introduce NNIS to new areas once they are expelled. The added cumulative effects of grazing to Alternative 2 would likely increase the risk of NNIS introduction and spread. Projects on private lands are not required to mitigate for the spread and/or introduction of NNIS species which could also increase negative cumulative effects to NNIS populations and subsequently raise the risk rating.

The BAER team analyzed the project area and prescribed emergency treatments to help limit the introduction and spread of NNIS from the 2014 fires and suppression activities. Emergency treatments will take place in the first year following the fires (2015) and will include additional surveys for NNIS within the fire footprints and contingency areas as well subsequent hand removal of newly located infestations. These treatments will help control the introduction and spread of annual NNIS species, such as *Centaurea solstitialis.* Unfortunately, biennial and perennial species that have a rosette lifestage are difficult to locate in the first year because of their short stature, and may not be found during these surveys. The Forest Noxious Weed Detection and Treatment program would also continue to survey for and treat new populations that may be introduced or spread onto Forest lands through on-going and future foreseeable Forest and Private land projects; however, the cumulative risk for the introduction and spread of NNIS would remain high due to the particularly vulnerable condition of the habitat.

Alternative 3 and 4

Direct, Indirect, and Cumulative Effects

Threatened, Endangered, Proposed and Candidate Plant Species

These alternatives will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

These alternatives will have the same direct, indirect, and cumulative effects to Sensitive botanical species as Alternative 2 and the same project Design Features would be incorporated to

mitigate those effects. Additionally, the added retention of snag clumps and coarse woody debris under this Alternative would indirectly benefit habitat for Sensitive bryophytes and fungi by mitigating effects to microclimate and providing substrate.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

These alternatives will have the same direct, indirect, and cumulative effects to Survey and Manage species as Alternative 2 and will incorporate the same project Design Features to mitigate those affects. Additionally, the added retention of snag clumps and coarse woody debris under this Alternative would indirectly benefit habitat for Survey and Manage bryophytes and fungi by mitigating effects to microclimate and providing substrate.

Non-native Invasive Species

Direct, indirect, and cumulative effects from these alternatives to the spread and introduction of NNIS infestations would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those affects.

Alternative 5

Direct Effects and Indirect Effects

Threatened, Endangered, Proposed and Candidate Plant Species

These alternatives will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

This alternative will have the same direct, indirect, and cumulative affects to Sensitive botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those affects.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

This alternative will have the same direct, indirect, and cumulative affects to Survey and Manage botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those affects.

Non-native Invasive Species

Direct, indirect, and cumulative effects from this alternative to the spread and introduction of NNIS infestations would be slightly less than for Alternative 2, because of the reduction in acres treated, resulting in less disturbed ground and chance of introduction of new species. The decrease in risk is very minimal and not enough to lower the risk rating from **high.** The same Project Design Features would be incorporated to mitigate effects.

Comparison of Effects

Table S- 4: Comparison of effects to Species of Concern and NNIS by Alternatives.

Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
TEPC	No direct, indirect or cumulative effects	No direct, indirect or cumulative effects	Same as Alt 2	Same as Alt 2	Same as Alt 2
Sensitive	No direct effects Indirect effects from competition, lack of disturbance, delayed reforestation, sedimentation of aquatic habitat, and increased risk of fire	Direct effects to individuals may occur, but are not likely to result in a trend toward federal listing or a loss in population viability	Same as Alt 2. Additionally, the added retention of snag clumps and coarse woody debris would mitigate microclimate and provide substrates for Sensitive species	Same as Alt 2. Limiting treatments in Riparian Reserves would protect the majority of habitat for Sensitive bryophytes and fungi, reduced road construction would limit risk of stream sedimentation.	Same as Alt 2
Survey and Manage	No direct effects Indirect long-term effects from competition, lack of disturbance, delayed reforestation, and increased risk of fire	No direct effects to Category A, B and E species because all known sites would be protected. Minimal direct effects to Category C and D species because high priority sites would be protected with the implementation of project design features.	Same as Alt 2. Additionally, the added retention of snag clumps and coarse woody debris would mitigate microclimate and provided substrates for Survey and Manage species	Same as Alt 2. Limiting treatments in Riparian Reserves would protect the majority of habitat for Survey and Manage bryophytes and fungi	Same as Alt 2
NNIS	No direct effects Indirect long-term effects from habitat disturbance and non-project dependent vectors	High risk of spread due to numerous existing NNIS populations, habitat vulnerability, non-project and project dependent vectors, and ground disturbing activities.	Same as Alt 2	Same as Alt 2	Risk of NNIS spread would be slightly less than for the Alternative 2. The decrease in risk is very minimal and not enough to lower the risk rating from high.

Determination of Effects

Alternative 1

Under alternative 1, it is my determination that the Westside Fire Recovery project **will not affect** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 2

Under alternative 2, it is my determination that the Westside Fire Recovery project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 3

Under alternative 3, it is my determination that the Westside Fire Recovery project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 4

Under alternative 4, it is my determination that the Westside Fire Recovery project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 5

Under alternative 5, it is my determination that the Westside Fire Recovery project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Compliance with Law, Regulation, Policy, and the Forest Plan

Threatened, Endangered, and Sensitive Botanical Species:

The Westside Fire Recovery project complies with section 7 of the Endangered Species Act of 1973, as amended, in the preparation of a Biological Assessment and Biological Evaluation and the disclosure of effects; Forest Service Policy (FSM 2670), and Klamath National Forest Plan Standards and Guidelines for Sensitive plant species have been met by managing populations for viability where possible.

Survey and Manage Plants:

The Westside Fire Recovery project complies with the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines by preparing an assessment and documenting effects (USDA 2014a).

Non-native Invasive Species:

The Westside Fire Recovery project complies with Forest Service Manual 2900 and Forest Plan Standards and Guidelines for Non-native invasive species by preparing the Noxious Weed Risk Assessment, and providing Project Design Features to minimize effects.

Biological Assessment of Threatened, Endangered, Proposed, and Candidate Botanical Species

Introduction

The purpose of this Biological Assessment is to evaluate the Westside Fire Recovery Project in sufficient detail to determine its effects on Threatened, Endangered, or Proposed plant species. This Biological Assessment (BA) is prepared in accordance with the legal requirements set forth under Section 7 of the Endangered Species Act [19 U.S.C. 1536 (c)], and follows the standards established in the Forest Service Manual direction (FSM 2672.42).

Current Policy and Management Direction

Section 7 of the Endangered Species Act of 1973, as amended, and Forest Service Policy (FSM 2670) direct Federal agencies to ensure that any action authorized, funded, or permitted by such agencies is not likely to jeopardize the continued existence of species listed, or proposed to be listed as Endangered or Threatened by the U.S. Fish and Wildlife Service (USDA 2005).

Analysis Indicators

The effects of the alternatives on Threatened, Endangered, Proposed or Candidates plant (TEPC) species are compared using the following indicators:

- Likelihood of jeopardizing the continued existence of Threatened, Endangered, Proposed, or Candidate species populations.

Methodology

The likelihood that the continued existence of Threatened, Endangered, Proposed, or Candidate plant populations will be jeopardized by this project will be evaluated by determining the number of existing populations within the project boundary and the number and degree to which those populations will be negatively affected by the proposed action.

To determine which species are known to occur or may potentially occur within the project boundaries the following resources were consulted.

- U.S. Fish and Wildlife Service list of Threatened, Endangered, Proposed or Candidate (TEPC) species which might occur on the Klamath National Forest (Document # 287031142-10176) (USFWS 2014) (table 1);
- California Natural Diversity Database species occurrence list for all 7.5 quadrangles that intersect the project area;
- Klamath National Forest species occurrence records (Natural Resource Inventory System Database), survey records, and site visit records from within the project boundary;
- Project Preliminary Botanical Review (USDA 2014a);
- Rapid Assessment of Vegetation Condition after Wildfire (RAVG); and

Table 1 USFWS list of TEPC species that may occur on the Forest as of October 24, 2014

Scientific Name	*Common Name*	*Status*
Arabis macdonaldiana	McDonald's rock-cress	Endangered
Astragalus applegatei	Applegate's milk-vetch	Endangered
Calochortus persistens	Siskiyou mariposa lily	Candidate
Fritillaria gentneri	Gentner's fritillary	Endangered
Phlox hirsute	Yreka phlox	Endangered

Preliminary Botanical Review

An office preliminary field review was conducted to determine if the Westside Project area is within the range of any listed Threatened, Endangered, Proposed, and/or Candidate species and if suitable habitat is present within the proposed project area (USDA 2014a).

The U.S. Fish and Wildlife Service list of TEPC species that may occur on the Klamath National Forest (Forest) (USFWS 2014) was reviewed in conjunction with occurrence and survey records to determine if any TEPC populations are present in the project area.

Aerial photographs, RAVG data, treatment unit selection criteria, site visits, and species distribution information were used to determine if suitable habitat for TEPC species is present within treatment units.

During the Preliminary Botanical Review, the proposed project area was determined to contain no documented occurrences of TEPC species. Suitable habitat for *Fritillaria gentneri* was determined to be present in subpart A of the project area; subparts B and C are not within range and do not contain suitable habitat for TEPC species. Field surveys of identified suitable habitat for previously undocumented *F. gentneri* populations were triggered during the Preliminary Botanical Review. Intuitive controlled surveys will be conducted during appropriate times for identification (Spring 2015) throughout numerous sections within Township 47 North, Range 8 and 9 West, and Township 46 North Range 8 and 9 West. Survey areas were determined by comparing potentially suitable habitat with RAVG data and treatment unit location and will be further refined in the field as post-fire habitat recovery is assessed.

If populations of *F. genterni* are located during field surveys, project design features intended to protect populations from being jeopardized, as detailed in Chapter 2 of the *Westside fire Recovery Environmental Impact Statement*, will be implemented.

Spatial and Temporal Bounding of the Analysis Area

The project area will serve as the geographical bounds for short term, long term, and cumulative effects analysis of Threatened, Endangered, Proposed, and Candidate species. All potential disturbance and effects to TEPC species from this project will occur within this boundary. Additionally, effects from other present and foreseeable activities will interact with effects of the proposed project only within the project area.

The temporal bounding for Threatened, Endangered, Proposed, and Candidate species will be less than five years for the short-term effects and greater than five years for long term effects. Temporal boundings were chosen to account for species recovery and seed dormancy requirements.

Affected Environment

The Westside Fire Recovery project area is composed of the Beaver Fire (Subpart A), Happy Camp Complex (Subpart B), and Whites Fire (July Complex) (Subpart C) which all occurred on the Klamath National Forest during the summer of 2014. These fires resulted in a mosaic pattern of vegetation from the variety of burn intensities that occurred across the Project area.

Based on site visits and RAVG data the following assumptions are made:

- areas characterized by high severity burns experienced 75% or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris;
- areas characterized by moderate severity burns experienced 50-75% vegetation mortality, substantial reduction in canopy and understory cover, as well as duff layers and large woody debris; and
- areas characterized by no or low severity burns experienced 0-50% vegetation mortality and a reduction in fuel loading.

Modification of the forest structure and composition as a result of fire intensity, duration, and suppression efforts has had a profound effect on microclimate characteristics such as air temperature, relative humidity, and soil temperature and moisture, which could, in turn, result in adverse impacts to native plant communities. In moderate and high burn severity areas, microclimate characteristics commonly associated with habitat for species of concern have likely been lost, however these areas also provide the opportunity for the unique and less frequent elements of the California flora known as fire followers to come to life and establish a seed bank for the next event. Areas that experienced no or low burn severity may provide refugia for native species, and act as a seed source from which dispersal into the more intensely burned areas can occur.

Affected Plant Communities

Fritillaria gentneri is primarily known from small, widely scattered populations in Jackson and Josephine Counties in Southern Oregon, although 1 population has been documented on private property and 1 on State lands in Siskiyou County, California in close proximity to the Oregon border. It typically occurs at elevations below 5000 feet in grasslands and chaparral habitats within or bordering open oak woodlands (USFWS 2003). Oak species are fire resilient and re-sprout quickly following wildfire suggesting that suitable habitat may quickly be re-established in the project area. Additionally, species in the genus *Fritillaria* have deep-seated bulbs which are often not affected by fire, and can respond favorably to the removal of competition from other plant species and nutrient flushes from ash. Dispersal of *F. gentneri* into previously un-occupied sites may be a limiting factor because its primary means of population establishment and growth is through the vegetative production of underground bulblets (USFWS 2003). Sexual reproduction of F. gentneri tends to be minimal and occur as sporadic or episodic events. *F. gentneri* is hypothesized to be a hybrid of *F. recurva* and *F. affinis* and studies suggest that seed production is limited by high levels of sterility and low pollen germination rates which are common among species recently derived from hybridization (USFWS 2003).

Environmental Consequences

No populations of federally listed Threatened, Endangered, Proposed, or Candidate plant species have been recorded in botanical records or identified in previous surveys within the Westside Fire Recovery Project area. No species are expected to occur in subparts B and C due to lack of habitat. Since mitigations for the protection of *F. gentneri* will be implemented in the event of a population discovery in subpart A, there will be no direct, indirect or cumulative effects to *F. gentneri* or its habitat with no action, or any of the proposed action alternatives. Subsequently, there is no likelihood of jeopardizing the continued existence of any TEPC species.

Consultation to Date

A list of all Federally listed Threatened, Endangered, Proposed, or Candidate species which might occur on the Klamath National Forest was acquired from the U.S. Fish and Wildlife Service on October 24, 2014 (Document # 287031142-10176) (USFWS 2014). No consultation was necessary.

Determination of Effects

It is my determination that the Westside Fire Recovery Project will not affect *Arabis macdonaldiana, Astragalus applegatei, Calochortus persistens, Fritillaria gentneri*, or *Phlox hirsuta.*

Compliance with law, regulation, policy, and the Forest Plan

The Westside Fire Recovery project complies with section 7 of the Endangered Species Act of 1973, as amended, and Forest Service Policy (FSM 2670) in the preparation of a Biological Assessment and the disclosure that the project will have no effects to TEPC species.

Biological Evaluation for Sensitive Species

Introduction

The purpose of this Biological Evaluation is to evaluate the Westside Fire Recovery Project in sufficient detail to determine its effects on Sensitive plant species. This Biological Evaluation (BE) is prepared in accordance with the standards and guidelines established by Forest Service Manual direction (FSM 2672.42).

The US Forest Service Region 5 Regional Forester has listed plants for which there is a concern for species viability as Sensitive. Sensitive plants are those species which may occur in few to large numbers in a small localized area, or which may occur in a wide geographical area but in few numbers in restricted specialized habitats. Forty seven Sensitive plants species are known, or thought likely to occur on the Klamath National Forest (USDA 2013a). This BE addresses this list.

Current Policy and Management Direction

Forest Service Policy (FSM 2670) directs Federal agencies to ensure that any action authorized, funded, or permitted by such agencies is not likely to jeopardize the continued existence of species listed as Sensitive by the Regional Forester, or to cause a trend to federal listing for species listed as Sensitive (USDA 2005). Forest-wide Standards and Guidelines have been developed that direct the management of Sensitive plant species to ensure maintenance of reproducing, self-sustaining populations and to prevent the need for the species to become listed as Threatened or Endangered (USDA 1995). In the event that surveys cannot be conducted, Forest-wide Standards and Guidelines state that the project area should be assessed for the presence and condition of Sensitive species habitat (USDA 1995).

Analysis Indicators

The effects of the proposed actions on Sensitive species are compared using the following indicator:

- Trend of Sensitive species population viability measured as increasing, declining, or static.

Methodology

Impacts from the Westside Fire Recovery project on the trend in population viability for Sensitive botanical species was evaluated by determining the number of extant populations on the Forest, the number of populations that will be impacted by the Project activities, and how that impact will affect the continued viability of the population. Trend in population viability will be measured as declining, increasing or static.

Assumptions:

- Analysis is based on spatial population records only, field visits to known sites were not conducted prior to analysis;

- Sensitive populations located in areas burned at moderate-high intensity, as indicated by RAVG data and salvage and site preparation and planting unit selection criteria, are assumed to be extirpated; and
- Habitat located in areas burned at moderate-high intensity, as indicated by RAVG data and salvage unit criteria, are no longer expected to support viable Sensitive species populations (except *Thermopsis robusta* which prospers following disturbance).
- Survey & Manage guidelines will be used to analyze effects on botanical species that are regulated by both Sensitive and Survey & Manage guidelines because they provide for a more protective management strategy.

To determine which species are known to occur or may potentially occur within the project boundaries the following resources were consulted:

- Region 5 list of Sensitive species that may occur on the Klamath National Forest (USDA 2013a);
- California Natural Diversity Database species occurrence list for all 7.5 quadrangles that intersect the project area;
- Klamath National Forest species occurrence records (Natural Resource Inventory System Database), survey records, and site visit records from within the project area.
- Project Preliminary Field Review (USDA 2014a);
- Rapid Assessment of Vegetation Condition after Wildfire (RAVG) data; and

Preliminary Botanical Review

An office preliminary field review was conducted to determine if the Westside Project area contains any Sensitive species populations and if suitable habitat is present within the proposed project area (USDA 2014a). During this review, the Region 5 list of Sensitive species that may occur on the Forest (USDA 2013a) was reviewed in conjunction with occurrence and survey records to determine if any Sensitive species populations are present in the project area. Aerial photographs, RAVG data, treatment unit selection criteria, site visits, and species distribution information were used to determine if suitable habitat for Sensitive species is present within treatment units.

During the Preliminary Botanical Review, the proposed project area was determined to contain 5 Sensitive plant species and 1 Sensitive fungal species. However, three of these species, *Cypripedium fasciculatum*, *Cypripedium montanum*, and *Phaeocollybia olivacea*, are protected under both Sensitive species and Survey & Manage guidelines. For the purpose of this Project, these species will be analyzed under Survey & Manage guidelines because they are more restrictive of management activities and provide more protection for species of concern. These species will not be discussed further in this Biological Evaluation; see the Survey & Manage section below for further analysis of project effects on these species. Sensitive species that may be affected by this Project are displayed in table 2 and a detailed table is available in Appendix A.

Due to the expedited Project time frame, need to conduct surveys during appropriate times for identification (typically when blooming), and the obligation to assess the condition of known populations it was unfeasible to conduct unit surveys in search of un-known populations of Sensitive botanical species. Surveys to evaluate the status of known populations within project activity areas will be conducted in the spring and summer of 2015 during appropriate times for

identification. If populations are located within treatment areas and the habitat in its current state is likely to be negatively impacted by the proposed action, a project design feature intended to protect Sensitive species populations from a declining trend in viability will be implemented.

Due to the ephemeral appearance of fruiting structures, the hazardous condition of the Project area, and the expedited time frame of the Westside Fire Recovery project, surveys for Sensitive fungal species were not practical. Sensitive fungi habitat in the Project area will be protected through the incorporation of Project design features associated with Forest Plan Standards and Guidelines for the Aquatic Conservation Strategy and woody material retention associated with wildlife habitat and soil stability and productivity.

Spatial and Temporal Context

The project area will serve as the geographical bounds for effects analysis of Sensitive species. All potential disturbance and effects to Sensitive species from this project will occur within this boundary. Additionally, effects from other present and foreseeable activities will interact with effects of the proposed project only within the project area.

Temporal bounding for Sensitive species will be less than five years for the short-term effects and greater than five years for long term effects. Temporal boundings were chosen to account for species recovery and seed dormancy requirements.

Affected Environment

The Westside Fire Recovery project area is composed of the Beaver Fire (Subpart A), Happy Camp Complex (Subpart B), and Whites Fire (July Complex) (Subpart C) which all occurred on the Klamath National Forest during the summer of 2014. These fires resulted in a mosaic pattern of vegetation from the variety of burn intensities that occurred across the Project area.

Based on site visits, and RAVG data the following assumptions are made:

- areas characterized by high severity burns experienced 75% or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris;
- areas characterized by moderate severity burns experienced 50-75% vegetation mortality, substantial reduction in canopy and understory cover, as well as duff layers and large woody debris; and
- areas characterized by no or low severity burns experienced 0-50% vegetation mortality and a reduction in fuel loading.

Modification of the forest structure and composition as a result of fire intensity, duration, and suppression efforts has had a profound effect on microclimate characteristics such as air temperature, relative humidity, and soil temperature and moisture, which could, in turn, result in adverse impacts to native plant communities. In moderate and high burn severity areas, microclimate characteristics commonly associated with habitat for species of concern have likely been lost, however these areas also provide the opportunity for the unique and less frequent elements of the California flora known as fire followers to come to life and establish a seed bank for the next event. These areas are also more vulnerable to invasion by noxious weeds due to the lack of ground cover that often acts as a barrier to establishment. Areas that experienced no or

low burn severity may provide refugia for native species, and act as a seed source from which dispersal into the more intensely burned areas can occur.

Table 2: Klamath National Forest Sensitive species populations that may be affected by the Westside Fire Recovery Project.

Scientific Name	Status	Total KNF, pre-2014 fires	Extant in project area	In Subpart A (Beaver)	In Subpart B (Happy Camp)	In Subpart C (Whites)
Eriogonum hirtellum	Sensitive	42	6	0	6	0
Erythronium hendersonii	Sensitive	2	2	0	2	0
Thermopsis robusta	Sensitive	36	1	0	1	0

Species Accounts

Vascular Plants

Klamath Mountain Buckwheat - *Eriogonum hirtellum*

This species is a rare endemic found only in northwest California in Del Norte and Siskiyou counties. On the Klamath National Forest, *Eriogonum hirtellum* is found from 2,000-7,000 feet on open serpentine barrens and rock outcrops often associated with yellow pine and red fir forest types. It prefers open areas with shallow, rocky/gravelly soils and little tree, shrub, or herbaceous cover. This species rarely occurs where there is an accumulation of organic material on the soil surface which may have protected populations from high fire severity during the 2014 fires.

There are currently 42 populations of *E. hirtellum* located on the Klamath National Forest. Of these, 6 populations are located within the Westside Fire Recovery project area (table 2), in the vicinity of Tom Martin peak.

Henderson's Fawn Lily - *Erythronium hendersonii*

This species was added to the Region 5 Sensitive plant list in July of 2013 due to its rarity State wide. It is known only from Josephine and Jackson Counties in southern Oregon, and Siskiyou County in northern California, with an undocumented historical occurrence in Del Norte County, California. On the Klamath National Forest, *E. hendersonii* can be found from 900-5,200 feet in a variety of habitats including dry woodlands and oak scrub near the valley floor. It prefers to grow in areas with forest openings or filtered sunlight.

There are currently 2 populations of *E. hendersonii* located on the Klamath National Forest and both of these populations are located within the Westside Fire Recovery project area (table 2) in the vicinity of Hamburg and O'Neill Creek campground along highway 96. These populations were last surveyed in 2012 and were found to be healthy and thriving with thousands of individuals present.

Robust False Lupine - *Thermopsis robusta*

Robust false lupine is endemic to northwestern California and is documented from Del Norte, Humboldt, and Siskiyou Counties. On the Klamath National Forest, suitable habitat for this

species occurs in upland broadleaved and North Coast coniferous forest types (CNPS 2009). Within these forest types, this species occurs in openings (both natural and man-made) such as roadsides, ridge tops, and other natural openings. In general, robust false lupine appears to thrive in areas with little canopy cover and/or recent disturbance from natural causes, logging, road grading, and/or clearing.

There are currently 36 populations of *T. robusta* located on the Klamath National Forest. Of these, 1 population is located within the Westside Fire Recovery project area (table 2) in the vicinity of woods bar. This population was last surveyed in 2004 and 11 individual plants were located in a disturbed gravel road turnout.

Bryophytes

No Sensitive bryophyte species are present within the Westside Fire Recovery project area. Shade and moisture requirements necessary for most Sensitive bryophyte species were lost throughout much of the project area during the 2014 fires. Suitable habitat for Sensitive bryophyte species may be present within areas characterized by no or low burn severity.

Lichens

No existing populations of the sole Sensitive lichen, *Peltigera gowardii*, are located within the Westside Fire Recovery project area. This Sensitive lichen generally occurs in the headwaters of shallow streams (typically less than 8 inches deep) that are fed by cold, clear water and where peak flows are not of the intensity that would lead to scouring. Suitable habitat may be present in cold creek spring and other un-named springs in Subparts B and C.

Fungi

There is very little specific information available about Sensitive fungi species. The majority of the information has come from the *Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan* (Castellano et al. 2003), *Handbook to Strategy 1 Fungal Species in the Northwest Forest Plan* (Castellano et al. 1999), and *Management Recommendations for Survey & Manage Fungi* (Castellano et al. 1997). Additional information on species habitat and range has been gathered from scientific literature, past project surveys, strategic surveys, and purposive surveys that have been completed within Oregon, Washington, and California (including the Klamath NF) since the handbooks of 1999 and 2003 were published.

Ectomycorrhizal fungi species: *Boletus pulcherrimus*

Ectomycorrhizal fungi are dependent upon the habitat elements that support the species and their vascular plant hosts throughout their life cycles. These fungi are obligate symbiotic organisms and cannot survive without their host species. The vulnerability of ectomycorrhizal fungi is linked to that of the symbiotic partner and subsequently anything that threatens its forest habitat will also threaten the continued survival of ectomycorrhizal fungal populations. *Boletus pulcherrimus* is known to primarily associate with *Pseudotsuga menziesii* and *Abies sp* .

Currently, 1 population of *B. pulcherrimus* has been identified on the Klamath National Forest; however, it is not located within the Westside Fire Recovery project area.

Habitat components necessary for ectomycorrhizal fungi, as described above, may have been destroyed during the 2014 fire season. Without obligate host trees, ectomycorrhizal fungi cannot survive. Upon the death of their host tree, ectomycorrhizal fungi may produce a flush of sporpcarps in a last attempt at reproduction, however; without the continued supply of nutrients from its host the mycelial body of the fungus will not persist.

Saprophytic fungi species: *Cudonia monticola, Dendrocollybia racemosa, and Tricholomopsis fulvescens*

Saprophytic species obtain nutrients through the decomposition of dead organic matter. These fungi species are dependent upon adequate amounts of detritus such as leaves, needles, limbs, large woody debris, or even dead animal carcasses to provide a substrate and supply a continuous source of nutrients. These species are not dependent upon specific vascular plant hosts, but may require adequate canopy coverage to retain moisture levels sufficient to support them.

No known populations of Sensitive saprophytic fungi are present within the Westside Fire Recovery Project area.

Environmental Consequences

Ground disturbance and alterations of the light, moisture, and nutrient regimes within forest and associated plant environments can affect sensitive plants and their habitats. These effects can take two forms; either the actual destruction of individuals in a population, (direct effect) or the adverse modification of suitable habitat considered critical to maintenance of viable populations, and future colonization of the site by a species (indirect effect).

Alternative 1

Under the Alternative 1, no treatments are proposed. Alternative 1 provides reviewers a baseline to compare the magnitude of environmental effects from doing nothing with the action alternatives.

Direct and Indirect Effects

Alternative 1 would compound the damage done to some occurrences by not preventing the downed and falling trees from interfering with the post-fire recovery of the Sensitive Plant, Bryophyte, and/or Fungi communities. A future wildfire burning through these areas of accumulated down trees and material could burn at increased duration and intensities with such a high burn severity that occurrences could be lost throughout large portions of the project area.

Vascular Plants

Eriogonum hirtellum

Of the 42 *E. hirtellum* populations on the Forest, 6 are located in the Project area all of which are presumed to be alive following the 2014 fires because they inhabit open, rocky serpentine outcrops that typically have little accumulation of woody debris. Under Alternative 1 there would be no direct effect to *E. hirtellum* populations within the Westside Fire Recovery project area from management activities.

Indirect effects to *E. hirtellum* populations that could occur under Alternative 1 would be due to increased competition from early seral species that were stimulated to germinate by the fire. The

habitat that *E. hirtellum* occupies is limited in water and soil resources. Any additional competition in this environment could be disadvantageous to the persistence of the population. Added competition in the short-term would cause a declining trend in population viability; however, the long-term trend in population viability would likely remain static as competition balances out.

Erythronium hendersonii

There are currently only 2 populations of *E. hendersonii* located on the Forest and both are within the project area and known to be alive following the 2014 fires because the area they occupy had little to no burn severity. Under Alternative 1 there would be no direct effect to *E. hendersonii* populations within the Westside Fire Recovery project area from management activities.

The genus *Erythronium* has been reported to show a significant increase in size and number of plants following wildfire (Clennett 2014). Unfortunately, the known populations of *E. hendersonii* are in an area modelled as being un-burned following the 2014 fires. Under Alternative 1, prescribed burning treatments would not occur and populations may be indirectly effected by not receiving the benefits fire provides this genus. The short-term trend in population viability would remain static; however, without a disturbance event, stable environmental conditions may cause a declining trend in population viability in the long-term.

Thermopsis robusta

Of the 36 *T. robusta* populations on the Forest, 1 is located within the Project area and it is believed to be alive following the 2014 fires. Under Alternative 1, there would be no direct effect to *T. robusta* populations within the Westside Fire Recovery project area from management activities.

Thermopsis robusta, like many species in the pea family, is adapted to disturbance and open habitats. The known population is in an area modelled as having un-burned to low vegetation burn severity and therefore received little disturbance during the 2014 fires. Disturbance is necessary for seed germination and to create new suitable habitat for this species. The development of canopy cover and a stable environmental condition are likely to have an indirect negative impact on the long-term viability of this population and encroachment is a continual concern. Alternative 1 would allow for further development of canopy cover and an increase in fuel loads which may decrease population viability in the short term, however; future natural disturbance (such as wildfires) in areas of fuel build-up would allow for the continued creation of new habitat. Subsequently, there would be a declining trend in population viability until the next disturbance event which could create conditions that would allow for an increasing trend in population viability.

Bryophytes, Lichens, and Fungi

There would be no direct or indirect effect to Sensitive Bryophytes, Lichen of Fungi species because none are known within the project area. Suitable habitat may be present within areas burned at none to moderate severity. Indirect effects to suitable habitat for Sensitive bryophytes, lichens and fungi are described below.

The retention of dead trees would provide abundant substrate for Sensitive saprophytic fungi to colonize, and their eventual decay would facilitate recruitment for many years after the initial

disturbance. However, heavy fuel loading from the accumulation of dead, burnt snags and debris from the 2014 fires is likely to have an indirect negative effect on potential habitat by creating conditions conducive to high severity wildfire in the future which would consume substrate and woody materials necessary for survival.

Under Alternative 1, there would be no soil and watershed enhancement activities reducing or preventing sedimentation of springs and headwaters that may provide habitat for *Peltigera gowardii*. The Burned Area Emergency Rehabilitation (BAER) team analyzed these fire areas for risk of sedimentation and the potential for emergency soil and watershed protection measures. Unfortunately, protection treatments were not feasible as part of the BAER process due to the steep gradient of identified high risk watersheds within the burn perimeter. Sedimentation of springs and headwater streams may have a negative indirect effect on the aquatic habitat of the sole Sensitive Lichen species causing a declining trend in potential population viability.

Sensitive ectomycorrhizal fungi rely on the presence of a live host trees for their continued existence. Under Alternative 1, forest re-establishment in severely burned areas may be delayed due to the loss of cone-bearing trees thereby indirectly postponing Sensitive ectomycorrhizal fungal re-colonization. This would cause a declining trend in potential population viability because the recovery time for suitable habitat (establishment of symbiotic conifer partners) would be prolonged.

Cumulative Effects

All activities and factors listed in Appendix C of the *Westside Fire Recovery Project Environmental Impact Statement* could have additional effects to Sensitive botanical species populations in the project area when added to Alternative 1. On-going and future foreseeable Forest projects have been and will be evaluated for effects to Sensitive botanical species. The implementation of project design features structured to protect the viability of Sensitive botanical species would limit the effects of on-going and future foreseeable Forest projects on these populations. It is expected that because of these past evaluations and inclusion of project design features, cumulative effects from Forest projects would have a neutral effect on population viability trends for Sensitive species.

Projects on private lands are not required to protect Sensitive botanical species, and subsequently actions on private lands may lead to a localized downward trend in population viability for these species. If that is the case, on-going and future foreseeable projects on private lands would have a declining cumulative effect on population viability trends for Sensitive species. However, without knowing how many species and/or populations are present, how many may be effected, and how project activities will affect habitat conditions it is difficult to determine how potential effects from private actions would cumulatively influence population viability trends.

Alternative 2

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct and Indirect Effects

Vascular Plants

Eriogonum hirtellum

Of the 6 populations known within the Project area, 5 are within activity units in subpart B (table 3 and Appendix A). One population is located within a fuels activity unit. This fuel treatment unit is prescribed to maintain a strategic ridgeline fuel break. *Eriogonum hirtellum* is restricted to bald serpentine outcrops and gravelly slopes and ridges that typically have no overstory cover and very little understory vegetation. Due to the lack of fuels in *E. hirtellum* habitat it is unlikely that fuel treatments in this unit will affect the population. However, because these areas are open they may be used to transport equipment to ridgeline treatment areas which could damage some individuals within the population.

The other 4 populations fall along road systems identified for hazard tree removal. Currently, 678 miles of National Forest Transportation System roads, County roads, and State Highways have been identified for hazard tree evaluation. The likelihood that *E. hirtellum* will be affected by hazard tree removal is very low because it occupies open rocky areas without a coniferous overstory.

Indirect effects to *E. hirtellum* that could occur under this alternative would be the adverse effects of increased competition from early seral species that were stimulated to germinate by the fire. The habitat that *E. hirtellum* occupies is limited in water and soil resources. Any additional competition in this environment could be disadvantageous to the persistence of the population.

In the short-term these effects would cause a declining trend in population viability as individuals are impacted by equipment use and/or increased competition. However, because effects would be minimal and to individuals rather than the whole population, the long-term trend in population viability would remain static.

Erythronium hendersonii

Of the 2 populations known within the Project are, both are in activity units located within subpart B (table 3 and Appendix A). Both of these populations have the potential to be directly impacted by Project activities. Fuels treatments that would affect these populations are designed to maintain adequate overstory and ground cover, while reducing excessive fuels; prescriptions consist of hand-thinning, piling and burning. The genus *Erythronium* has been reported to show a significant increase in size and number of plants following wildfire (Clennett 2014). Fuels treatments may indirectly benefit this population by mimicking the effects of wildfire.

These populations also fall along road systems identified for hazard tree removal. Currently, 678 miles of National Forest Transportation System roads, County roads, and State Highways have been identified for hazard tree evaluation and it is unclear whether these populations will be affected by hazard tree removal.

Because this species has a limited distribution on the Forest, adverse effects to these populations have a high likelihood of creating a trend towards listing. Especially of concern is the effect of burn piles on dormant underground bulbs. Burn piles burn at high intensity for long durations which would kill underground bulbs. In order to protect the continued viability of these populations and prevent a need for listing, Project Design Features have been incorporated and

can be found in chapter 2 of the Westside Fire Recovery Environmental Impact Statement. It is likely that some individuals may still be lost during implementation, but Project Design Features will protect the majority of each population. Subsequently, in the short-term this alternative would result in a declining trend in population viability as individuals are directly impacted; however, long-term beneficial effects to suitable habitat from fuels treatments would cause an overall increasing trend in population viability.

Thermopsis robusta

There is 1 known population located in subpart B of the project area and it falls within a fuels activity unit and along a road identified for hazard tree removal (table 3 and Appendix A).

This species requires disturbance for seed germination and to create new suitable habitat for population expansion. The population occurs in a gravel pullout and use of this pullout by equipment would create disturbance that would be beneficial to population expansion. Equipment using the gravel pullout may damage the above-ground portion of *T. robusta* plants; however, this species produces deep rhizomes that are difficult to kill and would remain alive and viable following mechanical disturbance. These disturbances would result in beneficial short-term effects since plants would re-sprout from under-ground rhizomes the following year and because ground disturbance facilitates seed germination in *T. robusta* resulting in an increased number of individuals and an expansion of suitable habitat.

There would be a short-term increasing trend in population viability due to disturbance caused by use of the gravel pullout and fuel treatment activities; however, the long-term trend in population viability would remain static or decline as stable environmental conditions develop. A future disturbance event would again allow for an increasing trend in population viability.

Bryophytes, Lichens, and Fungi

There would be no direct or indirect effect to Sensitive Bryophytes, Lichen of Fungi species because none are known within the project area or activity units. Suitable habitat may be present within areas characterized by none to moderate burn severity. Indirect effects to suitable habitat for Sensitive bryophytes, lichens and fungi are described below.

Suitable habitat for Sensitive bryophyte species, which require high moisture and shade have already been lost in salvage and site preparation and planting units due to the 2014 fires. Fuel treatments may cause short term effects to habitat through disturbance and the creation of small canopy openings causing an initial decline in population viability. However, fuels treatments are designed to maintain adequate overstory and ground cover, resulting in a long-term benefit to suitable habitat by reducing excessive fuel loading and the potential for another high severity wildfire. Therefore, treatments would cause a long-term increasing trend in population viability through the maintenance and protection of remaining suitable habitat.

Alteration of suitable habitat for the sole Sensitive lichen is not expected as a direct result of Project activities because it resides in cold, shallow springs. However, due to ground disturbing activities the risk of stream sedimentation would increase under this alternative in comparison to Alternative 1. The creation of roads and landings would indirectly increase short-term sedimentation of springs and headwater causing a more precipitous decline in potential population viability. However, approximately 150 legacy sediment sites within the Elk Creek watershed will be repaired under all action alternatives. Legacy site restoration will reduce the

risk of sedimentation in the Elk Creek watershed resulting in a static trend in potential population viability in that specific watershed.

Suitable habitat for ectomycorrhizal fungi requires the presence of live host trees, because these species are obligate symbionts. Planting prescriptions in salvage and site preparation and planting units will indirectly benefit *B. pulcherrimus* habitat by increasing the speed at which conifers are re-established. This would cause an increasing trend in potential population viability through the creation and restoration of suitable habitat.

Saprophytic fungi live in and feed on downed wood, detritus, and duff accumulated on the forest floor. Although, these species are not dependent upon specific vascular plant hosts, they require adequate canopy cover to retain sufficient moisture levels to support them. Unfortunately, these characteristics were already lost during the 2014 fires. Fuel reduction treatments would decrease the likelihood of another high severity fire event. Therefore, treatments would cause a long-term increasing trend in population viability through the maintenance and protection of the remaining suitable habitat. Additionally, project design features associated with Aquatic Conservation Standards, soil stability and productivity, and retention of large woody debris and snags would protect/create areas of suitable habitat for saprophytic fungi.

Cumulative Effects

All activities and factors listed in Appendix C of the *Westside Fire Recovery Project Environmental Impact Statement* could have additional effects to Sensitive botanical species populations in the project area when added to Alternative 2. Sensitive species viability and persistence may be both beneficially and negatively affected by cumulative Forest projects. Project design features have been or will be incorporated into all on-going and future foreseeable Forest projects to limit negative effects on population viability trends. Consequently, the cumulative effect of Forest projects on Sensitive species would be expected to cause a short-term declining trend in population viability as individuals are lost, but would create a long-term increasing trend in population viability from the beneficial impacts of management activities on suitable habitat (i.e. fuel treatments, conifer planting, habitat creation, ect…).

Projects on private lands are not required to protect Sensitive botanical species, and subsequently actions on private lands may lead to a localized downward trend in population viability for these species. If that is the case, on-going and future foreseeable projects on private lands would have a declining cumulative effect on population viability trends for Sensitive species. However, without knowing how many species and/or populations are present, how many may be effected, and how project activities will affect habitat conditions it is difficult to determine how potential effects from private actions would cumulatively influence population viability trends.

Table 3: Number of Sensitive populations that may be affected by Alternative 2.

Subpart	Scientific Name	# of Pop's	Activity
A – Beaver	*None*	NA	NA
B - Happy Camp Complex	*Eriogonum hirtellum*	5	Fuels, Roadside hazard
	Erythronium hendersonii	2	Fuels, Roadside hazard
	Thermopsis robusta	2	Fuels, Roadside hazard
C - Whites	*None*	NA	NA

Alternative 3

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Vascular Plants, Bryophytes, Lichens, and Fungi

Direct, indirect, and cumulative effects from this alternative to Sensitive species would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those effects.

Additionally, the added retention of snag clumps and course woody debris would indirectly benefit Sensitive bryophytes and fungi by mitigating the effects of microclimate change and reducing potential effects from Project activities to the substrate and/or fungal organisms (Cushman and Huff 2007). The retention of woody debris would also provide beneficial substrates for fungal decomposers and bryophytes.

Alternative 4

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Vascular Plants, Bryophytes, Lichens and Fungi

Direct, indirect, and cumulative effects from this alternative to Sensitive species would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those affects.

Additionally, under this alternative, road construction and maintenance would be limited within key watersheds which would likely decrease the risk of sedimentation to waterways. Reducing the risk or volume of sedimentation to streams would be an indirect benefit to Sensitive lichen habitat. This alternative would also benefit Sensitive bryophytes and fungi by limiting treatments in Riparian Reserves, which is where the majority of habitat is for these species. Retention of adequate shade and moisture levels, litter, duff, and coarse woody debris components would provide continued high quality habitat for the bryophyte and fungi species of concern.

Alternative 5

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Vascular Plants, Bryophytes, Lichens, and Fungi

Direct, indirect, and cumulative effects from this alternative to Sensitive species would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those affects.

Compliance with Law, Regulation, Policy, and the Forest Plan

The Westside Fire Recovery project complies with section 7 of the Endangered Species Act of 1973, as amended, in the preparation of a Biological Evaluation; Forest Service Policy (FSM 2670), and Klamath National Forest Plan Standards and Guidelines for Sensitive plant species have been met by managing populations for viability where possible.

Determination of Effects

Alternative 1

Under the no action alternative it is my determination that the Westside Fire Recovery Project **will not affect** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 2

Under alternative 2 it is my determination that the Westside Fire Recovery Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 3

Under alternative 3 it is my determination that the Westside Fire Recovery Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 4

Under alternative 4 it is my determination that the Westside Fire Recovery Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 5

Under alternative 5 it is my determination that the Westside Fire Recovery Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability *for*** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Review of Survey & Manage Botanical Species

Introduction

The purpose of this review is to analyze the proposed project in sufficient detail to determine its effects on Survey & Manage (S&M) vascular plant, bryophyte, lichen, and fungi species.

Current Policy and Management Direction

The Bureau of Land Management and Forest Service have adopted standards and guidelines for the management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl, commonly known as the Northwest Forest Plan (NWFP). The NWFP includes measures for management of known sites, site-specific pre-habitat disturbing surveys, and/or landscape scale surveys for about 400 rare and/or isolated species. The standards and guidelines for these mitigation measures are known as Survey & Manage (S&M).

The most recent Survey & Manage direction (USDA 2014b) directs Agencies to follow the 2001 Record of Decision (ROD) for Amendments to the Survey & Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA/USDI 2001), and the December 2003 species list (USDA/USDI 2003), except for the red tree vole which remains a Category C. Category descriptions are provided in the table 4 below.

Table 4: Requirements for Survey & Manage categories

Category	Relative Rarity	Pre-disturbance surveys	Manage all known sites	Strategic surveys
A	Rare	Yes	Yes	Yes, not required for NEPA
B	Rare	No	Yes	Yes, NEPA requirement
C	Uncommon	Yes	High-priority only	Yes, not required for NEPA
D	Uncommon	No	High-priority only	Yes, not required for NEPA
E	Rare	No	Yes	Yes, not required for NEPA
F	Uncommon	No	No	Yes, not required for NEPA

To be in compliance with the 2001 ROD, projects must have pre-disturbance surveys conducted if the activity is potentially considered to be habitat-disturbing (Category A and C), and known and high-priority sites must be managed to protect persistence. “Habitat-disturbing activities are defined as those disturbances likely to have a significant negative impact on the species’ habitat, its life cycle, microclimate, or life support requirements” (USDA/USDI 2001 – Standards and Guidelines, p.22). Species-specific standards and guidelines, survey protocols, and management recommendations from the Northwest Forest Plan are identified below under species effects analysis, if applicable.

In 2006, Judge Pechman established four project categories that are exempt from S&M Standards and Guidelines for pre-disturbance surveys and management of known sites. These project types include:

A. Thinning projects in stands younger than 80 years old;

B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and floodplain reconstruction, or removal of channel diversions; and
D. The portions of projects involving hazardous fuel treatments where prescribed fire is applied. Any portions of a hazardous fuel treatment project involving commercial logging will remain subject to the Survey & Manage requirements except for thinning of stands younger than 80 years old under subparagraph (a) of this paragraph.

Additionally, pre-disturbance surveys are not required for routine maintenance of improvements and existing structures including pulling ditches, clearing encroaching vegetation, managing existing seed orchards and falling hazard trees (USDA/USDI 2001, Standards and Guidelines, pg. 22).

Analysis Indicators

The effects of the proposed actions on Survey & Manage species are compared using the following indicators

- Compliance with Survey & Manage guidelines as defined by the 2001 ROD

Methodology

The likelihood that Survey & Manage botanical populations will be affected by this project will be evaluated by determining the number of existing populations within the project boundary and the number and degree to which those populations will be impacted by the proposed action.

Assumptions

- Analysis is based on spatial population records;
- Survey & Manage populations located in areas burned at moderate-high intensity, as indicated by RAVG data and salvage and site preparation unit selection criteria, are assumed to be extirpated;
- Habitat located in areas burned at moderate-high intensity, as indicated by RAVG data and salvage and site preparation unit selection criteria, are no longer expected to support viable Survey & Manage species populations; and
- Strategic surveys for Category B fungi are assumed to be complete pending acceptance of the Draft Document by the Regional Ecosystem Office.

To determine which species are known to occur or may potentially occur within the project boundaries the following resources were consulted:

- Survey & Manage Species list from the 2003 Record of Decision (ROD) for Amendments to the Survey & Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA/USDI 2003);
- Klamath National Forest species occurrence records (Natural Resource Inventory Database), survey records, and site visit records from within the project boundary;
- Klamath National Forest Survey & Manage Strategic Survey records; and
- Rapid Assessment of Vegetation Condition after Wildfire (RAVG) data;

Preliminary Botanical Review

An office preliminary field review was conducted to determine if the Westside Project area contains any Survey & Manage populations and if suitable habitat is present within the proposed project area (USDA 2014a). During this review, the 2003 Survey & Manage species list was reviewed along with species occurrence and survey records to determine if any Survey & Manage populations are present in the project area. Aerial photographs, RAVG data, treatment unit selection criteria, site visits, and species distribution information were used to determine if suitable habitat for Survey & Manage species is present within treatment units.

During the Preliminary Botanical Review, the proposed project area was determined to contain 17 Survey & Manage species which are listed below in table 5.

Pre-disturbance surveys will be conducted for Category A and C species in project activity units where known sites and suitable habitat are still present, except for those occurring in roadside hazard tree removal units. Roadside hazard tree removal is considered routine maintenance and populations in these units are exempt from pre-disturbance surveys. Known occurrences of Category B and E species assumed to be extant within the Project area and high-priority populations of Category D species will be protected for continued persistence at the site. Protection measures will include flagging and avoiding extant populations and nearby suitable habitat in order to maintain necessary habitat characteristics.

Spatial and Temporal Context

The project area will serve as the geographical bounds for effects analysis of S&M species. All potential disturbance and effects to S&M species from this project will occur within this boundary. Additionally, effects from other present and foreseeable activities will interact with effects of the proposed project only within the project area.

Temporal bounding for Survey & Manage species will be less than five years for the short-term effects and greater than five years for long term effects. Each temporal bounding was chosen to account for species recovery and seed dormancy requirements.

Affected Environment

The Westside Fire Recovery project area is composed of the Beaver Fire (Subpart A), Happy Camp Complex (Subpart B), and Whites Fire (July Complex) (Subpart C) which all occurred on the Klamath National Forest during the summer of 2014. These fires resulted in a mosaic pattern of vegetation from the variety of burn intensities that occurred across the Project area.

Based on site visits, and RAVG data the following assumptions are made:

- areas characterized by high severity burns experienced 75% or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris;
- areas characterized by moderate severity burns experienced 50-75% vegetation mortality, substantial reduction in canopy and understory cover, as well as duff layers and large woody debris; and
- areas characterized by no or low severity burns experienced 0-50% vegetation mortality and a reduction in fuel loading.

Modification of the forest structure and composition as a result of fire intensity, duration, and suppression efforts has had a profound effect on microclimate characteristics such as air temperature, relative humidity, and soil temperature and moisture, which could, in turn, result in adverse impacts to native plant communities. In moderate and high burn severity areas, microclimate characteristics commonly associated with habitat for species of concern have likely been lost. Based on the assumptions stated above it is assumed that species located in salvage and site preparation and planting units were extirpated during the 2014 fires. Areas that experienced no or low burn severity may provide refugia for native species, and act as a seed source from which dispersal into the more intensely burned areas can occur.

Species Accounts

Vascular Plants

Cypripedium fasciculatum

Cypripedium fasciculatum is a Category C species requiring pre-disturbance surveys, management of high-priority sites, and strategic surveys.

This species is a perennial orchid found scattered throughout the Northwestern US. It arises in early spring from a shallow rhizome and dies back by late summer. On the Klamath National Forest, *C. fasciculatum* populations occur in the understory of mixed conifer forests and are present in a variety of soil types. The majority of populations are located in moist sites on northern aspects with sufficient canopy cover to provide filtered light to the forest floor. On the Klamath National Forest, *C. fasciculatum* populations range from 1,650 – 5,600 feet.

Cypripedium fasciculatum requires mycorrhizal association with a fungus for germination and growth (Shefferson et al. 2005, Kaye and Cramer 2005). Cypripedium seeds lack endosperm and thus cannot provide food to the developing embryo. Instead, this genus relies on an epi-parastic relationship with a mycorrhizal fungus to gain nutrients (Kaye and Cramer 2005). The genus *Cypripedium* has been found to almost exclusively associate with a specific mycorrhizal family, the Tulasnellaceae (Shefferson et al. 2007). *Cypripedium* species also lacks a hard seed coat and therefore does not bank seeds in the soil.

Cypripedium fasciculatum populations do not typically survive high intensity fire in which the duff layer is consumed. Additionally, mechanical disturbance of the rhizome is generally fatal.

Surveys on the KNF for *Cypripedium fasciculatum* have been on-going since 1980. There were 126 known *C. fasciculatum* populations located on the KNF prior to the 2014 fires; 18 are now presumed extirpated as a result of these fires. Subsequently, 30 populations are located within the Westside Fire Recovery project area; 3 in subpart A, 20 in subpart B, and 7 in subpart C (table 5).

Cypripedium montanum

Cypripedium montanum is a Category C species requiring pre-disturbance surveys, management of high-priority sites, and strategic surveys.

This species is a perennial orchid found scattered throughout the Northwestern US. It arises in early spring from a shallow rhizome and dies back by late summer. On the Klamath National Forest, *C. montanum* populations occur in a broad range of habitats that vary greatly in soils,

elevation, aspect, and plant community types. The majority of populations are located in moist sites within 300 feet of a stream on northern aspects with sufficient canopy cover to provide filtered light to the forest floor. However, populations have occasionally been found on dry slopes with open canopy structure and more direct light. On the Klamath National Forest, *C. montanum* populations range from 1,600-5,900 feet.

Cypripedium montanum requires mycorrhizal association with a fungus for germination and growth (Shefferson et al. 2005, Kaye and Cramer 2005). Cypripedium seeds lack endosperm and thus cannot provide food to the developing embryo. Instead, this genus relies on an epi-parastic relationship with a mycorrhizal fungus to gain nutrients (Kaye and Cramer 2005). The genus *Cypripedium* has been found to almost exclusively associate with a specific mycorrhizal family, the Tulasnellaceae (Shefferson et al. 2007). This genus also lacks a hard seed coat and therefore does not bank seed in the soil.

Cypripedium montanum populations do not typically survive high intensity fire in which the duff layer is consumed. Additionally, mechanical disturbance of the rhizome is generally fatal.

Surveys on the KNF for *Cypripedium montanum* have been on-going since 1980. There were 108 known *C. montanum* populations located on the Klamath National Forest prior to the 2014 fires, 21 of these are assumed extirpated following this fires. Subsequently, 23 are located within the Westside Fire Recovery project area, 2 in subpart A, 14 in subpart B, and 7 in subpart C (table 5).

Bryophytes

Ptilidium californicum

Ptilidium californicum is a category A species requiring the management of all known sites, pre-disturbance surveys, and strategic surveys. This species is endemic to the Pacific Northwest ranging from northern California to southeastern Alaska.

It typically occurs between 1,275 to 5,725 feet in elevation as an epiphyte on bark at the base of large living mature fir trees, most often red fir, white fir, and Douglas-fir. It can also be found on decaying logs or stumps, and on small diameter conifers and hardwoods in moist understories. Severe wildfires that destroy old-growth trees would likely extirpate populations by consuming host trees, removing canopy cover, and causing smoke damage.

Low intensity fires that may not kill trees but blacken the base of the tree where *P. californicum* grows may also extirpate populations. Monitoring of populations located in areas subjected to high intensity fires in the past five years have shown no recovery. The proliferation of *P. californicum* in northern California, which is the southern extent of the species' range, is possibly an artifact of fire suppression.

There were 109 known occurrences of *P. californicum* on the Klamath National Forest prior to the 2014 fires; 6 are assumed to be extirpated. Subsequently, 4 are within the Westside Fire Recovery project area; 1 in subpart A, 2 in subpart B, and 1 in subpart C (table 5).

Lichens

No known occurrences of S&M lichen species are present in the Westside Fire Recovery Project area.

Fungi

Albatrellus flettii

Albatrellus flettii is a category B species requiring the management of all known sites and strategic surveys. This species is an ectomycorrhizal ground dwelling polypore. It typically occurs in mixed conifer forests where it grows in fused clusters. There are currently 3 known populations of *A. flettii* on the Forest. Of these, 1 is located within subpart C of the Project area (table 5).

Alpova olivaceotinctus

This is a Category B species requiring the management of all known sites and strategic surveys. It is an ectomycorrhizal tuber that grows and fruits entirely below ground. *Alpova olivaceotinctus* appears to associate with both conifer and hardwood species. There is currently 1 known population of *A. olivaceotinctus* on the Forest and it is within subpart A of the Project area (table 5).

Cantharellus subalbidus

This is a Category D species requiring the management of high priority sites and strategic surveys. It is an ectomycorrhizal fungus that preferentially associates with old-growth douglas-fir trees and is rarely found fruiting in second-growth forests (Dunham et al. 2006). There are currently 21 known populations of *C. subalbidus* on the Forest and of these 2 are within subpart B of the Project area (table 5).

Choiromyces alveolatus

This is a Category B species requiring the management of all known sites and strategic surveys. It is an ectomycorrhizal tuber that grows and fruits entirely below ground. *Choiromyces alveolatus* preferentially associates with conifers in the Pineacea family. There are currently 5 known populations of *C. alveolatus* on the Forest. Of these, 1 is located within subpart A of the Project area (table 5).

Gomphus clavatus

This is a category F species requiring strategic surveys. It is widely distributed throughout the Pacific Northwest and is considered a desirable edible mushroom. It is ectomycorrhizal with conifers and is typically found in rich soil and humus (Pilz et al. 2003). There are currently 7 known populations of *G. clavatus* on the Forest. Of these, 1 is located within subpart B of the Project area (table 5).

Marsmius applanatipes

This is a Category B species requiring the management of all known sites and strategic surveys. *Marsmius applanatipes* is a saprophytic fungus that can be found above 6,000 feet decomposing litter from conifer trees. There are currently 2 known populations of *M. applanatipes* on the Forest. Of these, 1 is located within subpart C of the Project area (table 5).

Mycena tenax

This is a Category B species requiring the management of all known sites and strategic surveys. *Mycena tenax* is a saprophytic fungus that grows gregariously in duff layers under fir, Douglas-

fir, and spruce trees (Castellano et al. 2003). There is currently 1 known population of *M. tenax* on the Forest and it is located within subpart C of the Project area (table 5).

Otidea leporina

This is a Category D species requiring the management of high-priority sites and strategic surveys. Little is known about *O. leporina*. It associates with specific conifer groups, but it is not known whether it is mycorrhizal or saprophytic. There are currently 15 known populations of *O. leporina* on the Forest. Of these, 2 are located in subpart B of the Project area (table 5).

Phaeocollybia californica

Phaeocollybia californica is a Category B species requiring the management of all known sites and strategic surveys. This is an ectomycorrhizal species that prefers to associate with Douglas-fir and Western hemlock (Castellano 1999). There are currently 7 known populations of *P. californica* on the Forest. Of these, 1 is located within subpart C of the Project area (table 5).

Phaeocollybia fallax

This is a Category D species requiring the management of high-priority sites and strategic surveys. *Phaeocollybia fallax* is an ectomycorrhizal fungus that is typically found associating with fir, Douglas-fir, and spruce in humus soils. There are currently 8 known populations of *P. fallax* on the Forest. Of these, 1 is located within subpart B of the Project area (table 5).

Phaeocollybia gregaria

This is a Category B species requiring management of known site and strategic surveys. *Phaeocollybia gregaria* is an ectomycorrhizal species that preferentially associated with spruce and Douglas-fir. There are currently 3 known populations of *P. gregaria* on the Forest. Of these, 1 is located within subpart B of the Project area (table 5).

Phaeocollybia olivacea

Phaeocollybia olivacea is a category E species requiring the management of all known sites and strategic surveys. This is an ectomycorrhizal species that generally occurs in mixed oak-conifer forests. It prefers to form relationships with oak and tanoak species. There are currently 12 known populations of *P. olivacea* on the Forest. Of these, 3 populations are located within the Project area; 2 in subpart B and 1 in subpart C (table 5).

Ramaria abietina

This is a Category B species requiring the management of all known sites and strategic surveys. *Ramaria abietina* is an ectomycorrhizal fungus that preferentially associates with conifers. There is currently 1 known population of *R. abientina* located on the Forest and it is within subpart B of the Project area (table 5).

Tremiscus helvelloides

This is a category D species requiring the management of high-priority sites and strategic surveys. *Tremiscus helvelloides* is a saprobe that generally grows on the ground or on well-rotted wood. It is almost always found in conifer forests. There are currently 5 known populations of *T. helvelloides* on the Forest. Of these, 2 populations are located within subpart B of the Project area (table 5).

Table 5: Survey & Manage populations that may be affected by the Westside Fire Recovery project.

Scientific Name	Category	Type	KNF Pre-2014 fires	Lost due to 2014 Fires*	Extant In Project Area	Sub part A Beaver	Sub part B Happy Camp	Sub part C Whites
Albatrellus flettii	S&M-B	Fungi	3	0	1	0	0	1
Alpova olivaceotinctus	S&M-B	Fungi	1	0	1	1	0	0
Cantharellus subalbidus	S&M-D	Fungi	20	0	2	0	2	0
Choiromyces alveolatus	S&M-B	Fungi	5	0	1	1	0	0
Cypripedium fasciculatum	S&M-C Sensitive	Plant	126	18	30	3	20	7
Cypripedium montanum	S&M-C Sensitive	Plant	108	21	23	2	14	7
Gomphus clavatus	S&M-F	Fungi	7	0	1	0	1	0
Marsmius applanatipes	S&M-B	Fungi	2	0	1	0	0	1
Mycena tenax	S&M-B	Fungi	1	0	1	0	0	1
Otidea leporina	S&M-D	Fungi	15	0	2	0	2	0
Phaeocollybia californica	S&M-B	Fungi	7	0	1	0	0	1
Phaeocollybia fallax	S&M-D	Fungi	8	0	1	0	1	0
Phaeocollybia gregaria	S&M-B	Fungi	3	0	1	0	1	0
Phaeocollybia olivacea	S&M-E Sensitive	Fungi	12	0	3	0	2	1
Ptilidium californicum	S&M-A	Bryophyte	109	6	4	1	2	1
Ramaria abietina	S&M-B	Fungi	1	0	1	0	1	0
Tremiscus helvelloides	S&M-D	Fungi	5	0	2	0	2	0

*Number of populations assumed to be lost as a result of the 2014 fires.

Environmental Consequences

The significance of management activities upon Survey & Manage plant species depends upon many factors, including the current habitat conditions of the known populations, the habitat conditions necessary to support the species, and the degree of species sensitivity to short-term and long-term habitat modification. Each alternative is evaluated in terms of how the proposed activities would meet the requirements of the species specific Management Recommendations discussed above, if known sites are present, and how the project would comply with the 2001 ROD (USDA/USDI 2001).

Alternative 1

Under Alternative 1, no treatments are proposed. Alternative 1 provides reviewers a baseline to compare the magnitude of environmental effects from doing nothing with the action alternatives.

Direct and Indirect Effects

Vascular Plants

Cypripedium fasciculatum and C. montanum

Cypripedium fasciculatum and *Cypripedium montanum* are closely related species with very similar life cycle characteristics. Due to the similarity in habitat needs, effects to these species are described together in this report.

Under Alternative 1 there would be no direct effect to *C. fasciculatum* or *C. montanum* populations within the Westside Fire Recovery project area from management activities, therefore the project would be in compliance with Survey & Manage regulations.

Indirect effects to suitable habitat and re-sprouting populations may occur, but these will not affect project compliance with Survey & Manage regulations. The retention of burned trees and large woody debris would provide available perches for seed-dispersing birds, thereby maintaining a similar composition of 'seed rain' and subsequently the plant community (Peterson et al. 2009). Woody debris would also provide protected "safe sites" for germination and establishment, especially in the post-fire environment (Peterson et al. 2009). On the other hand, standing burnt trees may damage re-sprouting populations by falling on them and downed trees may block germinating seeds or emerging plants. Additionally, accumulation of fallen dead trees would create heavy fuel loads which predispose areas to high burn intensities and durations during the next fire event, thereby damaging plants which survive falling trees, and subjecting the habitat to more adverse effects the next time around. In the short term, until natural vegetation re-sprouts and stabilizes slopes, erosion and earth flows could indirectly dampen the ability of sites to recover.

Bryophytes

Ptilidium californicum

Under Alternative 1 there would be no direct effect to Survey & Manage bryophyte populations within the Westside Fire Recovery project area from management activities, therefore the project would be in compliance with Survey & Manage regulations.

Indirect effects to suitable habitat and known populations may occur, but these will not affect project compliance with Survey & Manage regulations. Heavy fuel loading from the accumulation of dead, burnt snags and debris from the 2014 fires is likely to have an indirect negative effect on *P. californicum* populations by creating conditions conducive to high severity wildfire.

Fungi

Under Alternative 1 there would be no direct effect to Survey & Manage fungi populations within the Westside Fire Recovery project area from management activities, therefore the project would be in compliance with Survey & Manage guidelines.

Indirect effects to suitable habitat and known populations may occur, but these will not affect project compliance with Survey & Manage regulations. The retention of dead trees would provide abundant substrate for saprophytic Survey & Manage fungi to colonize, and their

eventual decay would facilitate recruitment for many years after the initial disturbance. Survey & Manage *mycorrhizal* fungi rely on the presence of live host trees for their continued existence. Under Alternative 1, forest re-establishment in severely burned areas may be delayed due to the loss of cone-bearing trees thereby indirectly postponing Survey & Manage *mycorrhizal* fungal re-colonization. Heavy fuel loading from the accumulation of dead, burnt snags and debris from the 2014 fires is likely to have an indirect negative effect on saprophytic and *mycorrhizal* populations by creating conditions conducive to high severity wildfire.

Cumulative Effects

All activities and factors listed in Appendix C of the *Westside Fire Recovery Project Environmental Impact Statement* could have additional effects to Survey & Manage botanical species when added to Alternative 2. On-going and future foreseeable Forest projects have been and will be evaluated for compliance with Survey & Manage regulations. Forest compliance with Survey & Manage regulations requires pre-disturbance surveys for habitat-disturbing projects (Category A and C species only), and the management of known and high-priority sites for continued persistence. All Forest project are required to comply with these regulations. Forest projects would not cumulatively affect Survey & Manage botanical species and would comply with regulations if project design features structured to protect Survey & Manage populations and associated habitats are implemented. Additionally, on-going and future foreseeable projects on private land that affect Survey & Manage botanical species would have no effect on whether the Westside Fire Recovery project is in compliance with these regulations since they pertain only to Forest occurrences and lands. Therefore, the project would continue to comply with Survey & Manage regulations regardless of cumulative actions on Forest or private lands.

Alternative 2

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct and Indirect Effects

Vascular Plants

Cypripedium fasciculatum

Of the 108 populations assumed to be extant on the Forest following the 2014 fires, 18 are within activity units (table 6 and Appendix A). Three of these populations are located along roads identified for hazard tree removal.

Subpart A

There are 2 populations of *C. fasciculatum* within activity units in subpart A. One population is located within a fuels treatment unit near Trail gulch and the other along Forest Service Road 47N29 identified for hazard tree removal.

Fuels treatments within this unit are prescribed to maintain a strategic ridgeline fuel break. The population (CYFA-5-11) is located midslope near a moist willow glade and is unlikely to be affected by ridgeline treatments. It uncertain whether hazard tree removal activities will affect *C. fasciculatum* population CYFA-5-10 because only road systems and not specific trees have been identified for hazard removal.

Subpart B and C

There are 10 *C. fasciculatum* populations located in subpart B, and 6 located in subpart C within a combination of fuels and hazard tree activity units. All of these populations have the potential to be directly affected by project activities.

Cypripedium fasciculatum is a Category C species requiring the management of high priority sites. High priority will be given to robust, healthy populations located in areas with intact suitable habitat present following the 2014 fires. Implementation of flag and avoid protection measures for high priority populations would result in very minimal direct effects to *C. fasciculatum* populations and would ensure compliance with Survey & Manage regulations.

The following describes possible affects without protection measures:

Fuels treatments that would affect these populations are designed to maintain adequate overstory and ground cover, while reducing excessive fuels. Treatments consist of a variety of prescriptions including mechanical and hand thinning, piling, and burning or chipping. This species has a shallow rhizome that is easily damaged by mechanical disturbance. The use of equipment for mechanical thinning operations has the potential to kill individual plants by damaging shallow, underground-rhizomes and removing duff layers necessary to support mycorrhizal symbionts. Trees that are felled by hand or machine have the potential to fall onto populations killing individual plants and preventing seedlings from emerging in the spring. Hazardous fuel burn piles may kill rhizomes and mature plants if they are located below the piles because of the high intensities and long durations at which these piles typically burn. Prescribed underburns typically burn at intensities that are low enough to avoid damaging below ground rhizomes. *Cypripedium fasciculatum* populations on the Forest have been documented to be able to re-sprout the year after a low-intensity underburn when the population's habitat is maintained.

Due to these treatments, there may be a short-term reduction in shading from within and adjacent to suitable habitat. Because larger canopy elements would be maintained, this would not reduce the shading to the habitat significantly. There is expected to be a long-term, indirect benefit to *C. fasciculatum* populations and suitable habitat by reducing excessive fuel loading and the potential for a future high severity wildfire.

Cypripedium montanum

Of the 87 populations assumed extant on the Forest following the 2014 fires, 16 are within activity units (table 6 and Appendix A).

Subpart A, B and C

Within fuels treatment units, there is 1 *C. montanum* population located in subpart A, 8 in subpart B, and 7 in subpart C. All populations have the potential to be directly affected by project activities.

Cypripedium montanum is a Category C species requiring the management of high priority sites. High priority will be given to robust, healthy populations located in areas with intact suitable habitat present following the 2014 fires. Implementation of flag and avoid protection measures for high priority populations would result in very minimal direct effects to *C. montanum* populations and would ensure compliance with Survey & Manage regulations.

The following describes possible affects without protection measures:

Fuels treatments that would affect these populations are designed to maintain adequate overstory and ground cover, while reducing excessive fuels. Treatments consist of a variety of prescriptions including mechanical and hand thinning, piling, and burning or chipping. This species has a shallow rhizome that is easily damaged by mechanical disturbance. The use of equipment for mechanical thinning operations has the potential to kill individual plants by damaging shallow, underground-rhizomes and removing duff layers necessary to support mycorrhizal symbionts. Trees that are felled by hand or machine have the potential to fall onto populations killing individual plants and preventing seedlings from emerging in the spring. Hazardous fuel burn piles burn may kill dormant rhizomes and mature plants if they are located below the piles because of the high intensities and long durations these piles burn for. Prescribed underburns typically burn at intensities that are low enough to avoid damaging below ground rhizomes. *Cypripedium montanum* populations on the Forest have been documented to be able to re-sprout the year after a low-intensity underburn when the population's habitat is maintained.

Due to these treatments, there may be a short-term reduction in shading from within and adjacent to suitable habitat. Because larger canopy elements would be maintained, this would not reduce the shading to the habitat significantly. There is expected to be a long-term, indirect benefit to *C. montanum* populations and suitable habitat by reducing excessive fuel loading and the potential for a future high severity wildfire.

Bryophytes

Ptillidium californicum

Of the 103 P. californicum populations assumed extant on the Forest following the 2014 fires, 2 are located in activity units. One population (PTCA5-55) in subpart A and 1 population (PTCA5-5-95) in subpart B. Both of these populations are located along roads identified for hazard tree removal (table 6 and Appendix A).

Ptilidium californicum is a Category A species requiring the protection of all known sites. Implementation of flag and avoid protection measures would result in no direct effects to *P. californicum* populations and would ensure compliance with Survey & Manage regulations.

Roadside treatments may indirectly effect *P. californicum* populations by creating small canopy openings adjacent to populations. This would be a short-term effect as larger canopy elements would be maintained and shading to the habitat would not be significantly reduced. The reduction in excessive fuels may indirectly benefit populations by reducing the risk of a future high severity wildfire.

Fungi

Albatrellus flettii

Of the 3 *A. flettii* populations located on the Forest, 1 is within the Project area and is located in a fuels treatment unit in subpart C (table 6 and Appendix A). *Albatrellus flettii* is a Category B species requiring the protection of all known sites. Implementation of flag and avoid protection measures would result in no direct effects to *A. fletti* populations and would ensure compliance with Survey & Manage regulations.

This population is in a unit designated for a prescribed underburn. Prescribed burns would be conducted during periods that promote low intensity fires and would aim to maintain canopy cover while reducing fuel loads. It is unlikely that prescribed burns would cause soil temperatures to increase enough to damage *A. flettii* mycelium or to compromise the persistence of this population by killing host trees that survived the 2014 Whites Fire. Additionally, because this population is in a treatment unit designated for a prescribed underburn it is exempt from Survey & Manage guidelines per Pechman Exemption D.

Watershed protection features designed to retain organic matter and large woody material would benefit this species by maintaining moisture and habitat requirements. Prescribed burn treatments may have an indirect beneficial effect on this population by reducing excessive fuels and the decreasing the risk of a future high severity fire event that would kill host trees and destroy moisture requirements necessary for the survival of this species.

Otidea leporina

Of the 15 known populations of *O. leporina* on the Forest, 1 is located within a fuels activity unit in subpart B (table 6 and Appendix A).

This is a Category D species requiring the management of high-priority sites. It is hard to define a high priority site for this species because little is known about it. *Otidea leporina* associates with conifers, but it is not known whether it is mycorrhizal or saprophytic. Watershed protection features designed to retain organic matter and large woody material would benefit this species by maintaining moisture and habitat requirements. If appropriate habitat components are present to support mycorrhizal and saprophytic fungi this populations will be designated high-priority. Implementation of flag and avoid protection measures will result in no direct effects to this population and ensure compliance with Survey & Manage regulations.

Phaeocollybia californica and Phaeocollybia olivacea

Phaeocollybia californica and *P. olivacea* are closely related species with very similar life cycle characteristics. Due to the similarity in habitat needs, effects to these species are described together in this report.

Of the 7, *P. californica* populations located on the Forest, 1 is within the Project area and is located in a fuels treatment unit in subpart C (table 6 and Appendix A).

Of the 12 *P. olivacea* populations known on the Forest, 2 populations are located in fuels treatment units, 1 in subpart B and 1 in subpart C (table 6 and Appendix A).

Phaeocollybia californica is a Category B species and *P. olivacea* is a Category E species which both require the protection of all known sites. Implementation of flag and avoid protection measures would result in no direct effects to *P. californica* or *P. olivacea* populations and would ensure compliance with Survey & Manage regulations. These populations are in a unit designated for a prescribed underburn. Prescribed burns would be conducted during periods that promote low intensity fires and would aim to maintain canopy cover while reducing fuel loads. Both of these populations occur in a moist wet seep and fire in this area would likely burn at intensities that are low enough that below ground mycelium would not be killed. Additionally, because these populations are in a treatment unit designated for a prescribed underburn they are exempt from Survey & Manage regulations per Pechman Exemption D.

Watershed protection features designed to retain organic matter and large woody material would benefit these species' by maintaining moisture and habitat requirements. Prescribed burn treatments may have an indirect beneficial effect on these populations by reducing excessive fuels and the decreasing the risk of a future high severity fire event that would kill host tree's and moisture requirements necessary for the survival of these species.

Tremiscus helvelloides

Of the 5 known populations of *T. helvelloides* on the Forest, 1 is within a fuels activity unit in subpart B (table 6 and Appendix A).
This is a category D species requiring the management of high-priority sites. This population will be considered high priority if the habitat still provides adequate shade, moisture, and substrate necessary to support jelly fungi. Implementation of flag and avoid protection measures will result in no direct effects to this population and ensure compliance with Survey & Manage regulations.

Table 6: Survey & Manage species that may be affected by Alternative 2

Subpart	Species	Category	Pop's	Activity
Beaver	*Cypripedium fasciculatum*	C	2	Fuels and Roadside
	Cypripedium montanum	C	1	Fuels and Roadside
	Ptilidium californicum	A	1	Roadside
Happy Camp Complex	*Cypripedium fasciculatum*	C	10	Fuels and Roadside
	Cypripedium montanum	C	8	Fuels and Roadside
	Otidea leporina	D	1	Fuels and Roadside
	Phaeocollybia olivacea	E	1	Fuels and Roadside
	Ptilidium californicum	A	1	Roadside
	Tremiscus helvelloides	D	1	Fuels
Whites	*Albatrellus flettii*	B	1	Fuels and Roadside
	Cypripedium fasciculatum	C	6	Fuels and Roadside
	Cypripedium montanum	C	7	Fuels and Roadside
	Phaeocollybia californica	B	1	Fuels
	Phaeocollybia olivacea	E	1	Fuels

Cumulative Effects

All activities and factors listed in Appendix C of the *Westside Fire Recovery Project Environmental Impact Statement* could have additional effects to Survey & Manage botanical species when added to Alternative 2. On-going and future foreseeable Forest projects have been and will be evaluated for compliance with Survey & Manage regulations. Forest compliance with Survey & Manage regulations requires pre-disturbance surveys for habitat-disturbing projects (Category A and C species only), and the management of known and high-priority sites for continued persistence. All Forest project are required to comply with these regulations. Forest projects would not cumulatively affect Survey & Manage botanical species and would comply with regulations if project design features structured to protect Survey & Manage populations and associated habitats are implemented. Additionally, on-going and future foreseeable projects

on private land that affect Survey & Manage botanical species would have no effect on whether the Westside Fire Recovery project is in compliance with these regulations since they pertain only to Forest occurrences and lands. Therefore, the project would continue to comply with Survey & Manage regulations regardless of cumulative actions on Forest or private lands.

Alternative 3

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Vascular Plants, Bryophytes, and Fungi

This alternative will have the same direct, indirect, and cumulative affects to Survey & Manage species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Additionally, the added retention of snag clumps and large woody debris would provide available perches for seed-dispersing birds, thereby maintaining a similar composition of 'seed rain' and subsequently the plant community (Peterson et al. 2009). Woody debris would also provide protected "safe sites" for germination and establishment of specific species, especially in the post-fire environment (Peterson et al. 2009), by mitigating the effects of microclimate change and reducing potential effects from Project activities to the substrate and/or organisms (Cushman and Huff 2007).

Alternative 4

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Vascular Plants, Bryophytes, and Fungi

This alternative will have the same direct, indirect, and cumulative affects to Survey & Manage species as Alternative 2 and will incorporate the same Project Design Features to mitigate those affects.

Additionally, this alternative would benefit Survey & Manage bryophytes and fungi species by limiting treatments in Riparian Reserves, which is where the majority of habitat is for these species. Retention of adequate shade and moisture levels, litter, duff, and coarse woody debris components would provide continued high quality habitat for the bryophyte and fungi species of concern.

Alternative 5

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Vascular Plants, Bryophytes, and Fungi

This alternative will have the same direct, indirect, and cumulative affects to Survey & Manage species as Alternative 2 and will incorporate the same Project Design Features to mitigate those affects.

Compliance with Law, Regulation, Policy, and the Forest Plan

A botanical assessment for Survey & Manage vascular plant, bryophyte, lichen, and fungi, species has been completed for the Westside Fire Recovery Project. The project complies with the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey & Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines by managing all known sites of S&M species in the project area that are not otherwise exempt

Determination of Effects

Alternative 1

Under the no action alternative it is my determination that the Westside Fire Recovery Project will comply with Survey & Manage regulations.

Alternative 2

Under alternative 2 it is my determination that the Westside Fire Recovery Project will comply with Survey & Manage regulations if project design features structured to protect Survey & Manage populations and associated habitat are implemented.

Alternative 3

Under alternative 3 it is my determination that the Westside Fire Recovery Project will comply with Survey & Manage regulations if project design features structured to protect Survey & Manage populations and associated habitat are implemented.

Alternative 4

Under alternative 4 it is my determination that the Westside Fire Recovery Project will comply with Survey & Manage regulations if project design features structured to protect Survey & Manage populations and associated habitat are implemented.

Alternative 5

Under alternative 5 it is my determination that the Westside Fire Recovery Project will comply with Survey & Manage regulations if project design features structured to protect Survey & Manage populations and associated habitat are implemented.

Unique Botanical Areas of Concern

Lake Mountain Special Interest Area

The Lake Mountain Special Interest Area is located in subpart B of the Project area near Lake Mountain Lookout. This Special Interest Area includes 100 acres and is the northern-most known location of Foxtail Pine. This subalpine conifer forest is home to at least 6 different conifer species including: western white pine, foxtail pine, Shasta red fir, white fir, mountain hemlock and Jeffrey pine. Such assemblages of high-elevation conifers are rare throughout California and are restricted to the Klamath-Siskiyou Mountains.

The ridgeline running southwest from the top of Lake Mountain is the southeast boundary of the Botanical Special Interest Area as well as the location of 3 fuels treatment units designed to maintain this ridgeline as a shaded fuel break. Project design features have been incorporated into the *Westside Fire Recovery Environmental Impact Statement* in order to maintain foxtail pine snags within this Special Interest Area. The retention of foxtail pine snags is important in order to protect the unique features for which this Special Interest Area was designated.

Non-project dependent activities that may influences stand dynamics in this Special Interest Area include cattle grazing and the presence of an active fire lookout on top of Lake Mountain with an access road on the east ridge. The amount of cattle found in the area is minimal due to limited foraging opportunities, but grazing effects have been noted. Trampling from cattle is significant on young tree seedlings struggling to survive in a sub-alpine environment dominated by harsh soils. Personnel from the fire lookout also place saltblocks for deer and feed birds. These actions may increase browsing pressure from deer and disrupt population dynamics of nutcrackers, a bird species with unique importance to the dispersal of foxtail pine seeds.

Cultural Plant Collecting Area

The Cold Creek springs area within subpart B of the Project area is an important resource for *Adiantium aleuticum* (five-finger fern) which is frequently utilized by local Tribes for basket weaving and botanical remedies (Lloyd 1964). The maintenance and perpetuation of cultural botanical resource is required by Forest Standard and Guidelines (6-21). There are 6 units located in the Cold Creek springs area that may affect the continued viability of this resource. Project design features have been incorporated into the *Westside Fire Recovery Environmental Impact Statement* in order to continue to ensure its preservation and continuation.

Noxious Weed Risk Assessment

Introduction

This weed risk assessment analyzes the effects of the proposed project on Klamath National Forest listed non-native invasive species (NNIS) within the project area boundaries. The Klamath National Forest has placed a high priority on management of NNIS, which includes reducing management related introduction and spread of NNIS on the Forest (USDA 2011). The purpose of this document is to evaluate the Westside Fire Recovery Project in sufficient detail to determine its effects on NNIS. This Risk Assessment follows the standards established by Forest Service Manual 2900 direction (USDA 2011).

Current Policy and Management Direction

The Forest Plan includes Forest-wide Standards and Guidelines for vegetative management that call for all silvicultural practices to consider how to best prevent introducing noxious or alien weeds. (USDA 1995 - S&G 21-53)

Forest Service Manual 2900 Invasive Species Management (USDA 2011) includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project. Specifically the manual states:

- Determine the risk of introducing, establishing, or spreading invasive species associated with any proposed action, as an integral component of project planning and analysis, and where necessary provide for alternatives or mitigation measures to reduce or eliminate that risk prior to project approval (FSM 2903-4).
- Use contract and permit clauses to require that the activities of contractors and permittees are conducted to prevent and control the introduction, establishment, and spread of aquatic and terrestrial invasive species. For example, where determined to be appropriate, use agreement clauses to require contractors or permittees to meet Forest Service-approved vehicle and equipment cleaning requirements/standards prior to using the vehicle or equipment in the National Forest System (FSM 2903-5).

Forest Service Manual 2900 Invasive Species Management (USDA 2011) also includes Executive Order #13112 which directs Federal agencies to:

- Identify actions that may affect the status of invasive species.
- Use relevant programs and authorities to: (a) prevent the introduction of invasive species; (b) detect and respond rapidly to and control populations in a cost effective and environmentally sound manner; (c) monitor; (d) restore; (e) research; and (f) promote public education on invasive species.
- Not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.
- Coordinate these duties with the National Invasive Species Council that coordinates Federal strategies to address the problem of noxious weeds.

Analysis Indicators

The effects of alternatives on non-native invasive species are compared using the following indicators

- The risk of introducing and/or spreading non-native invasive species measured by a rating of high, moderate, low, or very low.

Assumptions

The following assumptions were used in the effects analysis of alternatives on non-native invasive species infestations:

- Analysis is based on spatial population records;
- Not all existing NNIS infestations are currently mapped;
- Existing NNIS infestation were spread during the 2014 fires and associated suppression efforts;
- It's likely that new NNIS infestations were introduced during the 2014 fires and associated suppression efforts;
- Roadsides NNIS infestations are expected to continue to spread along road systems regardless of project activities;
- Inclusions of privately owned lands within the project boundary may contain infestations of NNIS that were previously unknown; these may spread to National Forest System lands regardless of our actions and efforts at prevention and control of NNIS on Forest lands; and
- Once established, NNIS infestations are likely to persist long term.

Methodology

The California Department of Food and Agriculture, and the Siskiyou County Department of Agriculture manage NNIS by use of the same list and risk rating criteria (CDFA 2010). There are approximately 39 species of State and County listed noxious and invasive weeds known within the Klamath National Forest.

The Klamath National Forest Noxious Weed and Non-native Invasive Plant List (Appendix A) includes high priority plants (H) from the State and County lists that are known or expected to occur on the Klamath National Forest. Based on inventories and current understanding of species' ranges, a total of thirty high priority NNIS are on the list (USDA 2013b). In addition, there are fifteen species of moderate and low priorities also included on the list that may be addressed in projects if those species are a problem locally. This list is used for resource management and decision-making, and is subject to change to reflect new information.

To determine which NNIS are located within the project area the following resources were consulted:

- Klamath National Forest Noxious Weed and Non-native Invasive Plant List (Appendix A)
- Klamath National Forest species occurrences records (Natural Resource Inventory Database - Invasive Species Survey and Inventory Application)
- Klamath National Forest NNIS treatment records

Inventory and Mapping

The Forest Service has developed national standards and protocols for the Inventory, Monitoring, and Mapping of Invasive Plants (USDA 2013c). NRM – TESP/IS (Invasive Species Survey and Inventory Application) and NRM-FACTS (Forest Activity Tracking System) are the databases of record for all survey and inventory data, and treatment and treatment monitoring activities for all invasive species management activities on the forest. These databases were used for information on NNIS sites that are currently mapped within or adjacent to the project area.

Annual weed inventories are conducted throughout the Klamath National Forest on a rotating basis across landscapes. If new invaders are discovered, they are mapped and a treatment plan is created based on priority and program capacity.

Risk Assessment

The invasive species risk assessment was developed to standardize the process for determining the risk of introducing or spreading noxious weeds associated with a project. For projects having a moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation (FSM 2903.04)

Risk of weed spread within a project area is evaluated using the following five risk factors:

- Known populations of NNIS within the project area;
- Vulnerability of the habitat to NNIS invasion;
- Possible non-project related vectors that may contribute to NNIS spread;
- The amount of disturbance resulting from project activities; and
- How much project activities will contribute to NNIS spread.

The risk analysis of introducing or spreading NNIS with the proposed activities are generally described as very low, low, moderate, or high, with the following definitions:

- *Very low* = no measurable effect on existing NNIS infestations or susceptible habitat.
- *Low* = existing NNIS infestations and/or susceptible habitat not likely affected
- *Moderate* = existing NNIS infestations or susceptible habitat affected, with the potential for expansion into un-infested areas and/or establishment of new invaders.
- *High* = NNIS infestations and/or susceptible habitat affected, with a high likelihood of expansion into un-infested areas and/or establishment of new invaders.

A risk analysis was conducted based on current distribution of NNIS in habitats similar to those found in the proposed treatment areas and on the types of proposed project activities. The estimation of risk of NNIS spread and introduction of new NNIS invaders from the proposed activity is based on peer-reviewed literature, experience in the project area and on similar sites in the KNF, and professional judgment.

Effects of proposed actions on NNIS spread are based on the amount of canopy removal, on the predicted amount of soil and/or understory vegetation disturbance, and on the predicted effectiveness of the project design features in each alternative. Proposed actions with greater disturbance of existing vegetation and with greater soil disturbance would have a higher risk of NNIS spread.

Spatial and Temporal Context

The project area, divided by subpart, will serve as the geographic bounds for effects analysis of Non-native and Invasive species. Determination of the risk analysis area for NNIS considered the extent of currently documented NNIS infestation and likely seed dispersal distance. This is an appropriate area to assess the effects of the proposed project because of the similarity of NNIS composition and distribution on adjacent lands and due to difficulties in predicting long distance vector transport.

Temporal bounding for NNIS will be less than five years for the short-term effects and greater than five years for long term effects. Temporal bounding was chosen to account for seed germination and dormancy characteristics, as well as to account for the difficulty in identifying biennial and perennial vegetative life stages (rosettes).

Affected Environment

The Westside Fire Recovery project area is composed of the Beaver Fire (Subpart A), Happy Camp Complex (Subpart B), and Whites Fire (July Complex) (Subpart C) which all occurred on the Klamath National Forest during the summer of 2014. These fires resulted in a mosaic pattern of burned vegetation from the variety of burn intensities that occurred across the Project area.

Based on site visits and RAVG data the following assumptions are made:

- areas characterized by high severity burns experienced 75% or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris;
- areas characterized by moderate severity burns experienced 50-75% vegetation mortality, substantial reduction in canopy and understory cover, as well as duff layers and large woody debris; and
- areas characterized by no or low severity burns experienced 0-50% vegetation mortality and a reduction in fuel loading.

The loss of under and over story canopy cover, competing vegetation, and duff layers creates an ideal environment for colonization and spread of non-native invasive species be removing barriers to establishment. Twelve Non-Native Invasive Species (NNIS) have been identified within the analysis area (table 6). Of these species, 7 are considered to be high priority, 4 are considered moderate priority and 1 is considered a low priority on the Klamath national Forest. A high priority NNIS is one that is of important local management concern because of its currently limited distribution on the KNF, highly invasive nature, and demonstrated potential to displace large geographic areas of native plant communities. For this Project, the risk analysis will only evaluate the likelihood for introducing and spreading high and moderate priority species. The low priority species present in the Project area will not be considered in the analysis because it is of lesser concern on the Forest and is not considered an issue locally. These species are discussed in detail in the weed risk analysis below.

The invasive species known to occur in the project area prior to the 2014 fire season were introduced and spread primarily through transport on vehicles, in straw and hay, on earthmoving, mowing or weed-eating equipment, and on animals associated with these activities. Following the fires, it is highly likely that these existing infestations were further spread by suppression efforts. Currently, the risk of introduction and spread for NNIS is high for each Project subpart

due to the loss of competing vegetation and canopy cover, soil disturbance, activation of dormant seedbanks, and potential spread from fire suppression activities.

Species Accounts

Cardaria chalepensis (Lens-podded white top) *and Cardaria draba* (White top)

Cardaria chalepensis and *C. draba* are closely related species with very similar life cycle characteristics. Due to the similarity in dispersal and management considerations, these species are described together in this report.

Cardaria chalpensis and *Cardaria draba* are erect perennials that can tolerate a wide range of soil types and moisture conditions. They typically occur in disturbed open sites, fields, agricultural areas, roadsides, and ditches. These species form dense infestations that crowd out native plants in open, un-shaded areas and can be difficult to eradicate due to the production of a deep tap root and their ability to spread vegetatively through fragmentation (DiTomaso and Healy 2007).

Plants primarily reproduce vegetatively from clonal colonies developed from creeping roots or through root fragmentation. Under favorable conditions, these species can increase vegetatively by more than 100 cm per year (DiTomaso and Healy 2007). Very small pieces of root fragments are capable of growth allowing these species to easily spread and create new infestations through the transport of contaminated soils. Although sexual reproduction seems to be less important to spread, these species are capable of producing 1,000 to 5,000 seeds per stem (each plant has multiple stems) which can remain viable as a seed bank for up to 5 years (DiTomaso and Healy 2007). Seed germination typically occurs in autumn after the first rains, with the plants overwintering as rosettes and flowering the following spring. Seeds are dispersed by water, vehicles, heavy equipment, contaminated hay, and short distance by wind.

Both species are B-rated pests and are considered moderate priority for the Klamath National Forest, meaning that these species are generally common, and are treated on a case by case basis depending on the location (USDA 2013c). There are currently 17 populations of *C. chalepensis* on the Forest, with all 4 occurring in subpart A of the Project area for a total of 2.5 infested acres. There are currently 14 populations of *C. draba* on the Forest, with 1 occurring in subpart A of the Project area for a total of 0.1 infested acres (table 7).

Centaurea maculosa (Spotted knapweed)

This species is a short-lived (up to 9 years) perennial forb that forms a deep tap-root from a basal rosette, and produces multiple stems. The taxonomy of this species in North America has seen many changes, and the name used here, *C. maculosa*, is a synomym for *C. biebersteinii* and *C. stoebe ssp. micranthos*. *Centaurea maculosa* was discovered to be a problem on the Klamath National Forest in 1997, and since then, control efforts have been on-going with some significant successes. However, this species can disperse via multiple vectors and there are still occasions where infestations are discovered for the first time, particularly in areas of mixed land ownerships where ground disturbance has been significant.

Centaurea maculosa reproduces solely through the sexual production of seeds. An individual plant can produce as many as 40,000 seeds per plant can be shed (DiTomaso and Healy, 2007), although production is variable depending on site condition, plant age, herbivory, and seed predation. Seeds can remain viable in the soil for more than 15 years (pers. com, Knight, M., 2015). Seed dispersal is primarily facilitated by human activities: roads, machinery,

contaminated hay, recreation; but can also be spread quite quickly on animals, birds and through waterways and wind.

Centaurea maculosa is highly adaptable, and can be found in multiple habitats, the common denominator being disturbance. The species is difficult to see unless it is flowering, which occurs late in the season, usually July-October. Since the taproot is so deep-seated, fire in not likely to kill this species, or kill seeds in the seed bank, making it one of the first plants to come back after fire. This is exactly what was observed in the Salmon fire of 2013, where dormant seed beds of *C. maculosa* were stimulated to germinate post fire.

Centaurea maculosa is an A-rated pest and a high priority species on the Forest. Most spotted knapweed infestations on the Klamath NF are being actively controlled by hand-pulling. This method, if applied consistently, can be effective control as long as revisits are conducted regularly to capture re-sprouting individuals.

There are currently 112 sites on the Forest, with 9 sites occurring in subpart B and 13 sites occurring in subpart C of the project area for a total of 13.6 infested acres (table 7).

Centaurea solstitialis (Yellow star thistle)

This species is an annual to biennial plant that grows up to 2 meters tall and has multiple branched stems with many flower heads subtended by spiny bracts. Plants reproduce by seed, with large plants producing as many as 75,000 seeds. *Centaurea solstitialis* was originally introduced into California from the Mediterranean region around 1850 and currently infests approximately 20 million acres in California. Plants occur in open, disturbed areas such as roadsides, burns, and logged areas, and can spread rapidly into habitats with open canopies such as grasslands and oak woodlands (DiTomaso and Healy 2007).

Seeds are dispersed by wind, water, birds and mammals, and human activities via numerous vector pathways. Of particular concern is the potential for spread from contaminated straw, hence the requirement for Certified weed free straw to be used. Seeds can remain viable in the soil for up to ten years (MSU 2001), however infestations under a successful treatment regimen where seed set is avoided, show great progress in three to four years (M.Knight, pers observation).

Centaurea solstitialis is a C-rated pest, and a moderate priority for the Klamath National Forest (USDA 2013) due to its widespread occurrence. Over 124 infestations have been identified on the Forest. Of those, 6 are within subpart A, 10 are within subpart B, and 1 is within subpart C of the Project area (table 7). Because it is so common, many of the infestations which tend to be very large, have not been mapped and the species has been given a lower treatment priority; however, there are high priority sites of this species near trailheads, wilderness, and areas of botanical concern that are treated to protect those resources.

Centaurea squarrosa (Squarrose knapweed)

Centaurea squarrosa is a class A species and a high priority for the Forest. It is a perennial species that averages about 18” tall and prefers disturbed open sites. It is distinguished from the other knapweeds by having a bushy appearance, spiny re-curved bracts on the flower head that act as hooks for dispersal, blooming in May or June (earlier than most knapweeds), and by having a unique dispersal mechanism whereby the seed head breaks off entirely on passing animals or people.

Centaurea squarrosa spreads through the sexual production of seeds. Main dispersal is through animal and human transport of the barbed seed heads. Dispersal can also be enhanced through soil and water movement. There are effective bio-controls available for this species; however the infestations on the Klamath are not large enough to support the bio-control agents. All treatments for this species are manual hand-pulling, and given the limited number of infestations known, it is a high priority species for treatment.

There are 15 sites on the Forest, and 5 sites within subpart B of the project area for a total of 0.9 infested acres (table 7). The majority of these infestations are on the river bar, and are not likely to be affected by fuel reduction treatments.

Cytisus scoparius (Scotch broom)

This species is an aggressive woody shrub in the pea family. It is very difficult to control because of its prodigious seed production and long-lived seed bank. One, medium-sized shrub can produce over 12,000 seeds per year which are able remain viable in the soil for 30 years, and possibly longer depending on site conditions (Zouhar 2005). Additionally, it is highly flammable, carries fire into the tree canopy, and increases the frequency and intensity of fire (Bossard 1991).

Cytisus scoparius reproduces from seed and has the ability to sprout from the root crown following damage or destruction of above ground portions. Seeds are produced in legumes which forcibly eject seeds an average distance of 3 feet as they dry (Zouhar 2005). *C. scoparius* seeds also contain elaiosomes that attract ants who gather the seeds and carry them back to their nest (Bossard 1991). Subsequently, *C. scoparius* bushes are often found in abundance around ant nests. Because the seeds are smooth, they are not typically dispersed on the fur of wildlife or livestock, but may also be transported by waterways, vehicles and equipment. Plants can re-sprout from the root crown following cutting, freezing, or fire. After fire, a flush of new seedlings is produced in recently burned areas with an existing seed bank (Zouhar 2005).

Although CDFA gives *C. scoparius* a C-rating for the state, it is a high priority species on the Forest. There are currently 125 populations of *C. scoparius* mapped on the Forest, with 18 populations occurring in subpart B and 3 populations occurring in subpart C of the Project area for a total of 66.7 infested acres (table 7).

Euphorbia esula (Leafy spurge)

This species is a perennial, growing up to 2.5 feet tall, with vertical and lateral roots extending to depths of 27 feet under optimal conditions (DiTomaso and Healy, 2007). The plant has milky sap that is an irritant to both humans and animals. It is one of the most tenacious weeds in the United States, forming large, dense colonies, which on the Klamath National Forest are along the Scott and Klamath River riparian corridors.

Dispersal is both by seed and extensively creeping roots. Seed capsules rupture upon maturity, and forcefully eject seeds up to 15 feet from the parent plant. New infestations are usually initiated by seed, but population expansion is primarily vegetative. Vectors include waterways, human activities, mud, and insects (ants).

The State of California has listed leafy spurge as an A-rated species, and the Forest considers this a high priority species, although effective treatment options are limited. The potential for degradation of native plant communities and habitat quality is extremely high for this species, due to the longevity of the species, and its ability to inhibit the germination of some other plant

species (DiTomaso and Healy, 2007). Once infestations become established, control is a challenge, requiring large investments of time and money. Extensive, cooperative inventories between the Forest and Siskiyou County Dept. of Agriculture have resulted in 406 populations of leafy spurge mapped on private and federal lands in the County. Of those 55 are within subpart B of the project area for a total of 28.5 infested acres (table 7). All known populations in the Project area are located along river bars of the Scott and Klamath Rivers. Leafy spurge is not likely to be spread or impacted by project activities, unless water drafting sites are necessary within infestations.

Isatis tinctoria (Dyer's woad)

This species is a winter annual, biennial or short-lived perennial, and is widespread and expanding on the Klamath NF and throughout Siskiyou County. It is difficult to eradicate due to its robust tap root, ability to resprout from the root crown following injury, and prolific seed production. The species has shown no elevation limits and forms large, dense colonies that have the potential to displace desirable native plant species. Areas subjected to disturbance, whether fire, flood, or human made, are highly susceptible to invasion by this species. Re-sprouting will occur from the taproot near the crown of the plant for several years if it is mechanically injured, although in some cases on the Klamath, mowing with weed-eaters has been an effective control mechanism where the infestation is too large to hand-pull.

Isatis tinctoria primarily spreads through seed production; however it will resprout from the taproot near the crown of the plant for several years following mechanical injury (CDFA 2014). An average plant will typically produce 250-500 seeds per year (CDFA 2014). Seeds are dispersed by vehicles along roadways, along waterways and by animals through ingestion. The seeds usually fall close to the parent plant, but wind can disperse seeds farther (CDFA 2014). Fire will top kill existing plants, but not kill underground portions of the plant. Post-fire conditions may allow plants to spread more rapidly (Zouhar 2009), largely due to lack of competition from other plants and the existing seed bank which is not affected by fire, especially fast-moving fire.

Isatis tinctoria is a C-rated pest species and a moderate priority species on the Klamath NF (Cal-IPC 2006). *Isatis tinctoria* is a common invasive found throughout the Klamath NF with over 239 populations identified on the Forest. Of these, 6 populations are in subpart A, 38 populations are in subpart B, and 9 populations are in subpart C of the Project area for a total of 614.4 infested acres (table 7).

Lepidium latifolium (Perennial pepperweed)

This species is an erect perennial that grows up to 6 feet tall. It is highly competitive in riparian areas where it can form dense colonies that displace native vegetation (DiTomasao and Healy 2007). This species can be difficult to eradicate due to the production of a long, robust, creeping roots and their ability to spread vegetatively through fragmentation (DiTomaso and Healy 2007).

Lepidium latifolium spreads primarily through vegetative reproduction from creeping roots and root fragmentation, and less importantly by seed. Its root system does a poor job holding soil together, which encourages erosion of riparian banks and subsequent spread through fragmentation (DiTomaso and Healy 2007). Large root fragments are able to withstand desiccation for extended periods of time creating a vegetative "seed" bank. Seed production is often abundant and highly viable; however seedlings are seldom encountered in the field

possibly due to white rust infection (DiTomaso and Healy 2007). It is unclear whether *L. latifolium* seeds persist as a seed bank, although laboratory studies indicate that they may remain viable for up to 2 years (Miller et al. 1986). Primary dispersal of root fragments and seeds is through waterways, floods, and soil movement as well as on animals, personnel, vehicles, and equipment.

Lepidium latifolium is a B-ranked pest for the state and is considered a high priority on the Forest. There are currently 16 populations of *L. latifolium* mapped on the Forest, with 11 populations occurring in subpart B of the Project area for a total of 2.4 infested acres (table 7).

Tribulus terrestris (Puncture Vine)

This species is a prostrate summer annual with stems that can reach greater than 3 feet in length (Di Tomaso and Healy 2007). It typically occurs in disturbed sandy soils, on roadsides, railways, cultivated fields, orchards, vineyards, and walkways. This species is considered a nuisance because it produces burs with stout spines that can injure humans and animals and the plants are toxic to livestock.

Tribulus terrestris spreads solely through the sexual production of seeds (DiTomaso and Healy 2007). Individual spiny burs disperse by adhering to the fur of animals, the shoes and clothes of personnel, and to the tires of vehicles and equipment. Each plant is capable of producing hundreds of seeds that can remain viable as a seed bank for several years (DiTomaso and Healy 2007).

Although CDFA give *T. terrestris* a C-rank for the state, it is considered a high priority on the Forest because of its scarce distribution. There are currently 5 mapped populations on the Forest, with 1 population occurring in the Project area which totals 0.1 infested acres (table 7).

Table 7: Acres of non-native invasive species infestations within the Westside Fire Recovery project area.

Scientific Name	Forest Priority	In Subpart A (Beaver)	In Subpart B (Happy Camp)	In Subpart C (Whites)	In Project Area
Cardaria chalepensis	Moderate	2.5	0	0	2.5
Cardaria draba	Moderate	0.1	0	0	0.1
Centaurea maculosa	High	0	1.2	12.4	13.6
Centaurea pratensis	High	0	1.1	0	1.1
Centaurea solstitialis	Moderate	240.3	23.9	0.25	264.5
Centaurea squarrosa	High	0	0.9	0	0.9
Cirsium vulgare	Low	0	0.7	0	0.7
Cytisus scoparius	High	0	66	0.7	66.7
Euphorbia esula	High	0	28.6	0	28.6
Isatis tinctoria	Moderate	164.23	182.8	267.32	614.4
Lepidium latifolium	High	0	2.4	0	2.4
Tribulus terrestris	High	0.1	0	0	0.1

Environmental Consequences

The risk of introducing and spreading non-native invasive species as a result of the Westside Fire Recovery Project were evaluated using the risk assessment described above.

Alternative 1

Under Alternative 1, there would be no direct effects to NNIS. Alternative 1 provides reviewers a baseline to compare the magnitude of environmental effects from doing nothing with the action alternatives.

Direct and Indirect Effects

Implementation of Alternative 1 would result in no direct introduction of new species or spread of existing NNIS populations from project activities.

Known Noxious Weeds

There are twelve known NNIS in the Project area infesting a total of 26,785 acres. Under Alternative 1, areas which currently have NNIS infestations would continue to support these species, providing seed sources for dispersal into adjacent areas. With limited competition, high levels of recent disturbance and increased nitrogen levels, the project area is highly susceptible to the spread of current populations. There is a **high** risk of spread of these species in the Project area.

Habitat Vulnerability

The Westside Fire Recovery Project area is highly vulnerable to the invasion of NNIS due to the severe fire intensity of the 2014 fires which removed the majority of vegetation and duff layers that normally compete with and impede the establishment of invasive species. Bare ground has no buffer from invasion by any species that may be introduced, and functionally has higher nutritional availability due to the ash layer which provides a flush of nitrogen

The dense volume of standing dead trees will result in high levels of fuel loading which could indirectly elevate the risk of NNIS spread by increasing the severity of the next wildfire. High severity wildfires promote the proliferation of NNIS infestations by removing competition from native vegetation cover and other barriers to establishment.

Habitat within the Project area is extremely vulnerable and thus has a **high** risk of NNIS invasion.

Non Project Dependent Vectors

Non-native invasive species populations may be indirectly introduced and/or spread from non-project dependent vectors, such as public traffic (foot, vehicle, and equestrian), wind, birds, and mammals. Additionally, the logging occurring on private lands in subpart A and B of the project area has the potential to introduce and spread NNIS as the private sector is not required to implement weed prevention measures.

Due to the abundance of known NNIS populations present in and adjacent to the project area, the high level of disturbance from the 2014 fires, and the substantial use of the project area for

recreation, wood cutting, and hunting indicates that there is an overall **high** risk of weed introduction and spread.

Habitat Alteration Expected as a Result of the Project

Habitat alteration would not be expected as a result of the Project under the No Action Alternative.

Increased Vectors as a Result of Project Implementation

Implementation of the No Action Alternative would not result in increased NNIS vectors as a result of Project implementation.

Summary of Indirect Effects

Indirect effects include the existing NNIS populations that will continue to spread at their current or higher rates due to the disturbance from the 2014 fires and suppression efforts, the subsequent habitat vulnerability, and the numerous non-project dependent vectors that are present in or utilize the project area.

Cumulative Effects

All activities and factors listed in Appendix C of the *Westside Fire Recovery Environmental Impact Statement* may cumulatively affect the proliferation of NNIS infestations, especially projects on private lands that are not required to mitigate the spread of NNIS infestations. On-going and future foreseeable Forest projects have been or will be evaluated for the risk of introduction and spread of NNIS infestations. Project design features have been or will be incorporated into Forest projects to limit their effects on the spread and introduction of NNIS infestations. It is expected that because of these risk evaluations and the inclusion of project design features, cumulative effects from Forest projects will have a neutral effect on the risk of introducing and/or spreading NNIS.

Spread from non-project dependent vectors (the public, wildlife, grazing allotments, ect...) may cumulatively affect the proliferation of NNIS populations within the Project area. Factors that are not planned and difficult to control such as wildfire, dispersed recreation, and climate change may also pose a high risk of proliferating NNIS infestations.

Projects on private lands are not required to mitigate for the spread and/or introduction of NNIS species which could also increase negative cumulative effects to NNIS populations and subsequently raise the risk rating.

There are 8 grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations in the project area. Livestock mainly transport NNIS propagules on their fur or through ingestion. Many NNIS have barbed or prickly seeds that readily adhere to animal fur and may potentially be transported long-distance and/or fall off in areas that are currently weed-free. Since many NNIS seeds can pass through the stomach unaffected, ingested seeds may also introduce NNIS to new areas once they are expelled. The added cumulative effects of grazing to Alternative 1 would likely increase the risk of NNIS introduction and spread.

The BAER team analyzed the project area and prescribed emergency treatments to help limit the introduction and spread of NNIS from the 2014 fires and suppression activities. Emergency

treatments will take place in the first year following the fires (2015) and will include additional surveys for NNIS within the fire footprints and contingency areas as well subsequent hand removal of newly located infestations. These treatments will help control the introduction and spread of annual NNIS species, such as *Centaurea solstitialis.* Unfortunately, biennial and perennial species that have a rosette lifestage are difficult to locate in the first year because of their short stature, and may not be found during these surveys. The Forest Noxious Weed Detection and Treatment program would also continue to survey for and treat new populations that may be introduced or spread onto Forest lands through on-going and future foreseeable Forest and Private land projects; however, the cumulative risk for the introduction and spread of NNIS would remain high due to the highly vulnerable condition of the habitat.

Alternative 2

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct and Indirect Effects

Known Noxious Weeds present and adjacent

Ten non-native invasive species (NNIS) have been identified within the analysis area for Alternative 2 (Appendix B).

Beaver

There are 2 moderate priority NNIS, *Centaurea solstitialis* and *Isatis tinctoria*, located within or adjacent to activity units in this subpart (Table 12).

There are 6 populations of *C. solstitialis* located within or adjacent to activity units and 24 miles along roads identified for hazard tree removal. There are 5 populations of *I. tinctoria* located within or adjacent to activity units and 16 miles along roads identified for hazard tree removal. These species are common across the Forest, and because of their widespread distribution they are typically given a lower priority than less common weeds and thus there is a high likelihood that there are populations of both *C. solstitialis and I. tinctoria* within the Project area that have not been mapped. Because these species are both located in activity units and along haul routes there is potential for spread through the disturbance of existing populations, activation of seed banks, and transport on equipment and vehicles. There is a **high** risk of spread of these two species within this subpart.

Happy Camp Complex

There are eight NNIS located in or adjacent to activity units. Of these, six are high priority species, *Centaurea maculosa, Centaurea pratensis, Centaurea squarrosa, Cytisus scoparius, Euphorbia esula,* and *Lepidium latifolium*; and 2 are considered moderate priority species, *Centaurea solstitialis* and *Isatis tinctoria*. The number of populations and infested acres of each NNIS that may be affected by alternative 2 are displayed in Table 12 by subpart and activity type.

There is 1 population of *C. pratensis* known in this subpart along a road identified for hazard tree removal. The populations is located on private property adjacent and surrounding the 5 mile bridge on Elk Creek road. Because this population is on private property, Project design features

cannot be used to mitigate spread. However, the land owners in conjunction with the Forest Noxious Weed crew have been effectively working to eradicate this population since 2005. Due to these continued treatment efforts, the likelihood of spread from this population is **low**.

Euphorbia esula and *Lepidium latifolium* populations occur in riparian areas located along river and stream banks and thus have a **very low** likelihood of being disturbed by Project activities, unless water drafting sites are located within known populations.

There are approximately 15 miles identified for roadside hazard tree removal that are infested with NNIS in subpart B. The numbers of infested roadside miles being considered for hazard tree removal under alternative 2 are displayed by species in Table 13.

Because *Centaurea maculosa, Centaurea squarrosa, Cytisus scoparius, Centaurea solstitialis* and *Isatis tinctoria* are located in activity units and along haul routes there is potential for spread through the disturbance of existing populations, activation of seed banks, and transport on equipment and vehicles. There is a **high** risk of introduction and spread of these NNIS within this subpart.

Whites

There are 4 NNIS infestations located in or adjacent to activity units. Of these, 2 are high priority species, *Centaurea maculosa* and *Cytisus scoparius*, and 2 are moderate priority species, *Centaurea solstitialis* and *Isatis tinctoria*. Additionally, there are approximately 26 miles identified for roadside hazard tree removal that are infested with NNIS in subpart C.

The number of populations and infested acres of each NNIS that may be affected by alternative 2 are displayed in Table 12 by subpart and activity type. The numbers of infested roadside miles being considered for hazard tree removal under alternative 2 are displayed by species in Table 13.

Because these species are located in activity units and along haul routes there is potential for weed spread through the disturbance of existing populations, activation of seed banks, and transport on equipment and vehicles. There is a **high** risk of introduction and spread of NNIS within this subpart.

Habitat Vulnerability

Subparts A, B and C have had major habitat disturbance due to the 2014 Beaver Fire, Happy Camp Complex and Whites Fire and subsequent suppression efforts. The loss of under and over story canopy cover, competing vegetation, and duff layers during these fires has created an ideal environment for colonization and spread of non-native invasive species be removing barriers to establishment. These areas are highly vulnerable and thus have a **high** risk of invasion by non-native invasive species.

Non-project Dependent Vectors

Non-native invasive species populations may be indirectly introduced and/or spread from non-project dependent vectors, such as public traffic (foot, vehicle, and equestrian), wind, waterways birds, and mammals. The majority of NNIS species in the Project area are prolific seeders. With extensive infestations occurring along roadways, dispersal distance may be greatly increased through transport on recreational vehicles. Seeds may also be spread by wildlife as well as

livestock. There are 8 grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations. The logging occurring on private lands in subpart A and B of the project area also has the potential to introduce and spread NNIS. The composition of NNIS is comparable between private and Forest lands in these areas and spread between them is likely to occur, especially because the private sector is not required to implement weed prevention measures. Due to the abundant seed production, high amount of infested roadside miles, extensive recreational use, and considerable private logging occurring in the Project area there is a **high** risk of invasion by NNIS.

Habitat Alteration Expected as a Result of Project Implementation

Areas that burned at high - moderate severity are already highly susceptible to weed invasion because shade and duff layers, which typically provide a barrier to weed establishment, have been lost. Therefore, project activities are not expected to increase invasion potential through the removal of canopy cover or duff layers. Units with planned site preparation and planting activities will likely re-establish canopy cover at a quicker rate. As canopy cover is re-established the potential risk and persistence of NNIS infestations is expected to decline.

The maintenance, reconstruction, and creation of landings and temporary roads can contribute to the spread of NNIS infestations (Merriam et al. 2004). Infestations that may be impacted by road construction and maintenance activities are displayed in Table 13 above, and NNIS infestations that may be impacted by landing creation and use are displayed in table 8 below. Soil disturbing activities, such as grading, may spread existing weed infestations and activate existing noxious weed seed banks. Any project activities that contribute to the movement of soils contaminated with NNIS propagules will contribute to the spread of infestations. Stockpiles of crushed aggregates can also be infested with NNIS which are easily spread during use of these stockpiles. Equipment carrying contaminated soils can contribute to long-distance dispersal by depositing seeds along haul routes and into stream crossings. Water-tenders may also spread NNIS propagules through waterways when filling their tanks, allowing new infestations to establish downstream.

Species adapted to open disturbed sites will be primary colonizers in most units. Following establishment, NNIS infestations are extremely difficult to eradicate and alter native vegetation and soil structure. Given the chance to expand, NNIS infestations will displace native vegetative communities, fragmenting sensitive plant and animal habitat (Scott and Pratini 1995). Large infestations of NNIS, such as *Cytisus scoparius* and *Centaurea solstitialis*, alter fire behavior by changing vegetative communities, decreasing soil moisture, and increasing flammable fuels (Keeley et al. 2011). These changes to fire behavior will predispose Forest areas to burn more frequently and at higher intensities (DiTomaso and Healy 2007).

Due to the high level of disturbance already present in the Project area as a result of the 2014 fires, the risk for introduction and spread of NNIS infestations is **moderate**.

Table 8: NNIS infestations on or adjacent to landings that may be affected by the Alternative 2.

Subpart	Species	Population	Landing	Status	Infested acres
A - Beaver	*Centaurea solstitialis*	HETO16	L177	Existing	1.09
			L220	New	1.03
			L223	New	1.01
			L224	New	1.52
			L225	New	1.16
		RYTH5	L174	Existing	0.02
			L176	Existing	1.21
			L203	New	0.82
			L219	New	1.3
B - Happy Camp	*Centaurea solstitialis*	RSC23	L002	Existing	0.1
	Isatis tinctoria	ISTI-178	L044	New	0.06
		ISTI-169	L034	Existing	0.2
			DZ17	New	0.25
		ISTI-122	L261	New	1.09
		ISTI-148	L005	Existing	3.03
			L006	New	2.5
			L007	New	1.53
		ISTI-73	L013	Existing	1.65
			L269	New	0.6
C - Whites	*Isatis tinctoria*	ISTI-93	L048	Existing	0.41
			L064	Existing	1.31
			L066	Existing	1.31

Increased vectors as a result of Project implementation

New road construction is one of the primary contributors to noxious weed invasion (Merriam et al. 2004). The construction of new roads increases vehicular access, which can increase the risk of new introduction by vehicles. New temporary road construction and existing road reconstruction is planned in this project; however these roads will be closed and stabilized after use. Quickly closing and stabilizing roads, seeding with native grasses where necessary, and mulching with weed free straw would reduce the likelihood that the new temporary roads would become vectors for NNIS spread. Most introduced NNIS do not compete well in the presence of heavy mulch layers and where natives quickly establish vegetative cover.

Helicopter logging in areas infested with NNIS would indirectly increase the rate of spread during the times when NNIS are in bloom, or when seed is ripe for dispersal. Down drafts from rotor blades could displace weed seeds and disperse them over large distances. This could

expand relatively small and isolated infestations subsequently increasing the time, effort and money required for control.

There would be an overall short-term increase in vectors due to temporary road construction and Project activities. Overall, this represents a **moderate** risk for introduction of NNIS for each subpart. Project design features and mitigation measures would minimize these effects.

Cumulative Effects

All activities and factors listed in Appendix C of the *Westside Fire Recovery Environmental Impact Statement* may cumulatively affect the proliferation of NNIS infestations, especially projects on private lands that are not required to mitigate the spread of NNIS infestations. On-going and future foreseeable Forest projects have been or will be evaluated for the risk of introduction and spread of NNIS infestations. Project design features have been or will be incorporated into Forest projects to limit their effects on the spread and introduction of NNIS infestations. It is expected that because of these risk evaluations and the inclusion of project design features, cumulative effects from Forest projects will have a neutral effect on the risk of introducing and/or spreading NNIS.

The five risk factors combined have a high potential for NNIS introduction and spread within the project area for Alternative 2, due to the high level of ground disturbing activities and increased vectors. Project design features and mitigation measures would minimize these effects; however the risk would remain high due to the pre-existing condition. On-going and future foreseeable projects would also implement mitigation measures aimed at reducing NNIS introduction and spread. Unfortunately, project design features cannot eliminate risk and it is expected that new NNIS infestations would still become established in spite of these mitigation measures. Consequently, the cumulative risk of NNIS introduction and spread from Forest projects would increase, resulting in a continued risk rating of high.

There are 8 grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations in the project area. Livestock mainly transport NNIS propagules on their fur or through ingestion. Many NNIS have barbed or prickly seeds that readily adhere to animal fur and may potentially be transported long-distance and/or fall off in areas that are currently weed-free. Since many NNIS seeds can pass through the stomach unaffected, ingested seeds may also introduce NNIS to new areas once they are expelled. The added cumulative effects of grazing to Alternative 2 would likely increase the risk of NNIS introduction and spread. Projects on private lands are not required to mitigate for the spread and/or introduction of NNIS species which could also increase negative cumulative effects to NNIS populations and subsequently raise the risk rating.

The BAER team analyzed the project area and prescribed emergency treatments to help limit the introduction and spread of NNIS from the 2014 fires and suppression activities. Emergency treatments will take place in the first year following the fires (2015) and will include additional surveys for NNIS within the fire footprints and contingency areas as well subsequent hand removal of newly located infestations. These treatments will help control the introduction and spread of annual NNIS species, such as *Centaurea solstitialis.* Unfortunately, biennial and perennial species that have a rosette lifestage are difficult to locate in the first year because of their short stature, and may not be found during these surveys. The Forest Noxious Weed Detection and Treatment program would also continue to survey for and treat new populations that may be introduced or spread onto Forest lands through on-going and future foreseeable

Forest and Private land projects; however, the cumulative risk for the introduction and spread of NNIS would remain high due to the highly vulnerable condition of the habitat.

Overall Level of Risk for the Project

The project area is already highly susceptible to NNIS infestation regardless of Project activities due to the numerous NNIS infestations already present, the vulnerability of the Project area from the 2014 fires, and the high recreational use of the Project area. In this alternative, the five risk factors combined have a **higher** potential for NNIS introduction and spread within the Project area when compared to the No Action Alternative, due to the higher level of ground disturbing activities and increased vectors. Project design features and mitigation measures would minimize these effects; however the risk would remain high due to the pre-existing condition. Continuation of the existing Forest weed monitoring and treatment program would detect any new high-priority weed sites that may become established within the project area. Quickly treating these sites will limit new NNIS establishment. Additionally, BAER inventories and treatments of NNIS spread from fire activities within the project area would help constrain NNIS introduction and spread.

Mitigation Measures

Resource protection measures have been developed to reduce the risk of NNIS introduction and spread in this Project. These include:

- Washing heavy equipment prior to and following off-road activities in the Project area;
- Equipment and vehicle exclusion from high priority and large NNIS infestations within the Project area;
- Management of infestations occurring on landings to prevent the spread of contaminated soils;
- Requiring the use of State certified weed free materials; and
- Requiring the inspection of materials for which certification does not exist.

These mitigation measures are accepted weed prevention practices developed by public land management agencies and university cooperative extension offices and promoted by weed management organization across the nation (Sheley et al. 2002, USDA 2013). The above measures include those required in Forest Service Manual for activities related to timber harvest and roads (FSM 2903).

Alternative 3

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from this alternative on the risk of spread and introduction of NNIS infestations would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those affects.

Alternative 4

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from this alternative on the risk of spread and introduction of NNIS infestations would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those affects.

Alternative 5

For a description of this alternative please see Chapter 2 of the *Westside Fire Recovery Environmental Impact Statement*.

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from this alternative to the spread and introduction of NNIS infestations would be slightly less than for Alternative 2. The decrease in risk is very minimal and not enough to lower the risk rating from **high.** The same Project Design Features would be incorporated to mitigate effects.

Compliance with Law, Regulation, Policy, and the Forest Plan

Forest Service Manual 2900 and Forest Plan Standards and Guidelines require that all projects be evaluated for the risk of noxious weed introduction and spread as a result of project activities. In addition, projects must be designed to reduce the risk of weed introduction or spread. In the action alternatives, Project Design Features have been incorporated which are expected to reduce the risk of weed introduction or spread. Forest Plan Standards and Guidelines and Manual direction will be met.

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Appendix A: Sensitive and Survey & Manage Species Table

Table A- 1: Detailed table of Sensitive and Survey & Manage species occurrence by alternative

Scientific Name	Subpart	Pop Number	Extirpated	Alt 2	Alt 3	Alt 4	Alt 5
Albatrellus flettii	C	ALFL6-5-3		F078, R136	Same	F078-7, R136	F078-7, R136
Alpova olivaceotinctus	A	ALOL3-5-1		NA	NA	NA	NA
Cantharellus subalbidus	B	CASU63-5-20		NA	NA	NA	NA
	B	CASU63-5-21		NA	NA	NA	NA
Choiromyces alveolatus	A	CHAL23-5-1		NA	NA	NA	NA
Cypripedium fasiculatum	A	CYFA-5-11		F162	F162, F175	F162	F162, F175
	A	CYFA-5-10		R045	Same	Same	Same
	A	CYFA-5-12	Y	NA	NA	NA	NA
	A	CYFA-5-86		NA	F182	NA	F182
	B	CYFA-5-33	Y	228-2, 55-2, 55	Same	55	NA
	B	CYFA-5-101		R101	Same	Same	Same
	B	CYFA-5-105	Y	262, R115	Same	Same	Same
	B	CYFA-5-103		F032, F068-1	Same	Same	Same
	B	CYFA-5-107		F030	Same	Same	Same
	B	CYFA-5-108		F030-2	Same	Same	Same
	B	CYFA-5-17		NA	NA	NA	NA
	B	CYFA-5-18	Y	NA	NA	NA	NA
	B	CYFA-5-19		NA	NA	NA	NA
	B	CYFA-5-20		NA	NA	NA	NA
	B	CYFA-5-21		NA	NA	NA	NA
	B	CYFA-5-22		NA	NA	NA	NA

Scientific Name	Subpart	Pop Number	Extirpated	Alt 2	Alt 3	Alt 4	Alt 5
	B	CYFA-5-23		NA	NA	NA	NA
	B	CYFA-5-24	Y	NA	NA	NA	NA
	B	CYFA-5-25	Y	NA	NA	NA	NA
	B	CYFA-5-26	Y	NA	NA	NA	NA
	B	CYFA-5-27	Y	NA	NA	NA	NA
	B	CYFA-5-28	Y	NA	NA	NA	NA
	B	CYFA-5-29	Y	NA	NA	NA	NA
	B	CYFA-5-30	Y	NA	NA	NA	NA
	B	CYFA-5-15		F043-5, R131	Same	Same	Same
	B	CYFA-5-32		R131	Same	Same	Same
	B	CYFA-5-33	Y	P321	Same	Same	Same
	B	CYFA-5-34		NA	NA	NA	NA
	B	CYFA-5-35		NA	NA	NA	NA
	B	CYFA-5-36		NA	NA	NA	NA
	B	CYFA-5-49		F146, R127-11	Same	Same	Same
	B	CYFA-5-50		F146, R127-11	Same	Same	Same
	B	CYFA-5-51		F027-1, F0146-1, R127-11	Same	Same	Same
	B	CYFA-5-52		NA	NA	NA	NA
	B	CYFA-5-53	Y	P119	Same	Same	Same
	B	CYFA-5-58	Y	NA	NA	NA	NA
	B	CYFA-5-76		F034, F034-1, F035, F035-1, 2, 3, R131	Same	Same	Same
	C	CYFA-5-1	Y	F157-1, R140	Same	Same	Same
	C	CYFA-5-111		F077, F077-1, F160-2, R140	Same	Same	Same
	C	CYFA-5-112		F019	Same	Same	Same

Scientific Name	Subpart	Pop Number	Extirpated	Alt 2	Alt 3	Alt 4	Alt 5
	C	CYFA-5-114	Y	NA	NA	NA	NA
	C	CYFA-5-14	Y	NA	NA	NA	NA
	C	CYFA-5-45		NA	NA	NA	NA
	C	CYFA-5-124	Y	R140, P017	Same	Same	Same
	C	CYFA-5-64		F157-2, R140	Same	Same	Same
	C	CYFA-5-70		F077, F077-1, F160-2, R140, R140-1	Same	F077, F077-1, F160-2, R140	Same
	C	CYFA-5-73		F020	Same	Same	Same
	C	CYFA-5-78		F077, F077-1, F160-2, R140	Same	Same	Same
Cypripedium montanum	A	CYMO2-5-19	Y	NA	NA	NA	NA
	A	CYMO2-5-21	Y	NA	NA	NA	NA
	A	CYMO2-5-22		NA	NA	NA	NA
	A	CYMO2-5-23		F091, R042	Same	Same	Same
	A	CYMO2-5-69	Y	R070	Same	Same	Same
	B	CYMO2-5-14	Y	NA	NA	NA	NA
	B	CYMO2-5-15	Y	NA	NA	NA	NA
	B	CYMO2-5-16	Y	NA	NA	NA	NA
	B	CYMO2-5-17	Y	NA	NA	NA	NA
	B	CYMO2-5-18	Y	NA	NA	NA	NA
	B	CYMO2-5-24	Y	NA	NA	NA	NA
	B	CYMO2-5-25	Y	NA	NA	NA	NA
	B	CYMO2-5-26	Y	NA	NA	NA	NA
	B	CYMO2-5-27	Y	NA	NA	NA	NA
	B	CYMO2-5-28		NA	NA	NA	NA
	B	CYMO2-5-29		NA	NA	NA	NA

Scientific Name	Subpart	Pop Number	Extirpated	Alt 2	Alt 3	Alt 4	Alt 5
	B	CYMO2-5-46		R127-11	Same	Same	Same
	B	CYMO2-5-47	Y	23, R127-11	Same	Same	Same
	B	CYMO2-5-48		NA	NA	NA	NA
	B	CYMO2-5-54		NA	NA	NA	NA
	B	CYMO2-5-86	Y	262	Same	Same	Same
	B	CYMO2-5-90	Y	005-9	Same	Same	Same
	B	CYMO2-5-46		F146	Same	Same	Same
	B	CYMO2-5-7		F044-1,2, R131	Same	Same	Same
	B	CYMO2-5-78		F034, F034-1, F035, F035-1,2,3, R131	Same	Same	Same
	B	CYMO2-5-82		NA	NA	NA	NA
	B	CYMO2-5-85		R115	Same	Same	Same
	B	CYMO2-5-86	Y	R115, R131	Same	Same	Same
	B	CYMO2-5-88		F151	Same	Same	Same
	B	CYMO2-5-89	Y	R131	Same	Same	Same
	B	CVYMO2-5-90	Y	R127-11	Same	Same	Same
	B	CYMO2-5-91		NA	NA	NA	NA
	B	CYMO2-5-93		F030	Same	Same	Same
	B	CYMO2-5-94		F030-2	Same	Same	Same
	C	CYMO2-5-10		F157, F157-2, R140	Same	Same	Same
	C	CYMO2-5-107		F160, R140	Same	Same	Same
	C	CYMO2-5-11	Y	R140, P017	Same	Same	Same
	C	CYMO2-5-3	Y	F157-1, R140	Same	Same	Same
	C	CYMO2-5-37	Y	R140, P017	Same	Same	Same
	C	CYMO2-5-44		R140	Same	Same	Same

Scientific Name	Subpart	Pop Number	Extirpated	Alt 2	Alt 3	Alt 4	Alt 5
	C	CYMO2-5-9		F020, F157, F157-1, R140	Same	Same	Same
	C	CYMO2-5-95		R140	Same	Same	Same
	C	CYMO2-5-96		F077, F160-2, R140	Same	Same	Same
	C	CYMO2-5-98		F019	Same	Same	Same
Eriogonum hirtellum	B	ERHI7-5-33	N	508-1, F071, R127-11, P065	Same	Same	Same
	B	ERHI7-5-31	N	R127-11	Same	Same	Same
	B	ERHI7-5-32	N	R093	Same	Same	Same
	B	ERHI7-5-34	N	NA	NA	NA	NA
	B	ERHI7-5-35	N	R127-4	Same	NA	Same
	B	ERHI7-5-36	N	R127-4	Same	NA	Same
Erythronium hendersonii	B	ERHE7-5-1	N	F025, F025-1, F026, F106, F106-1,3, R119	Same	Same	Same
	B	ERHE7-5-2	N	F109, R128	Same	Same	Same
Gomphus clavatus	B	GOCL-5-6		NA	NA	NA	NA
Marsmius applanatipes	C	MMAAP3-5-1		NA	NA	NA	NA
Mycena tenax	C	MYTE-5-1		NA	NA	NA	NA
Otidea leporina	B	OTLE-5-14		NA	NA	NA	NA
	B	OTLE-5-15		F151, R131	Same	Same	Same
Phaeocollybia californica	C	PHCA40-5-4		F078-7	Same	Same	Same
Phaeocollybia fallax	B	PHFA5-5-8		NA	NA	NA	NA
Phaeocollybia gregaria	B	PHGR23-5-3		NA	NA	NA	NA
Phaeocollybia	B	PHOL-5-11		F030	Same	Same	Same

Scientific Name	Subpart	Pop Number	Extirpated	Alt 2	Alt 3	Alt 4	Alt 5
olivacea	B	PHOL-5-12		NA	NA	NA	NA
	C	PHOL-5-8		F078-7	Same	Same	Same
Ptilidium californiucm	A	PTCA5-5-55		R040	Same	Same	Same
	B	PTCA5-5-18	Y	NA	NA	NA	NA
	B	PTCA5-5-71		NA	NA	NA	NA
	B	PTCA5-5-72	Y	226	Same	NA	NA
	B	PTCA5-5-73	Y	228, P321	Same	Same	NA
	B	PTCA5-5-94	Y	23, R127-11	Same	Same	Same
	B	PTCA5-5-95		R127-11	Same	Same	Same
	B	PTCA5-5-96	Y	524, F072, R127-11	Same	F072, R127-11	F072, R127-11
	B	PTCA5-5-99	Y	521, F072, R127-11	Same	Same	Same
	C	PTCA5-5-65		NA	NA	NA	NA
Ramaria abietina	B	RAAB4-5-1		NA	NA	NA	NA
Thermopsis robusta	B	THRO4-5-13	N	F043-4, R131	Same	Same	Same
Tremiscus helvelloides	B	TRHE7-5-4		F030	Same	Same	Same
	B	TRHE7-5-5		NA	NA	NA	NA

Appendix B: NNIS Infestations that may be affected by Project Activities

Table B- 1: Detailed table of NNIS infestations that may be affected by Project activities by alternative

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
Centaurea maculosa	B	CEMA4-151	R128	Same	Same	Same
	B	CEMA4-157	R082	Same	Same	Same
	B	CEMA4-163	F008, R082	Same	Same	Same
	B	CEMA4-166	R127-11	Same	Same	Same
	B	CEMA4-G	R100	Same	Same	Same
	C	CEMA4-119	P026, R136	Same	Same	Same
	C	CEMA4-540	F075	Same	Same	Same
	C	CEMA4-542	F076, , R140F159	Same	Same	Same
	C	CEMA4-543	F022, F076, F159, R140	Same	Same	Same
	C	CEMA4-538	F013, F155, R136	Same	Same	Same
	C	CEMA4-539	F155	Same	Same	Same
	C	CEMA4-546	F076, F159, R140	Same	Same	Same
	C	CEMA4-547	F077, F160, R140	Same	Same	Same
	C	CEMA4-174	R140	Same	Same	Same
	C	CEMA4-541	F015, F016, F076, R140	Same	Same	Same
	C	CEMA4-544	F160, R140	Same	Same	Same
	C	CEMA4-545	F076, F077, F160, R140	Same	Same	Same
	C	CEMA4-557	F155, R136	Same	Same	Same
Centaurea pratensis	A	CEPR2-12	R131, 45N19-0.02 DP	Same	Same	Same

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
Centaurea solstitialis	A	5102RYTH5	1151, 1155, P089, P099, F087, F088, R020, R021, R022	P089, P099, F087, F088	Same	Same
	A	5102HETO16	P089, P102, P105, P106, P107, F084, R024, R027	Same	Same	Same
	A	5102RYTH6A	P072, P073, P075, P113, F086, F087, F090, R015, R033, R038	Same	Same	Same
	A	5102HETO15	F087, R015	Same	Same	Same
	A	5102RYTH2A	F050, F051, F053, F080, F081, R030, R041, R054, R062, R073, R074	Same	Same	Same
	A	5102SHLO11B	R017	Same	Same	Same
	B	CESO3-48	F038, R131	Same	Same	Same
	B	CESO3-49	F036, F038, F044, F045, R131	Same	Same	Same
	B	CESO3-65	F038, R131	Same	Same	Same
	B	CESO3-66	F044, R131	Same	Same	Same
	B	CESO3-67	F044, R131	Same	Same	Same
	B	CESO3-77	F113, R131	Same	Same	Same
	B	CESO3-81	F036, F038 , R131, 45N19-0.02 DP	Same	Same	Same
	B	CESO3-88	R131	Same	Same	Same
	B	5503RSC23	R127-11	Same	Same	Same
	C	CESO3-52	F015	Same	Same	Same
Centaurea squarrosa	B	CESQ-12	F028	Same	Same	Same
	B	CESQ-H	F152, R132	Same	Same	Same
				Same	Same	Same

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
Cytisus scoparius	B	CYSC4-20	F109, R128	Same	Same	Same
	B	CYSC4-85	R128	Same	Same	Same
	B	CYSC4-97	F028, F029, R130	Same	Same	Same
	B	CYSC4-123	F026	Same	Same	Same
	B	CYSC4-104	R118	Same	Same	Same
	B	CYSC4-22	F038, R131, 16N05-6.88 AOP	Same	Same	Same
	B	CYSC4-23	F038R131	Same	Same	Same
	B	CYSC4-24	F037, F044, F045, R131	Same	Same	Same
	B	CYSC4-71	F113, R131	Same	Same	Same
	B	CYSC4-79	F038, F113, R131	Same	Same	Same
	B	CYSC4-80	F034, R131	Same	Same	Same
	B	CYSC4-81	R131	Same	Same	Same
	B	CYSC4-102	F034, F035, F043, R131	Same	Same	Same
	B	CYSC4-99	F038, R131	Same	Same	Same
	C	CYSC4-57	F155, R136	Same	Same	Same
	C	CYSC-109	F078	Same	Same	Same
	C	CYSC4-18	407, F157, R140	Same	Same	F157
Euphorbia esula	B	EUES-17	F028, F029, F034, R130	Same	Same	Same
	B	EUES-19	R109	Same	Same	Same
	B	EUES-15	R118	Same	Same	Same
	B	EUES-48	R118	Same	Same	Same
	B	EUES-59	R118	Same	Same	Same
	B	EUES-60	R102	Same	Same	Same
	B	EUES-41	R128	Same	Same	Same

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
	B	EUES-43	R111	Same	Same	Same
	B	EUES-44	F152, R132	Same	Same	Same
	B	EUES-46	R128	Same	Same	Same
	B	EUES-1	R131	Same	Same	Same
	B	EUES-2	R131	Same	Same	Same
	B	EUES-8	F034, R131	Same	Same	Same
	B	EUES-35	R106	Same	Same	Same
	B	EUES-22	R082	Same	Same	Same
	B	EUES-23	R100	Same	Same	Same
	B	EUES-24	R127-11	Same	Same	Same
	B	EUES-KK	R127-11	Same	Same	Same
	B	EUES-OO	R082	Same	Same	Same
	B	EUES-P	R100	Same	Same	Same
	B	EUES-PP	R082	Same	Same	Same
	B	EUES-Q	F002, R100	Same	Same	Same
	B	EUES-S	R096	Same	Same	Same
	B	EUES-U	R096	Same	Same	Same
	B	EUES-X	R094	Same	Same	Same
Isatis tinctoria	A	5102RYTH6B	P072, P073, P075, P113, F086, F087, F090, R015, R033, R038	Same	Same	Same
	A	5102RYTH2B	F050, F051, F053, F080, F081, R030, R041, R054, R062, R073, R074	Same	Same	Same
	A	5102RYTH4	R032	Same	Same	Same
	A	5102SHLO11A	R017	Same	Same	Same

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
	A	ISTI-216	F162	Same	Same	Same
	B	5102SHLO3	R128	Same	Same	Same
	B	ISTI-83	R131	Same	Same	Same
	B	ISTI-134	F151	Same	Same	Same
	B	ISTI-135	P160, F184, R127-11	Same	Same	Same
	B	ISTI-178	62, F030, R131	Same	Same	F030
	B	ISTI-169	23, P139, F127, F129, R127-11	Same	Same	Same
	B	ISTI-173	F146, R127-11	Same	Same	Same
	B	ISTI-175	R127-11	Same	Same	Same
	B	ISTI-210	R109	Same	Same	Same
	B	ISTI-102	F113, R131	Same	Same	Same
	B	ISTI-108	F038, R131	Same	Same	Same
	B	ISTI-116	F121, R103	Same	Same	Same
	B	ISTI-117	F121, R103	Same	Same	Same
	B	ISTI-118	F121, R103	Same	Same	Same
	B	ISTI-119	F033, F133, R116	Same	Same	Same
	B	ISTI-120	R131	Same	Same	Same
	B	ISTI-121	F068, R131	Same	Same	Same
	B	ISTI-122	F044, R131	Same	Same	Same
	B	ISTI-123	F044R131	Same	Same	Same
	B	ISTI-105	F069	Same	Same	Same
	B	ISTI-155	F038, R131	Same	Same	Same
	B	ISTI-179	R131	Same	Same	Same
	B	ISTI-143	F044, R131	Same	Same	Same
	B	ISTI-166	F116, R131	Same	Same	Same
	B	ISTI-167	F069, R131	Same	Same	Same

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
	B	ISTI-203	R131	Same	Same	Same
	B	ISTI-148	R127-11	Same	Same	Same
	B	ISTI-59	F008, R082	Same	Same	Same
	B	ISTI-61	R127-11	Same	Same	Same
	B	ISTI-81	F072, R127-11	Same	Same	Same
	B	ISTI-175	23, 005-3	Same	Same	23
	B	ISTI-148	500, 501, P057, P058, P059, P061, P063, R127-11	Same	Same	P057, P058, P059, P061, P063
	B	ISTI-77	R079	Same	Same	Same
	B	ISTI-74	R127-11	Same	Same	Same
	B	ISTI-73	506, 508-4, 508-5, P065, F071, R127-11	Same	Same	508-4, P065, F071
	C	5403RSC27	R140	Same	Same	Same
	C	ISTI-190	R140	Same	Same	Same
	C	ISTI-184	R140	Same	Same	Same
	C	ISTI-93	410, 411, F013, F016, F018, F022, F075, F076, F077, F155, F156, F159, F160, R136, R140	Same	Same	Same
	C	ISTI-184	P028	Same	Same	Same
	C	5403RSC24	F074, F078	Same	Same	Same
	C	5403RSC25	F021, F076	Same	Same	Same
	C	ISTI-55	F017, F019, F157, R140	Same	Same	Same
	C	ISTI-56	F075, R136	Same	Same	Same
	C	ISTI-100	F015, F076, R137	Same	Same	Same
Lepidium	B	LELA2-T	F152, R132	Same	Same	Same

Scientific Name	Subpart	Pop Number	Alt 2	Alt 3	Alt 4	Alt 5
latifolium	B	LELA2-U	R128	Same	Same	Same
	B	LELA2-W	R100	Same	Same	Same
	B	LELA2-AA	R082	Same	Same	Same
Tribulus terrestris	A	TRTE-4	R017	Same	Same	Same

Appendix C: Noxious Weed and Nonnative Invasive Plant List

Table C- 1: NNIS plant list

Scientific Name (Jepson, 2012)	Plant Code	Common Name(s)	KNF Priority	CDFA Rating	Cal-IPC Rating	Family
Acroptilon repens (L.) DC.	ACRE3	Russian knapweed	High	B	Moderate	Asteraceae
Ailanthus altissima	AIAL	Tree of Heaven	Mod.	C	Moderate	Simaroubaceae
Bromus tectorum L.	BRTE	Cheat Grass	Low	None	High	Poaceae
Buddleja davidii Franchet	BUDA2	Butterfly bush	Mod.	None	None	Buddlejaceae
Cardaria draba (L.) Desv.	CADR	Heart-podded hoary cress Whitetop	Mod.	B	Moderate	Brassicaceae
Cardaria chalapensis (L.) Hand.-Maz	CACH10	Lens-podded Whitetop	Mod.	B	Moderate♦	Brassicaceae
Cardaria pubescens (C.A. Mey) Jarmol.	CAPU6	Hairy whitetop	High	B	Limited	Brassicaceae
Carduus acanthoides L. subsp. acanthoides	CAAC	Plumeless thistle	High	A	Limited	Asteraceae
Carduus nutans L.	CANU4	Musk thistle	High	A	Moderate	Asteraceae
Carduus pycnocephalus L. subsp. pycnocephalus	CAPY2	Italian thistle	High	C	Moderate	Asteraceae
Centaurea diffusa Lam.	CEDI3	Diffuse knapweed, white knapweed	High	A	Moderate	Asteraceae
Centaurea maculosa Lam.	CEMA4 CESTM	Spotted knapweed	High	A	High	Asteraceae
Centaurea melitensis L.	CEME2	Malta starthistle	High	None	Moderate	Asteraceae
Centaurea pratensis Thuill.	CEPR2 CENI3	Meadow knapweed	High	A	Moderate ♦	Asteraceae
Centaurea solstitialis L.	CESO3	Yellow starthistle	Mod.	C	High	Asteraceae
Centaurea squarrosa Willd.	CESQ CEVIS2	Squarrose knapweed	High	A	Moderate	Asteraceae
Chondrilla juncea L.	CHJU	Rush skeleton weed, hogbite	High	A	Moderate	Asteraceae
Cirsium arvense (L.) Scop.	CIAR4	Canada thistle	Mod.	B	Moderate	Asteraceae
Cirsium vulgare	CIVU	Bull thistle	Low	C	Moderate	Asteraceae
Conium maculatum L.	COMA2	Poison hemlock	Low	None	Moderate	Apiaceae
Cynoglossum officinale L.	CYOF	Houndstongue	High	None	Moderate	Boraginaceae
Cytisus scoparius (L.) Link.	CYSC4	Scotch Broom	High	C	High	Fabaceae

Euphorbia esula L.	EUES	Leafy spurge	High	A	High♦	Euphorbiaceae
Euphorbia oblongata Grisb.	EUOB4	Oblong spurge	High	B	Limited	Euphorbiaceae
Foeniculum vulgare Mill.	FOVU4	Fennel	High	None	High	Apiaceae
Genista monspessulana (L.) L. Johnson	GEMO2	French broom	High	C	High	Fabaceae
Hypericum perforatum L.	HYPE	Klamath weed, St. John's wort	Low	C	Moderate	Hypericaceae
Isatis tinctoria L.	ISTI	Dyer's woad, Marlahan mustard	Mod.	B	Moderate	Brassicaceae
Lathyrus latifolius L.	LALA4	Sweet pea	Low	None	None	Fabaceae
Lepidium latifolium L.	LELA2	Perennial Pepperweed, tall whitetop	High	B	High	Brassicaceae
Linaria dalmatica (L.) P. Mill ssp. Dalmatica	LIDAD	Dalmatian toadflax	High	A	Moderate	Schropulariaceae
Lythrum salicaria L.	LYSA2	Purple Loosestrife	High	B	High	Lythraceae
Melilotus spp.	MEAL2, MEOF	White Sweetclover, Yellow Sweetclover	Low	None	None	Fabaceae
Myriophyllum spicatum L.	MYSP2	Eurasian milfoil	High	None	High	Haloragaceae
Onopordum acanthium L.	ONAC	Scotch thistle, Cottonthistle	High	A	High	Asteraceae
Onopordum tauricum Willd.	ONTA	Taurian thistle, Bull cottonthistle	High	A	None	Asteraceae
Polygonum cuspidatum Sieb. & Zucc.	POCU6	Japanese knotweed	High	B	Moderate♦	Polygonaceae
Potentilla recta L.	PORE5	Sulphur cinquefoil	High	A	None	Rosaceae
Rubus discolor	RUDI2	Himalayan blackberry	Low	None	None	Rosaceae
Salvia aethiopis L.	SAAE	Mediterranean sage	High	B	Limited	Lamiaceae
Sonchus arvensis	SOAR2	Perennial Sow-thistle	High	A	None	Asteraceae
Spartium junceum	SPJU2	Spanish Broom	High	C	High	Fabaceae
Taenaiatherum caputmedusae	TACA8	Medusahead	Low	C	High	Poaceae
Tamarix parviflora	TAPA4	Tamarisk	High	B	High	Tamaricaceae
Tribulus terrestris	TRTE	Puncture vine	High	C	None	Zygophyllaceae

Total number of species: 45
KNF Priorities: High = 30; Moderate = 7; Low = 8.
Number of species known to occur on: FS lands = 39; Within Siskiyou County = 44
CDFA Non-rated = 10; **Cal-IPC Non-rated** = 8.
Note: Knapweed taxonomy is in a state of flux. Additional plant codes listed represent generally accepted synonyms.
Note: Klamath National Forest boundary includes lands in Oregon on the Dutchman Peak, Siskiyou Peak and Mt. Ashland quadrangles. Projects in these areas also address ODA list, referenced below.

Pest Ratings:

Klamath National Forest (KNF) Priority:

High: These species are currently either limited in distribution, highly invasive, or not present on the KNF. Treatment may vary by location.

Moderate: These species are generally common, and are treated on a case by case basis depending on location (Wilderness and Research Natural Area (RNA) increase the priority for treatment).

Low: These species are either widespread throughout the KNF, or are not considered to be highly invasive in our area. Usually not treated unless located in a high priority area, such as Wilderness or RNA.

California Dept. of Food and Agriculture (CDFA):

A: Eradication, containment, rejection, or other holding action at State-County level. Quarantine interceptions to be rejected or treated at any point in the State.

B: Species more widespread. Eradication, containment, control, or other holding action at the discretion of the County Ag. Commissioner.

C: Species very widespread. State endorsed holding action and eradication only when found in a nursery; action to retard spread outside of nurseries at the discretion of the commissioner; reject only when found in a crop seed for planting or at the discretion of the County Ag. Commissioner.

Q: Temporary "A" action outside of nurseries at the state-county level pending determination of a permanent rating. Species on List 2, "Federal Noxious Weed Regulation" are given an automatic "Q" rating when evaluated in California.

California Invasive Plant Council (Cal-IPC):

High: These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate: These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited: These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

♦ = Alert