

**Biological Evaluation of Intermountain Region Sensitive Plant
Species for
Cooperative Horse Removal with McDermitt Tribe
Humboldt-Toiyabe National Forest – Santa Rosa Ranger District
2014**

Prepared by: /s/Dirk W. Netz
Dirk W. Netz, Zone Botanist
Humboldt-Toiyabe NF

 October 2, 2014
Date

Table of Contents

I. Summary.....	3
II. Introduction	3
III. Proposed Project and Description.....	4
Purpose and Need.....	4
Proposed Action	5
IV. Species Considered and Species Evaluated.....	7
V. Affected Environment and Analysis Process.....	8
Affected Environment	8
Analysis Process.....	8
VI. Consultation.....	9
VII. Effects Analysis and Determinations for Sensitive Plants	10
Determinations	10
VII. Recommended Mitigation:	10
References.....	11
Appendix A.....	13

I. Summary

During implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for these species. Considering this and the short duration of activities, this project will have **no impact** on upswept moonwort, dainty moonwort, slender moonwort, moosewort, or whitebark pine.

Table 1. Summary determinations for Region 4 sensitive plant species with the potential to occur within the project area.

Species	Common name	Detected within project area Y/N	Proposed Action
<i>Botrychium ascendens</i>	upswept moonwort	N	NI
<i>Botrychium crenulatum</i>	dainty moonwort	N	NI
<i>Botrychium lineare</i>	slender moonwort	N	NI
<i>Botrychium tunux</i>	moosewort	N	NI
<i>Pinus albacaulis</i>	whitebark pine	N	NI

NI: No impact to individuals or populations of this species.

II. Introduction

The purpose of this Biological Evaluation is to identify the likely effects of the proposed action to endangered, threatened, proposed, and sensitive species. This Biological Evaluation conforms to the legal requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50CFR 402.12 (f) and 402.14 (c)) and Forest Service Manual direction (FSM 2672.42).

This includes the United States Department of Interior Fish and Wildlife Service (FWS) threatened, endangered, and proposed species list and United States Department of Agriculture Forest Service Regional Forester's (R4) Sensitive Species List (USDA FS, February 2011). The Northeast Zone Botanist has reviewed these lists for the Humboldt-Toiyabe National Forest. Additionally, any documented locations, previous field surveys, and the Nevada Natural Heritage Program Data Base (last accessed, December 2012) were reviewed.

Current management direction on desired future conditions for threatened, endangered and sensitive species on the Humboldt-Toiyabe National Forest can be found in the following documents, filed at the Mountain City and Jarbidge District Offices:

- Forest Service Manual and Handbooks (FSM/H 2670)
- National Forest Management Act (NFMA)
- Endangered Species Act (ESA)
- National Environmental Policy Act (NEPA)
- Humboldt National Forest Land and Resource Management Plan (LRMP)
- Intermountain Region (R4) Sensitive Species List (USDA FS, updated 2011)
- Governor's Sage Grouse Plan

III. Proposed Project and Description

Purpose and Need

The number of tribal horses on National Forest and other public lands surrounding the Fort McDermitt Indian Reservation has steadily increased over the past 30 years. Previous efforts to remove the unauthorized horses were not successful and strained relationships between the Forest Service and the tribal members. In a constant search for forage and water, the horses have degraded riparian areas and other fragile ecosystems on the forest, public lands managed by the Bureau of Land Management, and tribal lands. The unauthorized grazing and degraded rangeland conditions have impacted permitted livestock operations.

The tribe participated with the Humboldt-Toiyabe National Forest (HTNF) in a cooperative horse removal in August 2013, in which several hundred tribal, domestic horses were removed from Tribal Lands and BLM administered public lands. Other cooperators included the Nevada Department of Agriculture Brand Inspectors Office, Bureau of Land Management, Western Nevada Agency Bureau of Indian Affairs, Humboldt County Sheriff, and local ranchers. However, the HTNF had to suspend its participation in the 2013 gather early on due to litigation and other public concerns. Around 1,200 domestic horses remain on the HTNF and adjacent federal lands and continue to impact rangeland health and forage for permitted livestock.

The proposed action is needed in order to address the following:

- Damage from unauthorized domestic horses continues to degrade range conditions for the legal permit holders of these cattle allotments. The continued unauthorized use of these allotments by unauthorized horses has impacted riparian and other fragile systems on the Santa Rosa Ranger District and surrounding areas.
- Law enforcement efforts have not been an effective tool to remove unauthorized domestic horses and have strained relationships between the Forest Service and the tribe.
- The unauthorized domestic horse population on National Forest and adjacent public lands has increased to around 1,200 head. As the population increases the distribution has been expanding. The lack of fencing around the tribal lands has allowed tribal horses to free roam, in search of forage and water, away from tribal lands while increasing their population numbers.
- Unauthorized domestic horses are utilizing forage in areas that are intended for livestock production forcing Forest Service grazing permittees to reduce numbers to prevent overuse of forage and water resources.
- Expanded distribution of unauthorized tribal horses could potentially result in development of feral herds or bands adjoining the Little Owyhee Wild Horse Herd Management Area and further degrade habitats in those areas (see: Wild Horse and Burro Specialist Report).

Proposed Action

The Santa Rosa Ranger District of the Humboldt-Toiyabe National Forest is proposing to remove all unauthorized domestic tribal horses from portions of South and East Forks of Quinn River, Eight-mile Creek, and North Fork Little Humboldt River watersheds of the Santa Rosa Ranger District, adjoining Fort McDermitt Paiute-Shoshone Tribal lands, and associated public lands administered by the Bureau of Land Management. The project area is located in Humboldt County, 75 miles north of Winnemucca, Nevada off Highway 95. The project area includes approximately 760,000 acres of lands administered by the US Forest Service, Bureau of Land Management, and the Fort McDermitt Paiute-Shoshone Tribe (Figure 1).

It is currently estimated there are around 1,200 or more domestic tribal horses in the proposed gather area. This project would be conducted in partnership with the Fort McDermitt Paiute-Shoshone Tribe (tribe) as set forth in the *2014 Participating Agreement Between the Fort McDermitt Tribal Council and the USDA Forest Service Humboldt-Toiyabe National Forest* (in process).

The gather would consist of a helicopter operation over several intermittent 4-8 day periods in which domestic horses would be herded off the public and tribal rangelands to designated trap sites located on tribal lands. The use of roping from horseback may also be used when approved by the Contracting Officer Representative.

The tentative locations of trap sites, on tribal lands, are shown on the project area map (Figure 1). Exact locations would be determined by the Tribal resource manager, Forest Service resource advisor and contractor. No trap sites would be located on National Forest or BLM-administered public lands.

In the event that horses are herded from remote sections of the project area, a gathering pasture, located on National Forest lands as shown on Figure 1, may be used to rest and water the horses before moving them to a trap site on tribal lands or to the tribal holding facility.

From trap sites domestic horses would be moved by truck and trailer to the Fort McDermitt Reservation Rodeo Grounds which would be configured as the holding facility. The helicopter staging/fueling area would be located off public lands at either the McDermitt State Airport, a remote access Category V airport on the Oregon-Nevada border, one-half mile north of McDermitt, Nevada or other private lands outside Fort McDermitt Reservation. Support vehicles would be confined to state and county roads, Forest Service and BLM system roads, and established roads on Tribal lands.

The tribal holding facility would be a temporary facility configured using portable livestock panels to augment the existing facilities at the Rodeo Grounds on tribal lands. These livestock panels would be dismantled and removed after the gather operation is completed.

Once the unauthorized domestic livestock have been delivered to the holding facility, the Forest Service will relinquish control of the animals to the tribe. The Forest Service will not be responsible for disposition of the livestock back to the determined owners, arrangement of sales, or transport of livestock off tribal lands.

The following design criteria and operational controls are included as part of the proposed action to address concerns as identified by interdisciplinary team members and the public.

- While there are no documented historic or known current populations of wild horses located within the project area, a cooperative agreement has been approved between the Fort McDermitt Tribal Council, Forest Service and BLM which identifies management practices, safeguards and animal inspection criteria that would be used before and during the gather operation to ensure no wild horses or burros are inadvertently gathered during the removal of the tribal domestic horses.
- From March 1 to August 31, helicopters must stay 1,000 Above Ground Level from active raptor nests and a 200-meter horizontal buffer for on-the-ground activity
- No activity between March 1 and May 15 to protect Greater Sage-grouse lekking and for pygmy rabbit breeding season.
- Avoid activity during the peak breeding bird season from May 1 to July 15, limiting vehicles to existing roads, and keeping vehicle speed limits to 20 mph.
- Helicopter flight patterns would avoid air space over the Santa Rosa-Paradise Peak Wilderness, which is approximately 20 miles south of the gather area.
- The Comprehensive Animal Welfare procedures being used are adopted from BLM procedures described and set forth in *Instruction Memo 2013-059 Wild Horse and Burro Gathers: Comprehensive Animal Welfare Policy* (USDI BLM 2013) and *Comprehensive Animal Welfare Program for Wild Horse and Burro Gathers, Standards* (USDI BLM; in Process). Additionally, the Participating Agreement includes requirements for safe and humane treatment by the tribe while horses are in the holding facility. Throughout transporting and handling, standard humane practices will be implemented by the Forest Service contractor and personnel to ensure a low stress and safe experience for the horses.

Public observation of the gather activities on public lands would be allowed, but would be subject to observation protocols intended to minimize potential for harm to members of the public, to government and contractor staff, and to the horses being gathered. Public observation sites would be established in locations that reduce safety risks to the public (e.g., from helicopter-related debris or from the rare helicopter crash landing, or from the potential path of gathered domestic horses), to the horses by ensuring observers would not be in the line of vision of horses being moved to the gather site), and to contractors, or employees who must remain focused on the gather operations and the health and well-being of the horses. Any public viewing on tribal lands is subject to approval by the Tribal Council and beyond the scope of the authority of the Forest Service to address.

Due to the estimated domestic horse population and the limited capacity of the tribal holding facility, multiple removal efforts are expected to be needed in order to remove all tribal horses from federal lands. During a four to eight day removal effort, approximately 500 horses may be gathered and relinquished to the tribe. Based on the estimated population of 1,200 or more horses, three or more separate removal efforts may be needed. The removal efforts are expected to begin in November, 2014, with additional removal efforts conducted as needed after that as constrained by the design features specified above.

IV. Species Considered and Species Evaluated

Table 2. Regional Forester’s (R4) sensitive plant species (2014) for the Humboldt National Forest and R4 sensitive plant species for the Toiyabe National Forest that have the potential to occur on the Santa Rosa Ranger District (SRRD).

Species	Common name	NNHP/NatureServe Ranking	Potentially present on MTCRD Y/N
<i>Antennaria arcuata</i>	Meadow pussytoes	G2N2S1S2	N
<i>Asclepias eastwoodiana</i>	Eastwood milkweed	G3G4T3? NNRS3	N
<i>Astragalus lentiginosus</i> var. <i>latus</i>	broad-pod freckled milkvetch	G5T2N2S2	N
<i>Astragalus robbinsii</i> var. <i>occidentalis</i>	Lamoille Canyon milkvetch	G5T2T3N2N3S2S3	N
<i>Astragalus uncialis</i>	currant milkvetch	G2N2S1S2	N
<i>Boechera falcatoria</i>	Grouse Creek rockcress	G1N1S1	N
<i>Botrychium ascendens</i>	upswept moonwort	G2G3N2N3S2S1	Y
<i>Botrychium crenulatum</i>	dainty moonwort	G3N2N3S1S2S3	Y
<i>Botrychium lineare</i>	slender moonwort	G2N2N2?S1S2S3	Y
<i>Botrychium tunux</i>	moosewort	G2G3N1S1S2S3SN R	Y
<i>Draba oreibata</i> var. <i>serpentina</i>	Snake Range whitlow-grass	G4T1N1S1	N
<i>Draba pennellii</i>	Pennell draba	G2N2S2	N
<i>Erigeron cavernensis</i> (Syn. <i>E. uncialis</i> ssp. <i>uncialis</i>)	Cave Mountain fleabane	G3G4N3?S3?	N
<i>Eriogonum douglasii</i> var. <i>elkoense</i>	Sunflower Flats buckwheat	G5T1N1S1	N
<i>Eriogonum lewisii</i>	Lewis’ buckwheat	G2G3QN2N3S2S3	N
<i>Jamesia tetrapetala</i>	Basin jamesia	G2N2S2S1	N
<i>Lathyrus grimesii</i>	Grimes’ vetchling	G2N2S2	N
<i>Lewisia maguirei</i>	Maguire bitterroot	G1N1S1	N
<i>Penstemon concinnus</i>	Tunnel Springs beardtongue	G3N2S2S3	N
<i>Penstemon moriahensis</i>	Mount Moriah beardtongue	G1G2N1N2S1S2	N
<i>Penstemon pudicus</i>	bashful beardtongue	G1N1S1	N
<i>Penstemon rhizomatosus</i>	rhizome beardtongue	G1N1S1	N
<i>Phacelia inconspicua</i>	inconspicuous scorpion-weed	G2N1S1	N
<i>Phacelia minutissima</i>	least phacelia	G3N2S1S2	N
<i>Pinus albicaulis</i>	whitebark pine	G3G4N3N4	Y
<i>Poa abbreviata</i> var. <i>marshii</i>	Marsh’s bluegrass	G5T2N2S1	N
<i>Potentilla johnstonii</i>	Sagebrush cinquefoil	G1NNRS1	N
<i>Primula capillaris</i>	Ruby Mountain primrose	G1N1S1	N
<i>Primula nevadensis</i> (Syn. <i>Primula cusickiana</i> var. <i>nevadense</i>)	Nevada primrose	G2N2S2	N
<i>Silene nachlingerae</i>	Nachlinger’s catchfly	G2N2S2	N
<i>Sphaeralcea caespitosa</i> var. <i>williamsiae</i>	Jones’ globemallow	G2T2NNRS2	N
<i>Trifolium andinum</i> var. <i>podocephalum</i>	Currant Summit clover	G2T1N1S1	N
<i>Trifolium leibergii</i>	Leiberg clover	G2N2S1S2	N
<i>Viola lithion</i>	rock violet	G1G2N1S1	N

NatureServe ranking ([NatureServe 2008](#)).

- Letter designations; G = Global, N = National, and S = Sub-national, T= rank of a subspecies of an otherwise widespread and common species, Q = Questionable taxonomy that may reduce conservation priority, NR = not ranked.
- Number designations; 1 = critically imperiled, 2 = imperiled, 3 = vulnerable, 4 = apparently secure, 5 = secure, ? = Inexact Numeric Rank.

N = It has been determined after referring to the Rare Plant Atlas (Morefield, 2001), the Humboldt National Forest Sensitive Plant Field Guide (Anderson et al., 1991), existing databases including state databases (NNHP, 2005) that these plant species do not occur or have the probability of occurring on the SRRD where the project is located. Therefore, there will be **no impact** to the species from the proposed project activities and no further analysis for these species will be conducted.

Y = Potential habitat for upswept moonwort, dainty moonwort, slender moonwort, moosewort, and whitebark pine occur on the SRRD. These species were analyzed in further detail.

Species in bold are either known to occur or have the potential of occurring on the SRRD.

V. Affected Environment and Analysis Process

Affected Environment

The total area within the boundary of the Santa Rosa Ranger District that is a part of this gather is estimated to be 110,000 acres. The average elevation of the project area within the Santa Rosa Ranger District is 6,850 feet and ranges from approximately 8,750 to 5,000 feet above mean sea level. The annual precipitation in this area can vary between 8 and 50 inches a year, with the majority accumulating as snow. The project area within Forest System Lands is dominated by 5 distinct plant communities. According to the Forest Service Corporate Database (Citrix), these communities are riparian, mountain shrub, mountain big sagebrush, grasslands, and low sagebrush communities.

The United States Department of Agriculture Forest Service Regional Forester's (R4) threatened, endangered and sensitive species list (updated 2011), the Rare Plant Atlas ([Morefield, 2001](#)), the Humboldt National Forest Sensitive Plant Field Guide ([Anderson et al., 1991](#)), existing databases including state databases ([NNHP, 2005](#)), and current literature have been reviewed to determine potential habitat requirements for the threatened and endangered species listed on the FWS species list and the R4 sensitive species (TES).

Analysis Process

Information from district surveys through 2008 as well as the following databases were used to determine known occurrences of plants: Nevada Natural Heritage Program Occurrence database ([NNHP, 2005](#)); Natural Resource Information System (NRIS) Threatened, Endangered, and Sensitive Plants (TESP) database; and the Humboldt-Toiyabe Rare Plant database through 2009. The parameters of elevation and community type were used for all species. For the *Botrychium* species, locations of springs, seeps, and perennial streams were buffered by 300 feet and used in addition to these parameters to determine potential habitat. Details on habitat parameters are provided in [Appendix A](#).

Table 3. Summary of Pre-field Analysis for Region 4 sensitive plant species.

Species	Common name	Potentially present within project area based on habitat description
<i>Botrychium ascendens</i>	upswept moonwort	Yes – Habitat parameters of moist ground of spring head areas in deep shade or wet to moist meadows with moss, grasses, sedges, and rushes from 4,920 to 11,155 feet potentially exist within the project area. However, during implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for this species. Considering this and the short duration of activities, this project will have no impact on upswept moonwort.

Species	Common name	Potentially present within project area based on habitat description
<i>Botrychium crenulatum</i>	dainty moonwort	Yes – The project area is within the known elevation range and there is a potential for wet meadows, marshes, and springs. However, during implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for this species. Considering this and the short duration of activities, this project will have no impact on dainty moonwort.
<i>Botrychium lineare</i>	slender moonwort	Yes - Soil or gravel in high-elevation meadows, seeps, roadsides, and calcareous substrates below 9,840 feet potentially exist within the project area. However, during implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for this species. Considering this and the short duration of activities, this project will have no impact on slender moonwort.
<i>Botrychium tunux</i>	moosewort	Yes – Although this species is known from higher elevations in Nevada, there is still too little data to support an elevation restriction for this species in this state. Seeps, springs, and slightly drier upland communities and well-drained, rocky soils and scree slopes potentially exist within the project area. However, during implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for this species. Considering this and the short duration of activities, this project will have no impact on moosewort.
<i>Pinus albicaulis</i>	whitebark pine	Yes – Dry, rocky sites and ledges in alpine communities between 8,000 and 8,400 feet exist within the project area. However, during implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for this species. Considering this and the short duration of activities, this project will have no impact on upswept whitebark pine.

VI. Consultation

A list of threatened and endangered species was received from the United States Fish and Wildlife Service is on file at the Santa Rosa Ranger District office for public review. For plants, no threatened or endangered species were identified but one candidate (whitebark pine) was listed.

VII. Effects Analysis and Determinations for Sensitive Plants

Determinations

During implementation, horses will be widely dispersed over most of the Forest System Lands with only one trap that represents the concentration of these animals. That trap and the area adjacent have no potential habitat for this species. Considering this and the short duration of activities, this project will have **no impact** on upswept moonwort, dainty moonwort, slender moonwort, moosewort, or whitebark pine. With no action taken, the plant communities would continue to decline in health, resilience, and diversity. The proposed action has the potential to help land managers to increase the overall health of plant resources on Forest System Lands by eliminating year-round grazing pressures created by the animals that are removed. However, the native plant communities within the areas of concentrated activities are at risk for moderate to high disturbance which creates a high probability for the colonization and spread of invasive plant species.

VII. Recommended Mitigation:

- Invasive weed species will be monitored and treated in areas of concentrated activities until restoration has been declared successful by a qualified Forest Service representative.
- Any seed mix used for restoration will be approved by the Zone or Forest Botanist.

References

50 CFR Part 17. Federal Register/Vol.64, No. 164. August 25, 1999. Rules and Regulations.

Abbott, I. and D. Le Maitre. 2010. Monitoring the impact of climate change on biodiversity: The challenge of megadiverse Mediterranean climate ecosystems. *Austral Ecology*, Vol. 35, pp. 406 - 422. Ecological Society of Australia.

Anderson, M.G. and C.E. Ferree. 2010. Conserving the Stage: Climate Change and the Geophysical Underpinnings of Species Diversity. *PLoS One Diversity, Ecology Climate*, Vol. 5, issue 7. <http://www.plosone.org> .

Anderson, Steve. 1996. Leiberg's clover and Lewis's buckwheat. USFS, Humboldt-Toiyabe National Forest correspondence, October 17, 1996.

Anderson, S., M. White, and D. Atwood. 1991. Humboldt National Forest sensitive plant field guide. Ogden, Utah: U.S.D.A., Forest Service, Intermountain Region.

Cronquist, A., A.H. Holmgren, N.H. Holmgren, J.L. Reveal. 1972. Intermountain Flora, New York, NY: The New York Botanical Garden, Vol. 1, pgs. 229-236.

Farrar, D. 2005. Systematics of western moonworts (*Botrychium* subgenus *Botrychium*). Iowa State University, Ames, Iowa. May 3, 2005.

Farrar, Donald R. December 2011. *Botrychium tunux* fact sheet. Ada Hayden Herbarium (ISC). Iowa State University, Ames, Iowa. Online. Available: <http://www.public.iastate.edu/~herbarium/botrychium.html> (Accessed March 2013).

Farrar, John Laird. 1995. Trees of the Northern United States and Canada. Iowa State Press, Ames, Iowa. pg 48-49

Johnson-Groh, C., C. Riedel, L. Schoessler, and K. Skogen. 2002. Belowground distribution and abundance of *Botrychium* gametophytes and juvenile sporophytes. *American Fern Journal* 92: 80-92.

Johnson-Groh, C., J. M. Lee. 2002. Phenology and demography of two species of *Botrychium* (Ophioglossaceae). *American Journal of Botany* 89: 1624-1633.

Morefield, J. D. (ed.). 2001. *Nevada Rare Plant Atlas*. Carson City: Nevada Natural Heritage Program, compiled for the U.S. Department of Interior, Fish and Wildlife Service, Portland, Oregon and Reno, Nevada.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 4, 2013)

Nevada Natural Heritage Program (NNHP). 2005. Nevada Natural Heritage Occurrences Arcview Theme. Nevada Natural Heritage Program, Department of Conservation and Natural Resources. Carson City, Nevada 89706-7921. Provided on July 29, 2005.

Smith, F. J., and M. Curto. 1995. Humboldt National Forest, Mountain City and Jarbidge Districts: sensitive plant survey report prepared for USDA Forest Service, Humboldt-Toiyabe National Forest, Elko, NV. 105 pp.

Taylor, K., J. Mangold, L.J. Rew. 2011. Weed Seed Dispersal by Vehicles. MontGuide, MT201105AG New 6/11, Montana State University Extension. Accessed June 28, 2011 <http://msuextension.org/publications/AgandNaturalResources/MT201105AG.pdf>

USDA. United States Department of Agriculture, Forest Service. 2001. Sierra Nevada Forest Plan Amendment, Pacific Southwest Region, Vallejo, CA, FEIS vol. 3, Ch. 3, part 4.6.

United States Department of Agriculture Forest Service Manual (FSM) 2670. Threatened and Endangered, and Sensitive Plants and Animals. Washington, D.C: Forest Service, U.S. Department of Agriculture.

United States Department of Interior (USDI), Fish and Wildlife Service (USFWS). 2002. 50 CFR Part 17. Federal Register/Vol. 67, NO. 114. June 13, 2002. Pg. 40657-40679. Endangered and Threatened Wildlife and Plants; Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions; Annual Description of Progress on Listing Actions.

Wagner, W.H. and F.S. Wagner. 1993. Ophioglossaceae. Pages 85-106 in: Flora of North America Editorial Committee. *Flora of North America* vol. 2. New York: Oxford University Press.

Ward, K., R. Shoal, and C. Aubry. 2006. Whitebark pine in Washington and Oregon: A synthesis of current studies and historical data. Pacific Northwest Albicaulis Project. USDA Forest Service, Pacific Northwest Region. February 2006. Online. Available: <http://www.fs.fed.us/r6/genetics/publications/detail/pub0601> (Accessed 2011)

Yates, C.J., et al. 2010. Projecting climate change impacts on species distributions in megadiverse South African Cape and Southwest Australian Floristic Regions: Opportunities and challenges. *Austral Ecology*, Vol. 35, pp. 374 - 391. Ecological Society of Australia.

Appendix A

Table 4: Sensitive and Rare Plant Potential Habitat Parameters

Species	R4 Status	Elev. (feet)	Community
<i>Botrychium ascendens</i> upswept moonwort	sensitive	8,000 to 11,600	Riparian/seeps/springs
<i>Botrychium crenulatum</i> dainty moonwort	sensitive	7,500 to 11,600	wet meadows, marshes, bog-fen habitat types, and springs
<i>Botrychium lineare</i> Slender moonwort	sensitive	up to 9,840	High elevation meadows, seeps, and roadsides. May be growing in soil or gravel. Probably has some affinity for limestone or other calcareous substrates. May be known from SMNRA, potential across HT.
<i>Botrychium tunux</i> Moosewort	sensitive	9,200-9,850	Seeps, springs, and occasionally slightly drier upland communities. In Nevada, known from high elevation seeps/springs in SMNRA. Occurs in several disjunct areas, including low elevation coastal beaches and dunes in Alaska, well-drained rocky meadows in California, and sparsely vegetated alpine scree slopes in Montana, Wyoming and Colorado. Potential across H-T.
<i>Pinus albicaulis</i> whitebark pine	sensitive/ candidate	8,000 to 10,000	dry, rocky sites and ledges and cliff faces in subalpine/alpine

Figure 1. General location map of project area on the Santa Rosa Ranger District.

