

Little Hogback-Meyer’s Fire Salvage Effects Analysis–Sensitive Plants

INTRODUCTION

Resource Indicators and Units of Measure

Table 1: Resource Indicators and Units of Measure

Resource Element	Resource Indicator	Measure	Source
Habitat	Habitat Structure	Increase or decrease in suitable habitat structure	Forest Plan Goal Manual 2600
Abundance	Population Abundance	Increase or decrease in populations or individuals within a population	Forest Plan Goal Manual 2600
Reproduction	Reproductive Output	Increase or decrease in reproductive capacity	Forest Plan Goal Manual 2600
Invasive Plants	Risk of Weed Invasion	Increase or decrease in the risk of weed establishment in sensitive plant habitats	Forest Plan Goal Manual 2600

Methodology

- GIS resources were used to provide pre-field identification of species potential within the project area (MNHP, 2018; and VMap 2012 (Brown and Barber, 2011)).
- VMap’s DOM 6040 classification was run to identify any dominant whitebark pine stands in the project area or units.
- Field surveys of proposed treatment units were completed in June, July, and mid-August 2018 by the Forest Botanist and trained biological science technicians. The June surveys identified units with whitebark pine seedlings and saplings, as well as units with Veratrum species present. July and August surveys were scheduled during the flowering period for Veratrum, and consisted of revisits to those units previously noted as having Veratrum. Proper species identification was able to be done during the flowering window. Surveys for Botrychium species were done during all visits to the project area in conjunction with other species surveys.
- Regulatory Framework
 - Beaverhead-Deerlodge Forest Plan as Amended 2009
 - National Forest Management Act of 1976
 - Forest Service Manual 2600 Wildlife, Fish and Sensitive Plant Habitat Management
 - The Endangered Species Act
 - National Environmental Policy Act of 1969

AFFECTED ENVIRONMENT

Three sensitive plants are known or suspected to occur within the project area. California false-hellebore (*Veratrum californicum*), peculiar moonwort (*Botrychium paradoxum*), and whitebark pine (*Pinus albicaulis*). No additional sensitive plant species are suspected.

The analysis will differentiate between the two areas of the project: Little Hogback Fire (northern section) and Meyer's Fire (southern area).

Little Hogback - Northern

Sensitive moonworts: Roughly 10 populations of sensitive moonworts occur on the Beaverhead-Deerlodge National Forest, seven of which occur on the Pintler Ranger District. Peculiar moonwort is mapped just outside the project area, on BLM land. The last survey of the population in 2007 reported 17 plants (MNHP, 2018). The population lies between a mapped high severity burn and low severity burn according to post fire vegetation mortality (RAVG) and Soil burn severity (SBS) mapping (USFS, 2017). Field reconnaissance of the population was conducted in July 2018, but no individuals were found. The mapped population occurs in a moist meadow with tall grasses and sedges near a riparian stream. It is possible that additional populations of peculiar moonwort or other sensitive moonworts (wavy moonwort (*Botrychium crenulatum*), or Western moonwort (*Botrychium hesperium*)) occur in the project area, but none were found, and suitable habitat was limited within treatment units.

Moonworts prefer open canopy conditions and therefore, natural fire and disturbances that prevent closed canopy conditions can preserve early seral moonwort habitat (Ahlenlager and Potash, 2007). Most moonworts prefer 10-30 year old disturbed habitats (Beatty et al., 2003; Ahlenlager and Potash). Moonworts are related to ferns, and have underground bodies that form associations with mycorrhizal fungi. It is thought that the fungal partner is essential in the relationship and provides most of the moonwort nutritional needs, making the above ground moonwort parts primarily for reproduction (releasing spore bodies). These characteristics make moonworts more resilient to above ground disturbances, such as fire and herbivory (Ahlenlager and Potash, 2007).

Additional information on the ecology of sensitive moonworts can be found in the following documents which are all located in the project record:

- Vanderhorst 1997
- Beatty et al. 2003
- Ahlenlager and Potash 2007

Meyers - Southern

California false-hellebore: Six populations of California false-hellebore occur on the Beaverhead-National Forest. Four of the populations occur on the Pintler Ranger District. The species occupies late seral montane to subalpine wet meadow and riparian communities

(MNHP, 2010; Cosgriff et al., 2004). One population was previously mapped adjacent to salvage unit #38. The SAVG modeling of fire severity indicate that the timber adjacent to the population burned hot with moderate soil burn severity. The last documentation of the population occurred in 1984 and reported 3 clumps of 15-30 plants. Field reconnaissance of the population occurred in July 2018 and found 8 individuals occurring well outside any proposed treatment unit. Another population occurs within the project area (Meyers fire Salvage), but also well outside treatment units (MNHP, 2018). This population was visited in September 2016 (Field Notes 2016). Hellebore plants were found, but were not distinguishable from the common hellebore due to the lack of flowers on many, and wildlife browse and trampling of others.

Flowers are the only distinguishing feature between California false-hellebore and the more common green hellebore (*Veratrum viride*). Flowering occurs between July and August. Often times, plants do not produce flowers, or flower heads are browsed by wildlife, making species determinations difficult to impossible in a given year.

Field surveys were conducted in all proposed Meyer Salvage units in June 2018. Non-flowering *Veratrum* plants were found in or adjacent to units, 31, 32, 33, 46, and 48 (unit 48 has since been dropped) in moist wet meadow or streamside habitats. Follow up surveys conducted in late July and mid-August found all to be the common green hellebore. Therefore, no California false-hellebore was found within proposed treatment units. Within the project area, habitat suitability was high in wet meadows and along streams. Population abundance was low as only two populations are known. Reproductive output was low due to the very low number of individuals. Risk of weed invasion is low due to the current low weed infestation.

Whitebark pine experienced a mix of burn regimes in the Little Hogback and Meyers fires in 2017. Over 9000 acres of dominant whitebark pine stands are mapped within the fire perimeters using VMap. Of these, 40% of the whitebark pine dominant stands experienced high burn severity and moderate soil burn severity according to RAVG 3 and SBS indices, while 36% experienced low burn severity and very low soil burn severity.

Wildland fire is a natural component of whitebark pine ecosystems. It can benefit whitebark pine by reducing the competing conifers and providing opportunity for whitebark pine regeneration through Clark's nutcracker (bird) seed dispersal via seed caching (Keane and Parsons 2010). Additional information on whitebark pine ecology and threats can be found in the following documents which are located in the project record:

- U.S. Fish and Wildlife Service's 12-month Finding on a Petition to list *Pinus albicaulis* as Endangered or Threatened with Critical Habitat (2011).
- Tomback et al. 2001
- Keane and Parsons 2010

The region 1 existing vegetation classification database, VMap, shows no dominant stands of whitebark pine in the Little Hogback-Meyers Fire Salvage Project Area. However, mature

whitebark pine individuals have been mapped on the ground within the project area, in the Meyer's Fire project area where elevations reach 7800 feet. The individuals were mapped well outside any project treatment units, and described as few scattered individuals.

Field surveys conducted in June 2018 found seedling and sapling whitebark pine individuals present within treatment units. Many individuals were dead from burning, but retained their burnt needles. Some units where the fire was patchy had live seedlings and saplings present as well. No individuals 3" diameter (dbh) or greater were found.

Habitat suitability was low due to the mixed conifer stands at low elevations (primarily below 7,000 feet). Population abundance was low, since relatively few live individuals occurred within the units. Reproductive output was low since no mature individuals were found.

ENVIRONMENTAL CONSEQUENCES

NO ACTION ALTERNATIVE

Under the no action alternative, no salvage logging will occur.

Little Hogback - Northern

Sensitive moonworts

Fire is a natural disturbance agent, known to perpetuate moonwort habitats; whereas fire suppression is a known threat to moonwort habitats (Beatty et al., 2003; Ahlenslager and Potash, 2007). The impacts of the recent Little Hogback fire on sensitive moonworts are unknown at this time, but likely reduced canopy cover for the population and potentially other populations within the burned area. It is unknown whether the recent fire played a role in the lack of individuals detected at the BLM known population site during the 2018 surveys, as moonworts can have years where they simply do not appear above ground.

No known populations of sensitive moonworts occur within the project area. Habitat suitability is low within the treatment units, as units are typically high and dry. If present, population abundance and reproductive output within units is likely low since individuals usually occur in small population clusters and have infrequent above ground appearances for spore release. Risk to weed invasion is likely low. Under the No Action alternative, if sensitive moonwort species were to occur, current conditions and trends would be maintained. No direct, indirect or cumulative effects are anticipated; and therefore, no change in current habitat structure, population abundance, reproductive output or weed invasion is expected. **NO IMPACT.**

Meyers - Southern

California false-hellebore

California false-hellebore was not found in any treatment units. Two populations are known to occur within the project area, but well outside of treatment units. Under the No Action alternative, hellebore plants would persist in wet soils of the project area. Habitat suitability is

high in moist meadows and riparian areas of the project area, but these habitats are most often excluded from treatment units due to soft soils. Population abundance is low, since only two populations in the entire project area are known. Reproductive output is low due to the low number of individuals. Risk to weed invasion is low due to lack of weeds detected in the moist meadows and riparian areas. No direct, indirect, or cumulative effects are anticipated; and therefore, no change in habitat structure, population abundance, reproductive output or weed invasion is expected. **NO IMPACT.**

Whitebark pine

Whitebark pine seedlings and saplings that survived the fire will continue to grow within the project area. At the lower elevations, these individuals will likely be outcompeted by faster growing conifers, such as lodgepole pine (*Pinus contorta*). Habitat suitability is low within treatment units, and much of the project area, due to the low elevation where other conifers easily outcompete whitebark pine. Population abundance is low due to the low number of individuals detected during field surveys. Reproductive output is low as no individuals within treatment units were cone producing.

Under the No Action alternative, populations would remain in their current condition and trend within the project area. No direct, indirect or cumulative effects are anticipated; and therefore, no change in habitat structure, population abundance, or reproductive output is expected. **NO IMPACT**

PROPOSED ACTION

Design Criteria

- If any sensitive plant species are found during project implementation, a botanist will be consulted and the sensitive plants and their habitat will be protected.
- If whitebark pine is found within units during surveys or during salvage activities, individuals 3" dbh and greater will be avoided to the extent possible.

Direct and Indirect Effects

Little Hogback - Northern

Sensitive Moonworts

No known sensitive species of moonworts occur within the project area; however, with known individuals occurring just outside the project area, and elsewhere on the district, there is potential for them to occur within the project area. Moonwort populations are very difficult to detect due to their inconspicuous stature (1-10 cm tall), and sometimes infrequent appearance above ground. Survey windows for sensitive species of moonwort are typically late July to early August.

If sensitive species of moonworts occur within the project area and within treatment units, the proposed timber harvest and associated use of heavy equipment could result in: a change in

canopy cover; changes in hydrology; compaction of soils; burial of individuals; and an increased risk for noxious weed invasion (Ahrensleger and Potash, 2007). The change in canopy cover, as a result of timber harvest, has been found to negatively affect moonwort populations on the Forest (personal observation); conversely, sensitive moonworts have also been found occurring within 25 year old timber harvest units and along old logging roads on the Forest (personal observation).

Overall, suitable habitat was limited within treatment units due to the lack of moist meadow and riparian habitats. However, if salvage treatments occur within undetected occupied moonwort habitats, it can be assumed that habitat structure will change. Likely this change will decrease suitability, but in some cases, the removal of conifers could have the potential to improve habitat structure by creating early seral conditions. If individuals occur within treatment units, population abundance will likely decline for some time as individuals may be buried and soils compacted. Reproductive output will likely decrease as the number of individuals decreases. Risk of weed invasion shall be very minimal due to low infestation of weeds within the project area and the incorporated design criteria that require weed seed removal from equipment, and measures to reduce weed spread. Overtime, sensitive moonworts may recover in these areas. See Appendix A for sensitive moonwort species information and pictures.

Meyers - Southern

California false-hellebore

All units were surveyed and no California false-hellebore were found. Known populations occur well-outside proposed treatment units in moist meadow and riparian habitats. Based on this information, no impact shall occur. Habitat suitability shall remain the same since treatments will not occur in wet meadow and riparian habitats. Population abundance outside treatment units will remain low, where only two populations are known. Reproductive output will remain low. Risk of weed invasion shall be very minimal due to low infestation of weeds within the project area and the incorporated design criteria that require weed seed removal from equipment, and measures to reduce weed spread. See Appendix A for California false-hellebore species information and pictures.

Whitebark pine

The scattered whitebark pine seedling and sapling individuals within the project area may be impacted by salvage operations by means of equipment trampling and removal. Whitebark pine is not thriving in these habitats as elevations are low and competing conifer cover is high. Habitat suitability will remain low after treatments. Population abundance will remain low. Reproductive output will remain low.

CUMULTATIVE EFFECTS

Spatial and Temporal Boundaries

The spatial analysis boundary of direct and indirect effects to sensitive plants includes all Forest Service managed lands within the project area with a focus in treatment units, since impacts to sensitive plants are more likely to occur where project treatments are planned. In order to capture other activities that may affect sensitive plants within the area, the cumulative effects analysis spatial area was drawn. This area encompasses National Forest System land as well as all other ownerships within the 6th Code HUCs of the project area.

The temporal timeframe covers the span of time in which the effects of the proposed actions, in combination with past and present activities, may be evident. The short-term impacts (immediately after the proposed treatments), and long-term implications (approximately 50 years in the future) are considered. Approximately 50 years would be the time for habitat conditions to return to the present state in the project area.

Ongoing Effects of Past Actions

Table 2: Cumulative Effects

Activity	Timeframe	Comments
Livestock Grazing and Allotment Management	Past/Ongoing / Future	Grazing of livestock and associated grazing infrastructure development including fencing and water developments.
Timber Harvest	Past/future	Past and future timber harvest can damage plants and soils during operation, which also changing habitat conditions.
Fire Suppression	Past/Ongoing / Future	Fire suppression can have indirect impacts on plant succession.
Wildland Fire	Past/Ongoing / Future	Past wildfire acres are listed in the Master List of past, present, future actions in project file

Little Hogback - Northern

Sensitive Moonworts

Past activities that have likely affected sensitive moonwort populations in the Little Hogback portion of the cumulative effects analysis area include: livestock grazing, timber harvest, fire suppression and wildfire. Livestock grazing occurs on Forest Service, BLM, State and private lands within the cumulative effects area. Livestock grazing has been identified as a potential threat to sensitive moonwort populations, where it can remove above ground spore producing structures (reducing reproductive output), trample individuals, and alter habitat through soil compaction (Ahlenslager and Potash 2007; Beatty et al., 2003; Zika et al., 1995). Conversely,

livestock grazing in moonwort habitats has also been identified as means for maintaining early seral conditions suitable for moonworts (Ahlenlager and Potash 2007; Beatty et al., 2003). Timber harvest in the past may have had direct impacts to sensitive moonwort populations, but none are documented in the project area. Timber harvest, fire suppression and wildfire can all affect habitat conditions. Timber harvest and wildfire work to maintain early seral conditions and disturbances preferred by most moonwort species; whereas fire suppression over the last century has prevented wildfire from maintaining early seral conditions.

One known sensitive moonwort population occurs within the cumulative effects analysis area on BLM land. The extent of impact from these past and future activities on this and any unknown population is unknown.

Meyers - Southern

California false-hellebore

Past activities that have likely affected Californian false-hellebore populations in the Meyers portion of the cumulative effects analysis area include: timber harvest, fire suppression and wildfire. Timber harvest in the past may have had direct impacts to Californian false-hellebore populations, however soil requirements for the species are very wet, and may have precluded timber operations. Timber harvest, fire suppression and wildfire can all affect habitat conditions. Timber harvest and wildfire promote early seral conditions and disturbances; whereas fire suppression over the last century has prevented wildfire from maintaining early seral conditions. Activities that affect hydrology are the most likely to have impacts on habitat suitability for California false-hellebore, as it prefers moist sites.

Two known California false-hellebore populations occurs within the cumulative effects analysis area. The extent of impact from these past and future activities on this and any unknown populations is unknown, and anticipated to be very minor.

Summary of Environmental Effects

Table 3: Summary of Effects by Alternative

Resource Indicator	Indicator /Measure	Alternative 1 – No Action	Alternative 2 – Proposed Action
Habitat Suitability	Sensitive moonwort: Low California false-hellebore: High Whitebark pine: Low	Sensitive moonworts: No change California false-hellebore: no change Whitebark pine: no change	Sensitive moonworts: slight decrease California false-hellebore: no change Whitebark pine: no change
Population Abundance	Sensitive moonwort: Low California false-hellebore: Low Whitebark pine: Low	Sensitive moonworts: no change California false-hellebore: no change Whitebark pine: no change	Sensitive moonworts: slight decrease California false-hellebore: no change Whitebark pine: no change

			Whitebark pine: decrease (remain low)
Reproductive Output	Sensitive moonwort: Low California false-hellebore: Low Whitebark pine: Low	Sensitive moonworts: no change California false-hellebore: no change Whitebark pine: no change	Sensitive moonworts: decrease California false-hellebore: no change Whitebark pine: no change
Risk of Weed Invasion	Sensitive moonwort: Low California false-hellebore: Low	Sensitive moonworts: no change California false-hellebore: no change	Sensitive moonworts: slight increase California false-hellebore: slight increase

DETERMINATIONS

Little Hogback - Northern

Sensitive Moonworts

No known sensitive moonworts occur within the proposed treatment units. Based on the above information, implementing the proposed alternative, may result in slight decreases in habitat stability, population abundance, and reproductive output if unknown individuals occur within treatment units. A slight risk for increased weed invasion is also possible. Therefore, implementation of the proposed action *“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species”* of sensitive moonworts.

Meyers - Southern

California false-hellebore

No California false-hellebore were found within treatment units and no direct impacts are anticipated due to the lack of individuals and wet habitat requirements. There is a slight risk to increased weed invasion due to proposed activities, however incorporated design criteria shall reduce this risk. Based on the above information, implementing the proposed alternative, *“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species”* of California false-hellebore.

Whitebark pine

Whitebark pine seedlings and saplings do occur within proposed treatment units. Whitebark pine seedlings and saplings may be damaged or removed during proposed treatment activities. These activities are limited to treatment units, which comprise a very small portion of the project area. Habitat suitability, population abundance, and reproductive output will all remain low due to the low elevation and high abundance of competing conifers. Therefore, implementation of the proposed action *“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species”* of whitebark pine.

Literature Cited/Bibliography

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APPENDIX A.

VERATRUM CALIFORNICUM (California false hellebore) G5/S1



State Rank Reason

Known from only six extant locations in the state.

General Description

California False-hellebore is a robust, herbaceous perennial with solitary, unbranched stems that are 1-2 m high and arising from thick rhizomes. The numerous, alternate, broadly elliptic, sessile leaves are 2-3 dm long, and they have entire margins and parallel veins and sheath the stem at the base. Foliage is glabrous below, with the stem becoming densely short-hairy above. The nearly sessile flowers are crowded in a narrow, erectly branched inflorescence that is 3-6 dm long. Each flower has 6 white, petal-like, narrowly elliptic tepals that are 10-15 mm long with green markings at the base. There are 6 stamens that are less than 1/2 as long as the tepals and a glabrous ovary that matures into an egg-shaped capsule that is 2-3 cm long.

Phenology

Flowering in July-August.

Diagnostic Characteristics

California false-hellebore has **WHITE** flowers. The more common and widespread *V. VIRIDE* has **GREENISH** flowers, with petals that are 6-10 mm long and arranged on drooping branches of an open inflorescence.

Distribution Comments

WA to CA, east to MT, CO, and Mex. Peripheral.

Habitat

Wet meadows and streambanks in the montane and subalpine zones.

References

California False-hellebore — *Veratrum californicum*. Montana Field Guide. Retrieved on April 22, 2010, from http://FieldGuide.mt.gov/detail_PMLIL25020.aspx

***BOTRYCHIUM PARADOXUM* (peculiar moonwort) G2/S2**



State Rank Reason

This moonwort species is known to occur in western Montana from over two dozen extant occurrences, almost all of which are on federally-managed lands. Many occurrences are small in size and occupy mesic meadows and bunchgrass communities. Potential impacts to these sites include livestock grazing, weed invasion and recreational uses. Though some threats exist to individual occurrences, the species as a whole is not highly threatened by any single or combination of potential impacts in the state. As such, more thorough and increased observation data may eventually show that an S3 rank is more appropriate for the species.

General Description

Peculiar moonwort is a small perennial fern with a single above ground frond. The frond varies in height up to about 15 cm tall, is glaucous green, somewhat succulent, and divided into two similar segments which share a common stalk. The segments may be unbranched in small plants or branched in larger plants and are both fertile and bear grape-like sporangia. Spores germinate underground and develop into minute, subterranean, non-photosynthetic gametophytes which depend on an endophytic fungus for nourishment.

Phenology

Fronds mature in July.

Diagnostic Characteristics

BOTRYCHIUM PARADOXUM is perhaps the easiest of moonworts to recognize, being the only species to lack a sterile laminar frond segment, but other species could be mistaken for it if the sterile segment has been browsed or bears marginal sporangia. Reliable field determination of moonworts depends on the careful use of technical keys and comparison with silhouette outlines of verified specimens. It is complicated because there is often a high degree of morphological variability between individuals in a population and between populations of the same

species, several species may grow together at the same site, and the few diagnostic characters may not be apparent in small plants.

***BOTRICHUM CRENULATUM* (wavy moonwort) G3/S2**



State Rank Reason

This moonwort species is known in western Montana from over 40 extant occurrences. Most populations are located on either National Forest or State lands. Populations are generally small in size and occupy roadsides or other similarly open or disturbed habitats. As such, it is vulnerable to activities such as weed invasion, weed spraying and road maintenance.

General Description

Wavy Moonwort is a small, perennial fern with a single aboveground frond. The frond is usually 10 cm or less tall, yellow-green, and divided into two segments which share a common stalk. The mostly sterile segment is once pinnatifid with usually three or four well separated pairs of thin textured, broadly fan-shaped pinnae which have distinct veins and crenulate margins. The fertile segment is longer than the sterile segment, is branched (often like a tiny Christmas tree), and bears grape-like sporangia. Spores germinate underground and develop into minute, subterranean, non-photosynthetic gametophytes which depend on an endophytic fungus for nourishment.

Phenology

Fronds mature in June-July.

Diagnostic Characteristics

Yellow-green color and well separated, thin textured, broadly fan-shaped pinnae with crenulate margins and prominent veins are diagnostic of *B. CRENULATUM*.