

Gold Crown Hazardous Fuels Reduction Project

Threatened, Endangered and Sensitive Plants and Forest Species of Concern Report

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Introduction

This report discusses the environmental effects of implementation of the Gold Crown Hazardous Fuels Reduction Project on threatened, endangered, and sensitive plants, and Forest species of concern (rare plants). A summary of this report is included in the environmental assessment as part of the Affected Environment and Environmental Consequences section.

Regulatory Framework

Federal legislation, regulations, policy, and direction require protection of species and population viability, evaluation and planning-process consideration of threatened, endangered, and other rare plant species. The regulatory framework for these plants includes the Endangered Species Act (1973) as amended; the National Forest Management Act (1976); the National Environmental Policy Act (1969); Forest Service Manual (2672.1-2672.43); Idaho Panhandle National Forests (IPNF) Forest Plan (1987); and direction from the Regional Watershed, Wildlife, Fisheries and Rare Plants (WWFRP) program and Washington Office.

Threatened and Endangered Plant Species

No federally listed endangered plant species are suspected to occur in the Idaho Panhandle National Forests. The US Fish and Wildlife Service lists two threatened species - water howellia (*Howellia aquatilis* Gray) and Spalding's catchfly (*Silene spaldingii* Wats.) as suspected to occur in the IPNF (USDI 2008a). However, neither species is suspected to occur in Bonner County, Idaho, in which the Gold Crown project area occurs (USDI 2008b).

Sensitive Plants and Forest Species of Concern

Sensitive species are determined by the Regional Forester as those species for which population viability is a concern, as indicated by a current or predicted downward trend in population numbers or habitat capability, which would reduce the species' existing distribution. Fifty-four species are known or suspected to occur in the Kaniksu portion of the IPNF, which encompasses the Gold Crown project area.

In addition, several "Forest species of concern" are addressed in this analysis. A Forest species of concern is generally not at risk on a rangewide, regionwide, or state level, but may be imperiled within a planning area, such as a National Forest. While biological evaluations are not required to address Forest species of concern, these species are addressed in effects analysis to provide for maintenance of populations as directed in NFMA. A list of sensitive species and Forest species of concern is included in this report.

Sensitive plant species and Forest species of concern may be assigned to one or more rare plant guilds. These guilds are artificial assemblages based on similar habitat requirements of two or more rare plant species, and are used for analysis. Rare plant guilds include aquatic, deciduous riparian, peatland, wet forest, moist forest, dry forest, cold forest and subalpine. A list of habitat guild descriptions is included with the attached sensitive species list.

Existing Condition

Methodology

Information on the current status and condition of rare plants in the project area was derived from prefield review of existing vegetation information, from rare plant occurrence records (ICDC 2008) and from results of field surveys. Queries of the Timber Stand Management Record System (TSMRS) were used to provide a "coarse filter" assessment of suitable rare plant habitat in the project area. Aerial photographs, University of Idaho geologic maps and National Wetlands Inventory maps were also reviewed.

The coarse filter assessment helps to guide rare plant surveys by identifying the areas with the highest potential to support rare plants in the different habitat guilds. Because the query is based on habitat type at the stand level, it tends to overestimate the actual amount of suitable habitat that occurs in an area. Conversely, microsites of suitable habitat are not identified by using the query alone. Review of stand examination plot information, aerial photographs, topographical maps and National Wetlands Inventory maps also help to guide rare plant surveys. Field botanists then use this information to perform "controlled intuitive" surveys of the project area, in which they walk through proposed treatment areas to confirm the habitat assessments of the coarse filter query and identify and thoroughly survey areas of confirmed suitable habitat.

Prefield Review

Threatened and Endangered Plant Species

As noted above, no listed endangered plant species are suspected to occur in the IPNF, and no listed threatened plant species are suspected to occur in Bonner County.

Sensitive Species and Forest Species of Concern

Table 1 displays the current extent of suitable rare plant habitat in the project area, as indicated by the coarse filter query of existing vegetation information.

Table 1. Acres of suitable habitat for TES plants and Forest Species of Concern in the project area and within treatment areas under the proposed action.

Habitat Guild	Project Area	Alt. B
Aquatic	0	0
Peatland	0	0
Deciduous Riparian	0	0
Wet Forest	0	0
Moist Forest	154	10
Dry Forest	29	0
<i>Cypripedium fasciculatum</i>	398	26
Subalpine	0	0
Cold Forest	0	0
No Guild	1,812	538
Limited Data	896	0

* A separate query is conducted for *Cypripedium fasciculatum* because this species has slightly different habitat affinities from the moist forest and dry forest habitat guilds to which it is assigned. *Orobanche pinorum* has habitat affinities similar to those for *C. fasciculatum*.

The coarse filter query identified moist forest habitat as occurring in one stand proposed for activities. Although the coarse filter query did not identify any wet forest habitat, such habitat likely occurs in riparian areas that are not proposed for any activities; wet forest guild microsites may also occur in proposed treatment areas. Rare moist forest moonworts (*Botrychium* species) and green bug-on-a-stick moss (*Buxbaumia viridis* [DC.] Moug. & Nestl.) may occur in such microsites.

The TSMRS query identified a small amount of dry forest habitat that could support least bladderly milkvetch (*Astragalus microcystis* Gray) in the project area, but not in any stands proposed for treatment. Least bladderly milkvetch shows a strong correlation with limestone-like rock (WHNP 2008). Review of geologic maps of the project area indicates no limestone deposits.

Clustered lady's slipper (*Cypripedium fasciculatum* Kell.) occurs in a Douglas-fir/ninebark dry forest community approximately 24 miles south of the project area. The coarse filter query identified habitat that could support this sensitive species and the Forest species of concern pine broomrape (*Orobancha pinorum* Geyer) in a few proposed treatment areas.

Field Survey Results

Field surveys for rare plants were conducted in 2007. The surveys targeted all areas proposed for treatments in the Gold Crown project area, as well as areas considered for treatment but subsequently dropped. During the surveys, occurrences of the Forest species of concern pine broomrape (*Orobancha pinorum* Geyer) were discovered in the project area, but not in proposed treatment areas. No other rare plants were identified, although several proposed activity areas were found to contain suitable habitat for pine broomrape and the sensitive species clustered lady's slipper (*Cypripedium fasciculatum* Kell.). Habitat potential for least bladderly milkvetch (*Astragalus microcystis* Gray) in proposed treatment areas was determined to be low.

Several wet forest guild microsites that have high potential to support rare moonworts and green bug-on-a-stick moss were identified in the project area – most treatment activities would not occur near these habitats. Wet forest guild microsites occur in or adjacent to a few proposed treatment areas.

Surveys confirmed that there is no suitable aquatic, peatland, deciduous riparian, subalpine or cold forest habitat in the project area.

Complete results of the field surveys are in the project file.

Rare Plants and Suitable Habitat in the Project Area

Pine Broomrape (Orobancha pinorum Geyer)

Pine broomrape is a non-chlorophyllous member of the family Orobanchaceae. While once believed to be parasitic on the roots of various conifers (Hitchcock *et al.* 1959), recent research (Ellis *et al.* 1999) and anecdotal field observations suggest instead that the exclusive host plant is oceanspray (*Holodiscus* spp., in particular *Holodiscus discolor* [Pursh] Maxim.). Pine broomrape is endemic to western North America, where it occurs in scattered locations from northern California through Oregon, and in central and northeastern Washington and extreme north Idaho. It is found in mesic to dry grand fir and Douglas-fir habitats. Little is known about the species' ecology or the mechanism of parasitism between it and its host. Three occurrences of this species

were identified in the project area, though none are in or near proposed treatment units. However, unoccupied suitable habitat occurs in most proposed treatment units.

Clustered Lady's Slipper (Cypripedium fasciculatum Kell.)

This rare orchid occurs in two disparate habitats – moist cedar/hemlock forest and dry Douglas-fir/grand fir forest. In the Gold Crown project area, the highest potential habitat for the species is in Douglas-fir/grand fir forest. Although no occurrences of this sensitive species were identified during the surveys, suitable habitat does occur in several proposed treatment units.

Rare Moonworts (Botrychium Sw. species)

Although no rare moonworts were found during the surveys, some proposed activity areas have marginal potential to support them. Moonworts are seedless vascular plants that reproduce from spores and underground rhizomes. Western goblin (*Botrychium montanum* Wagner) often occurs with other rare moonworts, usually in wet or moist forest habitat and/or near streams and in soils with well-developed mycorrhizae¹. Mingan moonwort (*B. minganense* Vict.) and triangle moonwort (*B. lanceolatum* [Gmel.] Angstr.) may also occur with other rare moonworts in or adjacent to wet meadows, open disturbed areas, old roads and roadside ditches. All rare moonworts are small in stature and often inconspicuous; in addition, aboveground stalks may not appear every year.

Because rare moonworts have a broader habitat range than other rare plants, and because they can be overlooked even during thorough floristic surveys, these species have the greatest potential for experiencing impacts from project implementation.

Green Bug-on-a-Stick Moss (Buxbaumia viridis [DC.] Moug. & Nestl.)

Although no occurrences of this sensitive species were found during the surveys, some proposed activity areas have marginal potential to support green bug-on-a-stick moss (*Buxbaumia viridis*). This inconspicuous moss usually occurs on soil or well-rotted logs in moist forest habitats to about 4,000 feet elevation (Lawton 1971). It often occurs, and can be confused with, the more common *B. piperi*. *Buxbaumia viridis* is a short-lived, ephemeral species.

Buxbaumia viridis is interruptedly circumboreal in distribution. In western Washington, it is suspected to be fairly common but is often overlooked (Harpel 2002 personal communication). Threats to the species include removal of woody debris that could provide suitable habitat and destruction of individuals by fire, tree felling and skidding operations. Loss of canopy cover is apparently not considered a threat to the species (Harpel 2002 personal communication).

Environmental Consequences

Methodology

Analysis was conducted based on the results of rare plant surveys, current population distribution of rare plant species in the project area, the most current scientific literature, and professional judgment of the project botanist.

¹ Mycorrhizae are symbiotic relationships between fungi and the roots of certain plant species. Although their ecology is poorly understood, it is apparent that mycorrhizal relationships enhance uptake of nutrients by the host plant (Allen 1991).

The issue indicator for analysis of effects to rare plants is the relative amount of canopy opening and/or ground disturbance in and adjacent to documented rare plant occurrences and/or suitable rare plant habitat. The issue indicator was determined based on the affinity of moist forest moonworts for relatively closed-canopy conditions (ICDC 2008) and their dependence on soil mycorrhizae, which may be destroyed during ground-disturbing activities. Canopy removal and disruption of soil mycorrhizae are also a concern for clustered lady's slipper, as is disruption of natural fire regimes in its Douglas-fir/ninebark habitat. Ground disturbance was also considered for its effects on suitable habitat for green bug-on-a-stick moss.

The cumulative effects area for rare plants is the project area. This area represents the likely limit of effects to rare plant populations from implementation of the action alternative. Those limits are largely based on the expected distance of spore or seed dispersal and potential for colonization of rare plant populations in areas of suitable habitat. While patterns of dispersal are not known with certainty for many plant species, in studies of *Botrychium virginianum* most spores fell within three meters of the source plant (Peck *et al.* 1990). Other sensitive species' seeds that are heavier than *Botrychium* spores might be assumed to have similar if not more restricted dispersal patterns.

Effects to rare plant species and suitable habitat from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

- very low = no measurable effect on individuals, populations or habitat
- low = individuals, populations and/or habitat not likely affected
- moderate = individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species
- high = populations would likely be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species

The following past, current, ongoing and reasonably foreseeable activities and events apply to the cumulative effects analysis for rare plants. Other activities and events listed in the environmental assessment do not apply to the rare plants cumulative effects analysis either because they would occur outside the cumulative effects analysis area or because they generally did/do not result in disturbance sufficient to impact rare plants or suitable habitat (e.g. County road maintenance, hunting, special forest products collection and firewood gathering).

Past Activities and Events

- Large wildfires (1922, 1926-1931)
- Timber harvest on NFS lands
- Mining activities on NFS lands
- Timber harvest on other ownership lands
- Road and trail construction
- Development on private lands
- Wildfire suppression

Current and Ongoing Activities

- Road and trail maintenance
- Wildfire suppression
- Defensible space projects on private lands

- Development on private lands
- Timber harvest on other ownership lands

Reasonably Foreseeable Actions

- Noxious weeds monitoring and treatment
- Timber harvest on other ownership lands

The period for measuring cumulative effects to rare plants and suitable habitat is ten years following completion of harvest and other restoration projects, or, for the No Action alternative, ten years after signing the Decision Notice and FONSI. Beyond ten years, the likelihood of events or activities affecting rare plants and suitable habitat would be difficult to predict.

Mitigation and Monitoring

Required Mitigation

The Issues and Alternatives chapter of the environmental assessment includes the following required mitigation for rare plants:

1. No treatment activities are proposed in or near any documented rare plant occurrences. A qualified botanist would assist with unit layout as needed to ensure microsites of highly suitable wet forest guild habitat are buffered from project activities. Any changes to the selected alternative that may occur during layout would be reviewed, and rare plant surveys would be conducted as necessary prior to project implementation. Newly documented occurrences would be evaluated, with specific protection measures implemented to protect population viability. Such measures could include the following:
 - Dropping units from harvest activity
 - Modifying unit boundaries to provide adequate buffers around documented occurrences, as determined by the project botanist and based on topography, extent of contiguous suitable habitat for documented occurrences and the type of treatment proposed
 - Modifying harvest methods, fuels treatment or logging systems to protect TES plants and their habitat
 - Implementing, if necessary, Timber Sale Contract provisions B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources; C6.24#- Site Specific Special Protection Measures; and B8.33, Contract Suspension and Modification.

Estimated Effectiveness: High; the above measures would assure protection of the currently documented occurrences of pine broomrape and highly suitable wet forest guild habitat.

Required Monitoring

In addition to mitigation, Chapter 2 of the environmental assessment contains required monitoring.

IPNF Forest Plan Monitoring

IPNF direction is to inventory and manage sensitive plants so that no new species have to be listed as threatened or endangered. Suitable sensitive plant habitat in project areas is surveyed

and projects modified as necessary to achieve this objective. Sensitive plants are protected according to site-specific management plans developed by Forest and zone botanists.

Project Monitoring

Monitoring of rare plant populations where the proposed activity was modified by buffering to avoid adverse effects would be conducted to validate the effectiveness of mitigation measures during and following the activity.

Effects Common to Alternatives A and B

Direct and Indirect Effects

Threatened and Endangered Species

There are no listed endangered plant species suspected to occur in the IPNF and no listed threatened plant species suspected to occur in Bonner County. No effects to any federally listed plant species would occur with implementation of either alternative.

Sensitive Plants and Forest Species of Concern

There is no **aquatic, peatland, deciduous riparian, subalpine** or **cold forest** guild habitat in the project area. Highly suitable **wet forest** guild habitat would be buffered from all project activities. No direct or indirect impacts would occur to habitat or species of these guilds. **Moist forest** guild habitat outside of riparian areas was found to have low potential to support rare plant species other than moonworts or green bug-on-a-stick moss. No impacts to moist forest guild species other than those two would occur under either alternative.

No impacts to populations of or suitable habitat for **least bladderly milkvetch** would occur, since potential for occurrence of this species in or near proposed treatment areas was determined to be low.

No impacts to populations of **clustered lady's slipper** would occur, since this species was not found in the project area. Direct and indirect effects to suitable habitat for clustered lady's slipper are discussed separately for each alternative.

The documented occurrences of **pine broomrape** would not be directly impacted under either alternative. Under the No Action alternative, there would be no change in current management, while under the proposed action no treatment activities are proposed in or near documented occurrences of the species. The potential for indirect and cumulative impacts to suitable habitat for pine broomrape are discussed separately for each alternative.

Cumulative Effects

Current and Ongoing Activities

No impacts to rare plants or suitable habitat are expected to occur during road and trail maintenance activities confined to the existing road prism or trail tread.

Reasonably Foreseeable Actions

Weed treatment and monitoring would follow guidelines established in the Sandpoint Noxious Weeds Control Project EIS (USDA 1998a). Effects to rare plant species were analyzed in that

document and its adaptive strategy. No effects to rare plants beyond those described in that EIS are expected to occur.

Determination of Cumulative Effects

The proposed action and the No Action alternative would contribute no cumulative effects to most rare plants. Under either alternative, no cumulative impacts to rare plants and habitat in the **aquatic, peatland, deciduous riparian, subalpine** and **cold forest** guilds would occur, since these habitats were not found in the project area. No cumulative impacts would occur to suitable **wet forest** habitat from implementation of the proposed action, given the design criteria proposed in Chapter 2, or from no action. No cumulative impacts would occur to **moist forest** guild species not suspected to occur in the project area; moist forest habitat in proposed treatment areas has low potential to support species of that guild other than rare moonworts and green bug-on-a-stick moss. No cumulative effects to populations of or suitable habitat for **least bladderly milkvetch** would occur, since potential for occurrence of this species is low. No cumulative effects to populations of **clustered lady's slipper** would occur, since this species was not found in the project area (effects to suitable habitat for this species are discussed below).

When combined with the above current, ongoing and reasonably foreseeable activities, neither alternative would be expected to contribute cumulative effects to any rare plants or suitable rare plant habitat in the project area.

Alternative A – No Action

Direct and Indirect Effects

Management activities would not change from current levels, and current vegetation trends would be expected to continue. No direct effects to any rare plants would occur from implementation of this alternative.

Indirectly, the continued increase in fuel loading could pose a threat to suitable rare plant habitat in the context of a higher risk of stand replacing fires. Such fires could extirpate the documented occurrences of pine broomrape and/or any undetected individual rare moonworts or green bug-on-a-stick moss. Habitat suitability for rare moonworts and clustered lady's slipper may be reduced if fire intensity is sufficient to destroy soil mycorrhizae on which these species depend (Allen 1991). In addition, oceanspray, the preferred host plant for pine broomrape, could be at least temporarily reduced in cover by a high-intensity fire (Crane and Fischer 1986).

Cumulative Effects

When combined with the following past, current and ongoing activities and events, the No Action alternative has potential cumulative effects to rare plants that differ from those of the proposed action.

Past Activities and Events

Past large wildfires, timber harvest and road construction on NFS lands may have affected rare plants and/or suitable rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on National Forest lands before 1991, so the extent of and effect on rare plant populations of timber sale projects (including Gold Hill, for which the EA was completed in 1990) is unknown.

Timber harvest and development on private lands likely impacted suitable rare plants habitat and undocumented rare plant species. However, the extent of those impacts is unknown, since no protection measures for rare plants are required for activities on private lands.

Past wildfire suppression in the project area has increased the risk of severe stand-replacing fires. Implementation of the No Action alternative would not address these accumulated fuels in the project area.

Current and Ongoing Activities

Ongoing wildfire suppression in the project area would increase the probability of severe stand-replacing fires. Implementation of the No Action alternative would contribute to the continued accumulation of fuels in the project area. The effectiveness of defensible space projects on private lands could be reduced.

Determination of Cumulative Effects

When combined with the effects of past and ongoing fire suppression, implementation of the No Action alternative would further increase the risk of severe stand replacing fires. Should such a fire occur, it may impact populations and/or reduce habitat suitability for **pine broomrape**, **green bug-on-a-stick moss**, **rare moonworts** and **clustered lady's slipper**, at least temporarily. Such impacts would add to the effects of past timber harvest and road construction. The No Action alternative could have low, moderate, or high cumulative effects to these species and/or suitable habitat, depending on where a fire occurs and how severe it is. However, the occurrence and intensity of a future wildfire in suitable habitat for these species would be difficult to predict.

Alternative B – Proposed Action

Direct and Indirect Effects

Sensitive Species and Forest Species of Concern

Approximately 26 acres of highly suitable habitat for **clustered lady's slipper** (*Cypripedium fasciculatum* Kell.) would be treated under this alternative, with 13 acres of regeneration harvest, six acres of commercial thinning with group selection and six acres of hand thinning and piling. All but the six acres of hand work would be helicopter logged, which would cause only incidental amounts of ground disturbance in suitable habitat. Six acres of broadcast burning, six acres of burning hand piles and 13 acres of yarding of unmerchantable timber would comprise the fuels treatments.

The proposed treatments are consistent with natural disturbance regimes in the Douglas-fir/ninebark habitats that support clustered lady's slipper in northern Idaho. Stand structure and landscape pattern in regions where the species occurs in Idaho and Montana have historically been determined by fire. In Montana, clustered lady's slipper occurs primarily in Douglas-fir/ninebark and grand fir/ninebark habitat types that historically experienced low- to moderate-intensity surface fires on an interval of ten to thirty years (Lichthardt 2003). Following fifty or more years of fire suppression, stands in these habitat types are now more densely stocked and have greater canopy closure, increasing the probability of severe, stand-replacing fires that could reduce the availability of suitable habitat, both in terms of canopy removal and adverse soil and ground-layer effects (Lichthardt 2003). The proposed action would, to some degree, reintroduce low-intensity fire to dry site ecosystems in the project area and would reduce the risk of large, stand-replacing fires (see Fire/Fuels section of the EA).

Although no direct impacts to the documented populations of **pine broomrape** would occur under either alternative, indirectly, the proposed action would reduce the risk of a severe wildfire in stands surrounding the populations (see Fire/Fuels section of the EA). Therefore, the risk that a stand-replacing fire could extirpate the populations would be lower than under the No Action alternative.

No **rare moonworts** (*Botrychium* species) were identified during the surveys, and potential for their occurrence in proposed activity areas is considered low overall. However, undetected individuals may be impacted by project activities. Because moonworts appear adapted to a broad range of habitats, loss of undetected individuals is considered incidental.

While no rare plants were identified in areas proposed for the two miles of new permanent road construction and 0.13 mile of new temporary road construction, undetected individuals of sensitive moonworts may be directly impacted. Subsequent decommissioning of the proposed temporary road would not further impact rare plants or suitable rare plant habitat, since any impacts would occur when the road is constructed.

Indirectly, there could be a risk of prescribed fire escaping to impact suitable moonwort habitat that was buffered from harvest activity. The extent of risk would depend on many factors, including timing of the burn, phenology of the plant species involved and occurrence of abnormally wet or droughty conditions in suitable habitat at the time of the burn.

There have been a few studies of fire disturbance in *Botrychium* populations. Johnson-Groh and Farrar (1993) found that fire affects the aboveground fronds of *B. simplex*, but the population being studied appeared to be resilient even with particularly hot fires that desiccated the soil. The loss of photosynthetic capacity the year of the fire was considered equivalent to non-emergence for a year, and the fire might be considered a minor disturbance. However, as a secondary effect with other stress disturbances, loss of population vigor or population decline may result (Johnson-Groh and Farrar 2003, Johnson-Groh and Farrar 1996). While many documented *Botrychium* occurrences show evidence of previous fire, a study of historical documentation of the type and periodicity of such fires has not been undertaken.

Prescribed fires have the potential to emulate wildfire effects but with the advantage of management considerations of scale, timing and intensity. Timing of prescribed fire is essential, with burning recommended either prior to plant emergence or after spore maturity (Weldon *et al.* 2001, Johnson-Groh and Farrar 1989). In the Kaniksu portion of the IPNF, rare moonworts have been found to emerge aboveground in early to mid-June at the earliest (Hammet personal observations 1991-2005). This is well after the period in which prescribed spring burning would occur (Lux personal communication 2006). Similarly, fall burning typically occurs after spore maturity.

Based on the best available knowledge and the proximity of proposed underburn units to suitable moist forest habitat for rare moonworts that would be buffered from harvest activities, the risk of indirect impacts to undetected rare moonwort individuals from escaped fire under the proposed action would be very low.

Undetected individuals of **green bug-on-a-stick moss** (*Buxbaumia viridis*) could also be impacted during project activities. Harvest and fuel treatments in some stands could reduce the amount of available substrate for this moss (rotted logs in moist to wet forest habitat); however, well-rotted stumps and logs are widespread in forested habitats. Therefore, the extent of loss of suitable substrate from project implementation would be considered incidental and temporary.

The impacts of the proposed treatments to unoccupied suitable habitat for pine broomrape cannot be predicted with certainty because the species' ecology is poorly understood. However, the proposed treatments would likely enhance the preferred host species oceanspray. Oceanspray is considered to be well adapted to disturbance by fire, usually responding to a low-intensity burn by root crown and rhizome sprouting (Young 1983). The beneficial effects of proposed burning to oceanspray would also be beneficial to pine broomrape.

Under this alternative, approximately ten acres of **moist forest guild habitat** identified in the coarse filter query would be potentially affected by regeneration harvest by skyline, followed by broadcast burning. Field surveys found that habitat potential in these areas was very low for moist forest species other than sensitive moonworts and green bug-on-a-stick moss. There would be no direct or indirect impacts to any other species of the moist forest guild.

Cumulative Effects

Past Activities and Events

Past large wildfires, timber harvest and road construction on NFS lands may have affected rare plants and/or suitable rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on National Forest lands before 1991, so the extent of and effect on rare plant populations of timber sale projects (including Gold Hill, for which the EA was completed in 1990) is unknown.

Rare plant surveys were conducted for the Gold Hill Trail Construction CE in 1993 and the Gold Hill Ski Trail Construction CE in 1994 (see project file). No rare plants were identified during the surveys, and the proposed trail location was modified where needed to avoid microsites of suitable moist and wet forest guild habitat.

Timber harvest and development on private lands likely impacted suitable rare plants habitat and undocumented rare plant species. However, the extent of those impacts is unknown, since no protection measures for rare plants are required for activities on private lands.

Past **wildfire suppression** in the project area has increased the risk of severe stand-replacing fires. The proposed treatments would reduce the current fuel loading, thereby reducing the risk of stand-replacing fires. The proposed treatments would complement **defensible space projects** implemented by private landowners.

Current and Ongoing Activities

While **wildfire suppression** would continue in order to protect adjacent private property values, the proposed treatments would increase the ability to safely use prescribed fire, periodically reducing fuel loads, and to suppress unwanted wildfires. When combined with Alternative B, ongoing wildfire suppression would decrease the probability of severe stand-replacing fires. There would therefore be a lower risk of severe fire effects to occurrences of and/or suitable habitat for pine broomrape, sensitive moonworts, clustered lady's slipper and least bladderly milkvetch than under the No Action alternative.

Determination of Cumulative Effects

When combined with the above past, current and ongoing activities, cumulative impacts to **rare moonworts** and **green bug-on-a-stick moss** would be low (individuals, populations and/or habitat not likely affected) to moderate (individuals and/or habitat may be affected, but

populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species).

Cumulative impacts to populations of **clustered lady's slipper** would not be expected to occur under either alternative since this species was not found in the project area. The proposed treatments are compatible with natural disturbance regimes in this species' habitat. By reducing the risk of stand-replacing wildfires (see Fire/Fuels section of the EA), implementation of this alternative may have long term benefits to habitat for clustered lady's slipper. Cumulative impacts to suitable habitat for this species would be low (habitat not likely affected) to moderate (habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support the species).

The proposed treatments would also not contribute cumulative impacts to populations of **pine broomrape** that may have been affected by past timber harvest and road construction, since the two documented occurrences would be protected by site-specific buffers. The proposed treatments would reduce the risk of a severe wildfire in stands surrounding the populations (see Fire/Fuels section of the EA). In addition, as mentioned previously, the proposed treatments are compatible with maintenance of oceanspray, the host species for pine broomrape. Cumulative impacts to suitable habitat for this species would be low to moderate.

Compliance with the Forest Plan and Other Regulatory Direction

A Forest Plan management goal is to “manage habitat to maintain populations of identified sensitive species of animals and plants” (Forest Plan, II-1). A Forest Plan standard for sensitive species is to “manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations which could lead to federal listing under the Endangered Species Act” (Forest Plan, II-28). This standard meets the requirements of the National Forest Management Act (NFMA) of 1976, Section 6(g)(3)(B), by providing for diversity of plant communities based on the suitability and capability of the specific land area.

The Forest Plan also identifies the need to “determine the status and distribution of threatened, endangered and rare (sensitive) plants on the IPNF” (Forest Plan, II-18). Both alternatives would meet Forest Plan direction and provide for the viability of populations.

Across the Forest, suitable habitat for sensitive plant species appears to be well distributed. Approximately 705,000 acres have been identified as having the potential to support rare plant species in a wide array of plant communities. To date, approximately 122,003 acres (about 17 percent) of suitable habitat had been surveyed for rare plants.

In 1998, sensitive species trends across the Forest were qualitatively assessed (USDA 1998b, pp. 112-116). Of the sensitive plant species assessed, 11 species were considered to have fairly secure populations with stable trends and few observed threats; 28 species had mostly stable populations with some concerns and threats; and for 16 species there was a serious concern. Estimates for this assessment were based on the best information available, including known population size, distribution and threats. The trends for sensitive moonworts ranged from stable (*Botrychium lanceolatum* ssp. *lanceolatum* [S.G. Gmelin] Angstrom) to serious concerns for population and habitat decline over time (*B. montanum* W.H. Wagner). The trend for clustered lady's slipper (*Cypripedium fasciculatum* Kell.) was characterized as being a serious concern for population and habitat decline over time.

Since implementation of the Forest Plan in 1987, impacts to highly suitable habitat for many sensitive plant species have diminished with the implementation of laws and policies protecting riparian areas, wetland and peatland habitats and policies designed to maintain old growth forests.

A conservation assessment for sensitive moonworts in the IPNF has been prepared (Evans and Associates 2005). A conservation strategy for sensitive moonworts in the IPNF is being prepared. For clustered lady's slipper, where proposed activities in the IPNF may impact the species, formal monitoring plots have been established (USDA 2003). A conservation strategy for the species in the Northern Region has been prepared (Lichthardt 2003).

At the project level, and in accordance with Forest Service Manual (FSM) 2672.1-2672.43 and NFMA Section 6(g)(3)(E)(ii), suitable habitat has been identified and surveyed and the appropriate level of analysis conducted. The documented occurrences of pine broomrape would be buffered from all project activities under the proposed action. Proposed activities are consistent with management recommendations in the conservation strategy for clustered lady's slipper (Lichthardt 2003). Protection measures for the documented moonwort occurrences are consistent with the most current scientific literature (Lichthardt 1995, Vanderhorst 1997, Johnson-Groh and Farrar 2003).

There are no federally listed threatened or endangered species suspected to occur in Bonner County, Idaho (USDI 2008b). Therefore, the project is consistent with the Endangered Species Act (1973) as amended.

References

- Allen, Michael F. 1991. The ecology of mycorrhizae. Cambridge University Press. Cambridge, U.K.
- Crane, M. F. and William C. Fischer. 1986. Fire ecology of the forest habitat types of central Idaho. General Technical Report INT-218. USDA Forest Service Intermountain Research Station. Ogden, UT. 85 pp. *In: Fire Effects Information System. Species profile for oceanspray (*Holodiscus discolor*)*. Online at <http://www.fs.fed.us/database/feis/plants/shrub/holdis/all.html>.
- Ellis, Mark W., Ronald J. Taylor and Richy Harrod. 1999. The reproductive biology and host specificity of *Orobanche pinorum* Geyer (Orobanchaceae). *In: Madrono*, Volume 46:1. pp 7-12.
- Evans, David and Associates. 2005. Conservation assessment of eleven sensitive moonworts (Ophioglossaceae; *Botrychium* subgenus *Botrychium*) on the Idaho Panhandle National Forests. Spokane, Washington.
- Hammet, Anna E. 1991-2005. Personal observations of the project botanist concerning earliest emergence of sensitive moonworts (*Botrychium* subgenus *Botrychium*) during 15 years of rare plant surveys and monitoring on the Kaniksu portion of the Idaho Panhandle National Forests.
- Harpel, Judy. 2002. Personal communication between Gifford Pinchot National Forest botanist and IPNF North Zone botanist regarding habitat requirements and abundance of *Buxbaumia viridis* in western Washington.
- Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey and J. W. Thompson. 1959. Vascular Plants of the Pacific Northwest. Part 4: Ericaceae through Campanulaceae. University of Washington Press. Seattle, WA. Page 432.
- ICDC. 2008. Idaho Dept. of Fish and Game Conservation Data Center. Element Occurrence Records contained in an electronic database. Boise, Idaho.
- Johnson-Groh, C. L., and D. R. Farrar. 1989. [Abstract] Ecological monitoring of *Botrychium campestre* and a new species of *Botrychium* in western Minnesota. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.
- Johnson-Groh, C. L., and D. R. Farrar. 1993. Population dynamics of prairie moonworts (*Botrychium* subgenus *Botrychium*) in Iowa and Minnesota (abstract). *American Journal of Botany* 80 (supplement): 109. *In: Evans, David and Associates. 2005. Conservation assessment of eleven sensitive moonworts (Ophioglossaceae; *Botrychium* subgenus *Botrychium*) on the Idaho Panhandle National Forests. Spokane, Washington.*
- Johnson-Groh, C.L., and D.R. Farrar. 1996. [Abstract] Effects of leaf loss on moonwort ferns, *Botrychium* subgenus *Botrychium*. *American Journal of Botany* 83(Supple.): 127.
- Johnson-Groh, C.L., and D.R. Farrar. 2003. *Botrychium* inventory and monitoring technical guide. Revised draft. Unpublished. 37pp.
- Lawton, Elva. 1971. Moss flora of the Pacific Northwest. Hattori Botanical Laboratory. Nichinan, Miyazaki, Japan.

- Lichthardt, J. 1995. Conservation strategy for *Allotropa viragta* (Candystick). U.S. Forest Service, Northern and Intermountain Regions. Idaho Department of Fish and Wildlife. Boise, ID. 26pp.
- Lichthardt, Juanita. 2003. Conservation strategy for clustered lady's-slipper orchid (*Cypripedium fasciculatum*) in US Forest Service Region 1. Idaho Conservation Data Center. Boise, ID.
- Lux, David. 2006. Personal communication with Anna E. Hammet, project botanist, concerning the potential for spring burning to occur when *Botrychium* species are likely to have emerged aboveground. Dave Lux is the District fire management officer.
- Peck, J.H., C.J. Peck, D. R. Farrar. 1990. Influences of life history attributes on formation of local and distant fern populations. *In: American Fern Journal* 80(4): 126-142.
- USDA Forest Service. 1987. Idaho Panhandle National Forests Forest Plan. Coeur d'Alene, Idaho.
- USDA Forest Service. 1998a. Sandpoint Noxious Weed Control Project Environmental Impact Statement. Idaho Panhandle National Forests, Sandpoint Ranger District. Available at the district office.
- USDA Forest Service. 1998b. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.
- USDA Forest Service. 2003. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.
- USDI Fish and Wildlife Service. 2008a. Upper Columbia Fish and Wildlife Office. Spokane, Washington. Updated species list for the IPNF (1-9-08-SP-0067), dated April 9, 2008.
- USDI Fish and Wildlife Service. 2008b. Upper Columbia Fish and Wildlife Office. Spokane, Washington. Updated species list for Bonner County, ID (1/10/2008) available online at <http://www.fws.gov/easternwashington/ESA.html>.
- Vanderhorst, J. 1997. Conservation assessment of sensitive moonworts (*Botrychium* subgenus *Botrychium*) on the Kootenai National Forest. Montana Natural Heritage Program, Helena, MT. 82 pp plus appendices.
- Washington National Heritage Program. 2008. Field guide to selected rare vascular plants of Washington. Available online at http://www.dnr.wa.gov/nhp/refdesk/fguide/htm/fsp_asmi.htm. Species profile for *Astragalus microcystis*.
- Weldon, L.; A.B. Bail and C. R. Graham. 2001. Conservation strategy for *Botrychium pumicola* (pumice grape fern) on the Deschutes, Fremont and Winema National Forests and Prineville District, Bureau of Land Management. Oregon. 22pp.
- Young, Richard P. 1983. Fire as a vegetation management tool in rangelands of the Intermountain Region. *In: Mosen, Stephen B; Shaw, Nancy, compilers. Managing Intermountain rangelands - improvement of range and wildlife habitats: Proceedings; 1981 September 15-17; Twin Falls, ID; 1982 June 22-24; Elko, NV. General Technical Report INT-157. USDA Forest Service Intermountain Forest and Range Experiment Station. Ogden, UT. pp.*

18-31. *In*: Fire Effects Information System. Species profile for oceanspray (*Holodiscus discolor*). Online at <http://www.fs.fed.us/database/feis/plants/shrub/holdis/all.html>.

KANIKSU THREATENED, SENSITIVE AND FOREST SPECIES OF CONCERN, BY
HABITAT GUILD

Status and Species	Common Name	Rare Plant Guild
Threatened*		
<i>Howellia aquatilis</i> (Kootenai County)	water howellia	Aquatic
<i>Silene spaldingii</i> (Kootenai County)	Spalding's catchfly	Dry grassland
Sensitive**		
<i>Andromeda polifolia</i>	bog rosemary	Peatland
<i>Asplenium trichomanes</i> ssp. <i>trichomanes</i>	maidenhair spleenwort	Rock seeps in Moist / Wet Forest
<i>Symphytotrichum boreale</i>	rush aster	Peatland
<i>Astragalus microcystis</i>	least bladderly milkvetch	Dry Forest
<i>Betula pumila</i> v. <i>glandulifera</i>	dwarf birch	Peatland / Deciduous Riparian
<i>Blechnum spicant</i>	deerfern	Wet Forest / Moist Forest
<i>Botrychium ascendens</i>	upswept moonwort	Wet Forest
<i>Botrychium crenulatum</i>	dainty moonwort	Wet Forest
<i>Botrychium lanceolatum</i>	triangle moonwort	Wet Forest / Moist Forest
<i>Botrychium lineare</i>	linear-leaved moonwort	Moist Forest/ Wet Forest
<i>Botrychium minganense</i>	Mingan moonwort	Wet Forest / Moist Forest
<i>Botrychium montanum</i>	western goblin	Wet Forest
<i>Botrychium paradoxum</i>	peculiar moonwort	Wet Forest / Moist Forest
<i>Botrychium pedunculosum</i>	stalked moonwort	Wet Forest
<i>Botrychium pinnatum</i>	northwestern moonwort	Wet Forest / Moist Forest
<i>Botrychium simplex</i>	least moonwort	Wet Forest / Moist Forest
<i>Buxbaumia aphylla</i>	leafless bug-on-a-stick	Subalpine
<i>Buxbaumia viridis</i>	green bug-on-a-stick	Wet Forest
<i>Carex buxbaumii</i>	Buxbaum's sedge	Peatland
<i>Carex chordorrhiza</i>	string-root sedge	Peatland
<i>Carex comosa</i>	bristly sedge	Peatland
<i>Carex flava</i>	yellow sedge	Peatland
<i>Carex leptalea</i>	bristle-stalked sedge	Peatland
<i>Carex livida</i>	pale sedge	Peatland
<i>Carex magellanica</i> ssp. <i>irrigua</i>	poor sedge	Peatland
<i>Cicuta bulbifera</i>	bulb-bearing water hemlock	Aquatic / Peatland
<i>Cypripedium fasciculatum</i>	clustered lady's slipper	Moist Forest / Dry Forest
<i>Drosera intermedia</i>	spoon-leaved sundew	Peatland
<i>Dryopteris cristata</i>	crested shield fern	Peatland
<i>Epilobium palustre</i>	swamp willow-weed	Peatland
<i>Epipactis gigantea</i>	giant helleborine	Peatland / Seeps
<i>Eriophorum viridicarinatum</i>	green-keeled cotton grass	Peatland
<i>Gaultheria hispidula</i>	creeping snowberry	Wet Forest / Peatland
<i>Grimmia brittoniae</i>	Britton's dry rock moss	Calcareous rock substrate
<i>Hookeria lucens</i>	clear moss	Wet Forest
<i>Hypericum majus</i>	large Canadian St. John's wort	Peatland
<i>Iris versicolor</i>	blue flag iris	Peatland
<i>Lycopodiella inundata</i>	northern bog clubmoss	Peatland
<i>Lycopodium dendroideum</i>	ground pine	Wet/Moist/Cold Forest /

Status and Species	Common Name	Rare Plant Guild
		Deciduous Riparian
<i>Meesia longiseta</i>	meesia	Peatland
<i>Phegopteris connectilis</i>	northern beechfern	Wet Forest
<i>Polystichum braunii</i>	Braun's holly fern	Wet Forest
<i>Rhizomnium nudum</i>	naked mniium	Wet Forest
<i>Rhynchospora alba</i>	white beakrush	Peatland
<i>Salix candida</i>	hoary willow	Peatland / Deciduous Riparian
<i>Salix pedicellaris</i>	bog willow	Peatland
<i>Scheuchzeria palustris</i>	pod grass	Peatland
<i>Scirpus hudsonianus</i>	Hudson's bay bulrush	Peatland
<i>Schoenoplectus subterminalis</i>	water clubrush	Aquatic
<i>Sphagnum mendocinum</i>	Mendocine peatmoss	Peatland
<i>Streptopus streptopoides</i>	krushea	Wet Forest / Cold Forest
<i>Triantha occidentalis</i>	short-styled sticky Tofieldia	Peatland
<i>Trientalis europaea</i>	northern starflower	Peatland
<i>Vaccinium oxycoccos</i>	bog cranberry	Peatland
Forest Species of Concern***		
<i>Arnica alpina</i> var. <i>tomentosa</i>	alpine arnica	Subalpine
<i>Botrychium lunaria</i>	moonwort	Wet Forest
<i>Botrychium "michiganense"</i>	Michigan moonwort	Mesic to dry meadows
<i>Cetraria sepincola</i>	bog birch lichen	Peatland
<i>Cladonia bellidiflora</i>	toy soldiers	We t forest
<i>Collema curtisporum</i>	short-spored jelly lichen	Deciduous Riparian
<i>Cypripedium pubescens</i> v. <i>pubescens</i>	yellow lady's slipper	Peatland / Deciduous Riparian
<i>Diphasiastrum sitchense</i>	Sitka clubmoss	Subalpine / Cold Forest
<i>Ivesia tweedyi</i>	Tweedy's ivesia	Subalpine
<i>Lobaria scrobiculata</i>	textured lungwort	Rock cliffs in Dry Forest
<i>Maianthemum dilatatum</i>	beadruby	Peatland
<i>Muhlenbergia glomerata</i>	marsh muhly	Peatland
<i>Orobanche pinorum</i>	pine broomrape	Dry Forest
<i>Oxalis trilliifolia</i>	trillium-leaved wood-sorrel	Wet Forest
<i>Pentagramma triangularis</i>	goldback fern	Wet Forest
<i>Petasites sagittatus</i>	arrowleaf coltsfoot	Peatland
<i>Pilophorus clavatus</i>	tapered matchstick	Wet Forest
<i>Pinus albicaulis</i>	Whitebark pine	Subalpine
<i>Romanzoffia sitchensis</i>	Sitka mistmaiden	Subalpine
<i>Rubus spectabilis</i>	salmonberry	Wet Forest
<i>Tripterocladium leucocladulum</i>	tripterocladium moss	Granite / basalt rock substrate
<i>Ulota megalospora</i>	large spore ulota moss	Wet Forest
<i>Viola selkirkii</i>	Selkirk's violet	Wet Forest

* based on US Fish and Wildlife Service Biannual Species List for Bonner County, dated January 10, 2008

** based on Northern Regional Forester's Sensitive Species List, October 2004

*** As directed by the Species of Concern Protocol (Region One Planning Peer Group, Task Group 19, March 1997), species of concern are considered to be secure at the global, Regional and state levels, but may be at risk at the Forest planning level.

HABITAT GUILD DESCRIPTIONS

Subalpine Guild

Includes certain plant communities found at high elevation sites, generally above about 5,000 feet, mostly on ridges, subalpine parklands (subalpine grass and sedge communities), exposed rock outcrops and the following harsh, high elevation communities:

- *Abies lasiocarpa* (subalpine fir) *krummholtz*
- *Abies lasiocarpa* / *Rhododendron albiflorum* (subalpine fir/white rhododendron)
- *Salix commutata* (undergreen willow)
- *Abies lasiocarpa* / *Vaccinium scoparium* (subalpine fir/grouse whortleberry)
- *Abies lasiocarpa* / *Luzula hitchcockii* (subalpine fir/smooth woodrush)
- *Larix lyallii* (subalpine larch) / *Pinus albicaulis* (whitebark pine)

It also includes the harshest (cold and dry) phases of *Abies lasiocarpa* / *Menziesia ferruginea* (subalpine fir / menziesia) and *Abies lasiocarpa* / *Xerophyllum tenax* (subalpine fir / beargrass) plant communities. Rare species found in this guild include *Buxbaumia aphylla* (leafless bug-on-a-stick moss), and *Cetraria subalpina* (Iceland-moss lichen).

Cold Forest Guild

Includes the more productive and mesic phases of *Abies lasiocarpa* / *Menziesia ferruginea* (subalpine fir/menziesia) and *Abies lasiocarpa*/ *Xerophyllum tenax* (subalpine fir/beargrass) community types, mostly above 4,800 feet; however, they can occur below 4,800 feet in cold, north-facing drainages. Sensitive species found in this guild are *Cetraria subalpina* (Iceland-moss lichen) and sometimes *Lycopodium dendroideum* (groundpine); the Forest species of concern *Diphasiastrum sitchense* (Sitka clubmoss) also occurs on this guild. This includes cold riparian areas that can extend well below 4,000 feet and are dominated by cold and wet *Abies lasiocarpa* / *Calamagrostis canadensis* (subalpine fir / bluejoint reedgrass) and *Abies lasiocarpa* / *Streptopus amplexifolius* (subalpine fir/twisted stalk) communities. These cold riparian communities can also contain a mosaic of peatland communities and species, and a few rare species generally found in warmer western hemlock communities, such as *Streptopus streptopoides* (krushea).

Wet Forest Guild

This guild is found in wet, generally riparian, often mid- to late-successional western redcedar and wet western hemlock plant communities, including most identified 'ancient cedar groves' found scattered throughout the northern subbasins, generally at less than 4,000 feet. Certain plant communities within these systems, including *Thuja plicata* / *Oplopanax horridum* (cedar/devil's club), *Thuja plicata* / *Athyrium filix-femina* (cedar/ladyfern), *Thuja plicata* / *Adiantum aleuticum* (cedar/maidenhair fern), *Tsuga heterophylla* / *Gymnocarpium dryopteris* (western hemlock/oakfern) and *Thuja plicata* / *Gymnocarpium dryopteris* (cedar/oakfern), have a high potential to support rare plants. Many species within this guild are rare coastal disjuncts such as *Blechnum spicant* (deerfern), *Hookeria lucens* (clear moss), and *Polystichum braunii* (Braun's holly fern). Clear moss is associated with seeps and "boggy" areas in wet cedar forests. The sensitive species *Buxbaumia viridis* (green bug-on-a-stick moss) is found in this guild on decomposing cedar logs.

Other rare species are boreal disjuncts or boreal peripherals such as *Streptopus streptopoides* (krushea), *Phegopteris connectilis* (northern beech fern) and *Lycopodium dendroideum*

(groundpine). Certain scattered rare species like the *Botrychium* species (moonworts), especially *Botrychium montanum* (western goblin), *B. minganense* (Mingan moonwort), *B. pedunculatum* (stalked moonwort), *B. paradoxum* and *B. ascendens* (upswept moonwort) occur in these communities on riparian benches or other shallow-sloped microsites. *Asplenium trichomanes* (maidenhair spleenwort) can be found in wet, rock seeps in wet forest guild habitats. Wet forest communities can also contain, or intergrade into, peatland communities such that Peatland Guild species and Wet Forest Guild species can overlap across the landscape. Some of the Wet Forest Guild species can also be found in Moist Forest Guild habitats.

Moist Forest Guild

This guild is found in moist *Thuja plicata* (western redcedar) and *Tsuga heterophylla* (western hemlock) plant communities, generally in mid- to late-successional stages below 4,800 feet. A few species can also be found in moist *Abies grandis* / *Asarum caudatum* (grand fir / ginger) and *Abies grandis* / *Clintonia uniflora* (grand fir / queencup beadlily) communities. Certain members of the Wet Forest Guild can also be found in these more mesic upland plant communities. This guild contains the following plant communities: *Tsuga heterophylla* / *Asarum caudatum* (hemlock/wild ginger), *T. heterophylla* / *A. caudatum* - *Aralia nudicaulis* (hemlock/ginger - wild sarsaparilla), *T. heterophylla* / *Clintonia uniflora* (hemlock / beadlily), *T. heterophylla* / *C. uniflora* - *Aralia nudicaulis* (hemlock / beadlily - wild sarsaparilla), *T. heterophylla* / *C. uniflora* - *Menziesia ferruginea* (hemlock / beadlily - fool's huckleberry), *Thuja plicata* / *Asarum caudatum* (cedar/ginger) and *Thuja plicata* / *Clintonia uniflora* (cedar/beadlily). Some rare species occur in small, moist microsites within these mesic communities, like *Asplenium trichomanes* (maidenhair spleenwort), which is found on seepy rock outcrops. Rare and uncommon plant species such as the coastal disjunct *Blechnum spicant* (deerfern) are found in moist forest habitats. Rare *Botrychium* species (moonworts), especially *Botrychium minganense* (Mingan moonwort), *B. lanceolatum* (triangle moonwort) and *B. pinnatum* (northwestern moonwort), can be found in shallow-sloped microsites. The boreal species *Lycopodium dendroideum* (ground pine) can also occur in these more mesic communities.

Dry Forest Guild

This guild encompasses dry, open sites in *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii* / *Physocarpus malvaceus* (Douglas-fir / ninebark), *P. menziesii* / *Calamagrostis rubescens* - *Arctostaphylos uva-ursi* (Douglas-fir / pinegrass - kinnikinnick) and *P. menziesii* / *Festuca idahoensis* (Douglas-fir / Idaho fescue) or / *Agropyron spicatum* (bluebunch wheatgrass) communities, generally below 4,500 feet. *Astragalus microcystis* (least bladderly milkvetch), the only sensitive species of this guild to occur in the Kaniksu zone, is found on rock cliffs above Lake Pend Oreille and on gravelly banks above the Pend Oreille River.

Deciduous Riparian

Broad-leaved deciduous forests occur on islands and margins of lowland major rivers in the Kaniksu zone such as the Kootenai, lower Clark Fork, Pend Oreille and lower Priest rivers, and along the shores of Pend Oreille Lake and Priest Lake. These forests are most commonly dominated by *Populus trichocarpa* (black cottonwood), with lesser amounts of introduced *P. deltoides* (plains cottonwood) and escaped hybrid poplars (*Populus trichocarpa* X), which were planted for streambank stability. Cottonwood communities often are adjacent to shrub-carr communities and can form an indistinguishable mosaic. Deciduous riparian communities provide potential habitat for *Betula pumila* v. *glandulifera* (dwarf birch), *Collema curtisporum* (short-spored jelly lichen), *Cypripedium pubescens* v. *pubescens* (yellow lady's slipper) and *Salix candida* (hoary willow).

Stands of *Populus tremuloides* (quaking aspen) are also present and are associated with higher gradient streams or moist seeps. *P. tremuloides* (quaking aspen), *Betula papyrifera* (paper birch) and *Betula occidentalis* (water birch) also occur as secondary components in lowland conifer-dominated forests throughout northern Idaho. *Alnus rubra* (red alder) is an uncommon but sometimes locally abundant coastal disjunct. It can be a codominant in moist forests in lower elevation riparian zones and meadow margins along Lake Pend Oreille and the lower Priest River in the Kaniksu zone, as well as in Coeur d'Alene Lake, the lower Coeur d'Alene River and the lower St. Joe River. It is also found in patches in drainages in the Little North Fork of the Clearwater River.

Aquatic Guild

This guild occurs generally in littoral (< 2 meters) zones of vernal pools, small ponds and lakes throughout northern Idaho, generally at lower elevations. *Potamogeton natans* (floating-leaved pondweed), *Myriophyllum* species (water-milfoil), *Utricularia* species (bladderworts), and other *Potamogeton* species occur alone or in combination in shallow littoral zones. *Nuphar polysepalum* (yellow pond lily) and *Brasenia shreberi* (water-shield) are frequently present as monocultures in deeper littoral zones. *Potamogeton amplifolius* (large-leaved pondweed), *Potamogeton praelongus* (white-stalked pondweed), and *Potamogeton richardsonii* (Richardson's pondweed) are common in deep limnetic zones (> 2 meters) of many northern Idaho lakes.

The rare species *Cicuta bulbifera* (bulb-bearing water hemlock) and *Scirpus subterminalis* (water clubrush) are members of this aquatic guild. A single population of the rare *Nymphaea leibergii* (pygmy waterlily) was historically known from Granite Lake and is believed to be extinct in Idaho. The listed threatened species *Howellia aquatilis* (water howellia) was historically known to occur in the Pend Oreille subbasin and has likely also been extirpated. Only one other population is known in Idaho near Harvard, along the Palouse River; however, populations occur to the west in Spokane County, Washington. No other populations have been found to date in northern Idaho, even though high quality habitat exists.

Peatland Guild

Peatlands by definition are habitats whose soil substrate is composed of organic material, where deposition of organic material exceeds decomposition. In north Idaho, peatland habitats are found mostly in the northern three subbasins (Priest, Kootenai and Pend Oreille). This guild can be divided into five distinct sub-guilds, each containing different plant communities and species, substrates, pH and abiotic processes:

- poor fen
- intermediate/rich fen
- ombrotrophic bog
- paludified forest
- shrub carr

Poor fens occur in glacial scours, kettle holes, isolated oxbows, old lake beds, and at or near the heads of drainages where inflow is limited. Thick layers of *Sphagnum* peat have accumulated since the end of continental glaciation, about 6,000 - 7,000 years ago. Poor fens are minerotrophic, receiving nutrients from water percolating through mineral soil or bedrock, and are quite acidic (pH values 4-6). These communities are characterized by a solid mat of *Sphagnum* moss with scattered stems of vascular plants, including rare plants such as *Carex*

comosa (bristly sedge) and *Carex chordorrhiza* (string-root sedge). Poor fens support the oldest plant communities in northern Idaho and have changed little since the end of glaciation 6,000-7,000 years ago (Bursik and Moseley 1995; Moseley 1998). These communities are often erroneously referred to as 'bogs', especially when they occur on floating mats in seepage lakes.

Ombrotrophic bog ('true bog') communities occur in glacial scours, kettle holes, isolated oxbows, old lake beds, and at or near the heads of drainages where inflow is limited. Unlike poor fens, the thick mats of peat accumulate upwards forming hummocks, often at the base of shrubs or downed logs, and are above the influence of the water table. Incoming water and nutrients (from precipitation) are held above the water table, primarily by the low hydraulic conductivity of the Sphagnum peat. Vascular species are few or absent and are restricted to those tolerant of acidic conditions (poor fen species). Rare plants like *Andromeda polifolia* (bog rosemary), *Carex chordorrhiza* (string-root sedge), *Gaultheria hispida* (creeping snowberry), *Rhynchospora alba* (white beak rush) and *Vaccinium oxycoccos* (bog cranberry) are adapted to these harsh environments. The pH values are very acidic, ranging from pH 3- pH 4. Compared to rich fens (pH 6 - 7.5) the pH difference is equal to the difference between vinegar and salt water (Crum 1992).

Intermediate and rich fens are *Sphagnum*-poor peatlands with vascular plants contributing the majority of cover and composition. Most people usually refer to these communities as marshes, wet meadows or swamps. Fen soils are organic, usually with little to no decomposition of organic material, while true marshes have mineral soils and usually high rates of decomposition. Intermediate fens have equal dominance by bryophytes (*Sphagnum* species and true mosses) and vascular plant species, especially sedges, while rich fens have few (if any) *Sphagnum* species present. Organic soils of rich fens are formed by accumulation of sedge, grass and brown moss peat (*Aulacomnium* and *Calliergon* species). *Carex utriculata* (beaked sedge), *Carex lasiocarpa* (slender sedge), *Carex aquatilis* (water sedge), *Scirpus microcarpus* (small-fruited bulrush), *Typha latifolia* (cattails), *Calamagrostis canadensis* (bluejoint reedgrass), *Spiraea douglasii* (hardhack), *Betula glandulosa* (bog birch) and willow (*Salix* species)-dominated community types may occur as rich fens.

Rich fens in subalpine habitat are characterized by *Carex scopulorum* (Holm's mountain sedge), *Carex aquatilis* (water sedge), *Calamagrostis canadensis* (bluejoint reedgrass), *Deschampsia cespitosa* (tufted hairgrass), *Kalmia microphylla* (bog laurel) and *Betula glandulosa* (bog birch). Several rare species are found in rich fens, including *Carex leptalea* (bristle-stalked sedge), *Carex magellanica* ssp. *irrigua* (poor sedge) and *Trientalis europaea* (northern starflower). Rich fens are the most floristically diverse of the peatland types. Like poor fens, intermediate and rich fen communities can occur on floating or fixed organic mats. Floating mats contain some of the most ecologically stable communities occurring in north Idaho peatlands because they adjust to fluctuating water levels annually, maintaining constant contact with water and never becoming inundated like fixed (shore) mats. The pH values for intermediate and rich fens can vary from pH 6 - 7.5.

Paludified forests typically occur on the margins of closed peatland basins and often form a mosaic with poor fen, rich fen, or shrub-carr communities. These communities occur with the expansion of peatlands and result from a rise in the water table from peat accumulation. Paludification is thought to precede the formation of poor fen and true bog (ombrotrophic) habitats (Crum 1992). Paludified forests are characterized by an overstory of conifers, usually *Pinus contorta* (lodgepole pine) and *P. monticola* (white pine), with lesser amounts of *Abies lasiocarpa* (subalpine fir), *A. grandis* (grand fir), *Picea engelmannii* (Engelmann spruce), *Thuja*

plicata (western redcedar) or *Tsuga heterophylla* (western hemlock), with a soil that is *Sphagnum* peat. The understory is dominated by *Sphagnum* moss species and some vascular plants, including some rare species found in poor fens and ombrotrophic bogs. One species, *Maianthemum dilatatum* (beadruby) has been found in a single location in northern Idaho in a paludified forest.

Shrub-carr habitats include moist shrubland riparian communities. Habitats dominated by willows and other shrubs occur in nearly impenetrable patches along low gradient channels, as stringers or on narrow flood plains along high gradient streams, as mosaic patches within riparian forests, and on margins of meadows and fen communities. Most commonly, one or more shrubs dominate vast areas of moist to wet, seasonally flooded fens or riparian zones. Shrub-carrs often contain willow-dominated shrub lands associated with low gradient meandering channels or fens, and are characterized by *Salix drummondiana* (Drummond's willow) with lesser amounts of or codominance by *Salix geyeriana* (Geyer's willow) and *S. sitchensis* (Sitka willow); they may also contain *S. bebbiana* var. *bebbiana* (Bebb's willow), *Spiraea douglasii* (hardhack), *Alnus incana* (thinleaf alder), or *Betula glandulosa* (bog birch) community types.

The rare willows *Salix candida* (hoary willow) and *Salix pedicellaris* (bog willow) can be found in shrub-carrs and in shrub/fen mosaics. *Betula pumila* (dwarf birch), a rare species in northern Idaho, can be found in shrub-carrs in the Moyie and Kootenai river systems. One rare lichen, *Cetraria sepincola* (bog-birch lichen), is found exclusively on the branches of bog and dwarf birches. Rare hybrids between *Betula pumila* (dwarf birch) and *Betula glandulosa* (bog birch) - known as *Betula X sargentii* - occur in the Priest River drainage (Johnson 1995).

Willows are frequently absent or a minor component of shrub lands associated with higher gradient streams. *Alnus incana* (thinleaf alder), *Alnus sinuata* (Sitka alder), *Cornus sericea* (red-osier dogwood) and *Rhamnus alnifolia* (alder buckthorn) occur as community dominants along higher gradient streams. Patches of *Cornus sericea* (red-osier dogwood), *Salix bebbiana* var. *bebbiana* (Bebb's willow), *Crataegus douglasii* (Douglas hawthorn) and *Crataegus suksdorfii* (Suksdorf's hawthorn) are common in association with cottonwood forests on larger stream systems. *Crataegus columbiana* (Columbia hawthorn) is only found in warm, lower elevation drainages like the St. Joe, Coeur d'Alene, Kootenai and lower Pend Oreille. Channel bars are frequently vegetated with *Salix exigua* (coyote willow).

Rare plant species found in shrub-carr communities include *Cypripedium pubescens* v. *pubescens* (yellow lady's slipper), *Carex leptalea* (bristle-stalked sedge), *Carex magellanica* ssp. *irrigua* (poor sedge), *Dryopteris cristata* (crested shield-fern), *Lycopodium dendroideum* (groundpine), *Petasites sagittatus* (arrowleaf coltsfoot) and *Gaultheria hispidula* (creeping snowberry). Rare *Botrychium* species (moonworts) can also be found on the margins of these communities.