WASHINGTON NATURAL HERITAGE PROGRAM

Conservation Status and Protection Needs of Priority Plant Species in the Blue Mountains Ecoregion

Prepared for

US Fish and Wildlife Service, Region 1

Prepared by

Walter Fertig, Irene Weber, and Tynan Ramm-Granberg

December 16, 2022

Natural Heritage
Report 2022-06

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

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ON THE COVER: Snake River daisy (*Erigeron disparipilus*), a regional endemic of the Blue Mountains and Snake River drainage of southeastern Washington, northeastern Oregon, and west-central Idaho. Photo by Walter Fertig.

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Introduction

The state of Washington is relatively large and ecologically complex, with habitats ranging from marine tidal pools and coastal sand dunes, to desert scrublands, prairie grasslands, temperate rain forests, and alpine tundra and talus (Rocchio and Crawford 2015). To make sense of this diversity, it is convenient to subdivide the state into smaller and more natural geographic units. Counties are one way to attempt this, though in practice these subunits are based on political, rather than biological criteria. A better approach is to organize the state by "ecoregions": geographic areas that share similar climate, landforms, geology, hydrology, and vegetation. Numerous ecoregional classifications have been developed for North America (Bailey 1998, Omernik 1987, Ricketts et al. 1999, TNC 1999), each differing in specifics. NatureServe, the umbrella organization of state and provincial natural heritage programs in North America (including the Washington Natural Heritage Program [WNHP]), has adopted a modified version of the The Nature Conservancy (TNC) classification (Bryer et al. 2000, WDNR 2007).

Nine of the 63 ecoregions recognized in the contiguous United States are found in Washington State (Figure 1, Table 1). Two of the ecoregions are associated with topographic basins or lower elevation watersheds (Puget Trough and Columbia Plateau), while the other seven correlate with the Cascade Range and other highlands along the west coast and in the northern and southeastern portions of the state.

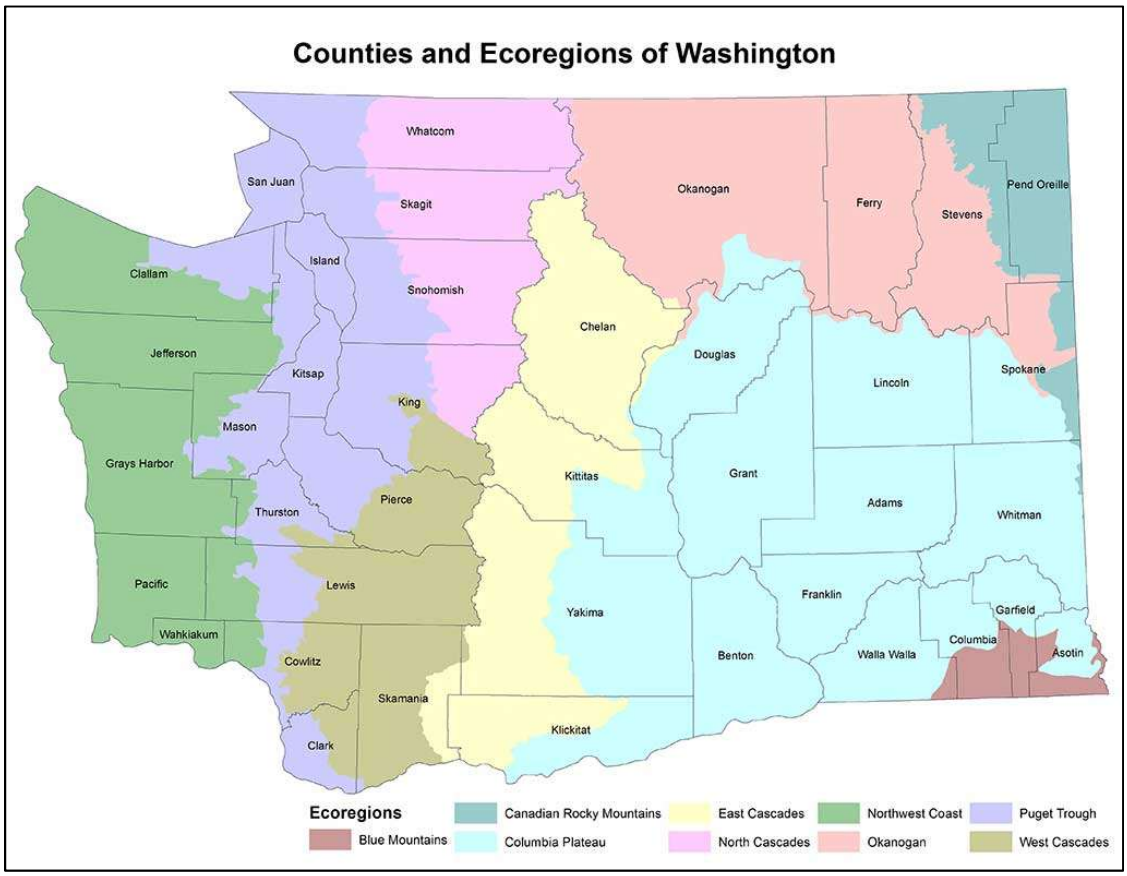

Figure 1. Ecoregions of Washington. From Camp and Gamon (2011)

Table 1. Comparison of the species richness and number of rare and unique vascular plant taxa in each of the nine ecoregions in Washington.

Ecoregion	Total # Taxa	# Native Taxa	# of Introduced Taxa	# of WA Plant Taxa of Conservation Concern	# of Plant Taxa Unique to the Ecoregion
Blue Mountains	**1,083**	**889**	**194**	**45**	**41**
Canadian Rockies	1,213	994	219	45	20
Columbia Plateau	2,046	1,427	619	133	153
East Cascades	2,468	1,960	508	134	104
North Cascades	1,305	1,050	255	45	17
Okanogan Plateau	1,880	1,542	338	80	56
Pacific NW Coast Range	1,599	1,199	400	76	74
Puget Trough	1,990	1,143	847	79	203
West Cascades	1,429	1,151	278	55	14
Total Washington State Flora	**3,677**	**2,637**	**1,040**	**369**	

Total number of taxa in each ecoregion derived from the Consortium of Pacific Northwest Herbaria website (www.pnwherbaria.org) and Washington Flora Checklist website (http://biology.burke.washington.edu/herbarium/waflora/checklist.php). Revised from Fertig and Kleinknecht 2020.

The Blue Mountains ecoregion, located in southeastern Washington, is the smallest ecoregion in the state, covering just 566,839 acres (1.2% of the total area of Washington). Outside of Washington, the Blue Mountains are part of a larger ecoregion (Blue Mountains-Middle Rocky Mountains) that includes the Wallowa Range of northeastern Oregon and the mountains of central Idaho and southwestern Montana (TNC 1999). The sliver of the Blue Mountains ecoregion found in Washington consists of a flat plateau (the Blue Mountains) averaging 2000-4000 feet (610-1220 m) in elevation and dissected by steep canyons carved by the Grande Ronde and Snake rivers (WDNR 2007). Most of the range is comprised of volcanic basalt, including the Wanapum, Saddle Mountain, and Grande Ronde basalts. Lime Hill, in the extreme southeast corner of the state is an anomalous remnant of the Wallowa Terrane, a slab of calcareous rock that originated as an island arc in Paleozoic southeastern Asia before slamming into western North America about 100 million years ago (Carson 2018).

Floristically, the Blue Mountains are relatively depauperate compared to other mountain ranges and ecoregions in Washington (Table 1). With just 889 native vascular plant species (33.7% of the state flora), the Blue Mountains have the lowest species richness of the nine ecoregions in the state. The Blue Mountains are also tied with the North Cascades and Canadian Rockies for the fewest

number of plant species of conservation concern in Washington (45). In part, the low vascular plant species diversity of the Blue Mountains is a consequence of their small geographic extent. However, the remoteness of the Blues has contributed to their being historically under-surveyed, especially compared to areas of western Washington and the Cascades (Fertig 2022, in prep). Of all the ecoregions in the state, the Blue Mountains are perhaps the one most in need of comprehensive survey to document new species and identify additional occurrences of rare species. In just the past 15 years, two new species have been described from the Blue Mountains (*Astragalus asotinensis* and *Phlox solivaga*), suggesting that others may still be documented with additional surveys (Björk and Fishbein 2006, Ferguson et al. 2015).

In 2018, the US Fish and Wildlife Service (USFWS) contracted with WNHP to conduct surveys and assess the habitat condition of high priority rare plant species in the Blue Mountains ecoregion. Seven species were identified as priorities for survey, including two former candidates for potential listing under the Endangered Species Act (*Lomatium rollinsii* and *L. serpentinum*) and five state threatened and endangered plants (*Astragalus asotinensis, Petrophytum caespitosum, Phlox solivaga, Rubus nigerrimus,* and *Trifolium douglasii*) (Table 2). The goals of the project included:

1. Inventory known occurrences and likely habitat of target species.
2. Conduct Ecological Integrity Assessments (EIA) at select sites to help identify target species for which habitat quality is a primary factor for species rarity and to prioritize areas for protection (higher quality areas) or restoration (degraded areas).
3. Identify additional areas of potential habitat for future surveys and conservation efforts.
4. Summarize the current number of occurrences, habitat, abundance, trends, threats, and degree of protection for all 45 vascular plant species of conservation concern in the Blue Mountains ecoregion (Fertig 2021).

The following report summarizes the results of rare plant survey and EIA work conducted by WNHP staff from 2018-2021. Appendix A includes a review of the current status and distribution of each species of conservation concern in the Blue Mountains ecoregion, including existing conservation areas and areas with protection needs. Appendix B summarizes EIA results for several occurrences of *Phlox solivaga*, rare plant species in the Lime Hill area (including *Astragalus asotinensis*) and adjacent areas of ecological importance.

Table 2. Vascular Plant Species of Conservation Concern in the Blue Mountains Ecoregion

Species/ Synonym	Common Name	Conservation Status Rank	Dist. Pattern	Federal Status	State Status	Presence
Allium campanulatum	Sierra onion	G4/S1	Periph	BS, FS	WS	P
Allium dictuon	Blue Mountain onion	G2/S2	LocEnd	FS	WT	P
Antennaria corymbosa	Meadow pussytoes	G5/S1	Periph	BS, FS	WS	P
Arabis crucisetosa	Cross-haired rockcress	G4G5/S1	RegEnd	BS, FS	WS	P
Asclepias cryptoceras	Pallid milkweed	G4/S1	Periph		WS	P

Species/ Synonym	Common Name	Conservation Status Rank	Dist. Pattern	Federal Status	State Status	Presence
(*A. cryptoceras* var. *davisii*)						
Astragalus arthurii	Arthur's milkvetch	G4/S2	RegEnd	BS, FS	WS	P
Astragalus asotinensis	Asotin milkvetch	G2/S1	LocEnd	BS	WE	P
Astragalus cusickii var. *cusickii* (*A. eremeticus* var. *malheurensis*)	Cusick's milkvetch	G5T4/S2	RegEnd	BS, FS	WS	P
Boechera cascadensis (*Arabis microphylla* var. *thompsonii*)	Cascades rockcress	G1G2/S1	RegEnd		WE	P
Bolandra oregana	Oregon bolandra	G3/S2	RegEnd	BS, FS	WT	P
Calochortus macrocarpus var. *maculosus*	Sagebrush mariposa lily	G5T2/S2?	RegEnd	BS, FS	WT	P
Calochortus nitidus	Broad-fruit mariposa lily	G3/S1	RegEnd		WE	R or Ex
Carex cordillerana	Cordilleran sedge	G3G4/S1	Sparse	BS, FS	WS	P
Crepis bakeri (includes ssp. *idahoensis*)	Idaho hawksbeard	G4/S1	RegEnd		WS	P
Cryptantha grandiflora	Clearwater cryptantha	G2G3/S1	RegEnd		WE	P
Cryptantha rostellata	Beaked cryptantha	G4/S2	RegEnd	BS, FS	WS	P
Diplacus cusickioides (*D. cusickii* or *Mimulus cusickii* misapplied)	Nesom's monkeyflower	G4G5/S1	Periph	BS, FS	WS	P
Erigeron davisii (*E. engelmannii* var. *davisii*)	Davis's fleabane	G5T3/S1	RegEnd	BS, FS	WE	P
Erigeron disparipilus	Snake River daisy	G5/S2	RegEnd	FS	WS	P
Erythranthe ampliata	Nez Perce monkeyflower	G3/SH	RegEnd		WX	Ex
Erythranthe patula (*Mimulus patulus*)	Stalk-leaved monkeyflower	G3?/S2?	Periph	BS, FS	WT	P or R
Hackelia diffusa var. *diffusa*	Diffuse stickseed	G4T3/S2	RegEnd	BS, FS	WT	P
Hackelia hispida var. *hispida*	Rough stickseed	G4T4/S1	RegEnd	BS, FS	WS	P
Lomatium rollinsii	Rollins' biscuitroot	G3/S2	RegEnd	BS, FS	WT	P
Lomatium serpentinum	Snake Canyon biscuitroot	G4/S2	RegEnd	BS	WS	P
Lupinus sabinianus	Sabin's lupine	G4/S1	LocEnd		WS	P
Myriopteris gracilis (*Cheilanthes feei*)	Slender lipfern	G5/S1	Periph	BS	WS	P
Oenothera cespitosa ssp. *marginata*	Tufted evening-primrose	G5T3T5/S1	Periph	BS, FS	WS	P
Pedicularis bracteosa var. *siifolia*	Smoothflower bracted lousewort	G5T1T3/SH	RegEnd		WX	Ex
Penstemon pennellianus	Blue Mountain beardtongue	G3/S2	RegEnd	BS, FS	WT	P
Penstemon wilcoxii	Wilcox penstemon	G4/S1	RegEnd	BS, FS	WS	H
Petrophytum caespitosum ssp. *caespitosum*	Rocky Mountain rockmat	G5T5/S1	Periph	BS	WS	P
Phlox solivaga	Yeti phlox	G1/S1	LocEnd	FS	WE	P

Species/ Synonym	Common Name	Conservation Status Rank	Dist. Pattern	Federal Status	State Status	Presence
Polygonum austiniae (*P. douglasii* var. *austiniae*)	Austin's knotweed	G5T4/S1	Sparse	FS	WS	P
Pyrrocoma scaberula (*Haplopappus scaberulus*)	Palouse goldenweed	G2/S1	RegEnd	BS, FS	WE	P
Ranunculus populago	Mountain buttercup	G4/S2	Sparse	BS, FS	WS	P
Ribes cereum var. *colubrinum*	Snake wax currant	G5T3/S1	RegEnd	BS, FS	WE	P
Ribes oxyacanthoides var. *irriguum* (*R. irriguum*)	Idaho gooseberry	G5T4/S2	RegEnd	BS, FS	WS	P
Ribes wolfii	Wolf's currant	G4/S2	Periph	FS	WS	P
Rubus nigerrimus	Northwest raspberry	G2/S2	LocEnd	BS	WT	P
Silene scouleri ssp. *scouleri*	Scouler's catchfly	G5T3T5/S1	Sparse	BS, FS	WS	P
Silene spaldingii	Spalding's catchfly	G2/S2	RegEnd	T	WT	P
Spartina pectinata (*Sporobolus michauxianus*)	Prairie cordgrass	G5/S2	Sparse	BS, FS	WS	P
Trifolium douglasii	Douglas' clover	G3/S1	RegEnd	BS, FS	WE	P
Trifolium plumosum var. *plumosum*	Plumed clover	G4T4/SH	RegEnd		WX	H

Legend (for complete descriptions, see Fertig 2021). **Heritage Rank**: G = Global Rank; T = Trinomial Rank (global rank of subspecies or variety); S = State Rank. 1 = Critically Imperiled; 2 = Imperiled; 3 = Vulnerable; 4 = Apparently Secure; 5 = Secure; H = Historical (last relocated in 1982 or earlier); X = Extirpated, Q = Questionable taxonomy; ? = rank is uncertain. **Dist. (Distribution) Pattern** : LocEnd = Local Endemic; RegEnd = Regional Endemic; Disj = Disjunct; Periph = Peripheral. **Federal Status**: E = Endangered; T = Threatened; BS = BLM Sensitive; FS = US Forest Service Sensitive. **State Status**: WE = Washington Endangered; WS = Washington Sensitive; WT = Washington Threatened; WX = Washington Extirpated. **Presence in Ecoregion:** ? = questionable occurrence – needs confirmation; Ex = Extirpated; H = Historical; P = Present; R= Reported.

Cryptantha gracilis (cottonball cryptantha) was recently reported for the Blue Mountains, but the specimens may be misidentified *C. grandiflora*. Dr. Michael Simpson of San Diego State University is currently verifying these specimens.

Methods

Based on maps and occurrence information from the WNHP Biotics database, known and potential sites for survey were identified for the high priority target species from the Blue Mountains ecoregion prior to field surveys in the summer of 2018, 2019, 2020, and 2021. Field work included relocating known occurrences to collect updated information on distribution, abundance, habitat, associated species, and threats. Based on these site visits, similar areas with potential habitat were targeted for survey. Information from newly discovered or revisited populations was entered into the Biotics database and WNHP digital rare plant field guide (WNHP 2022).

In addition to traditional rare plant surveys, Ecological Integrity Assessments (EIA) were conducted at select rare plant occurrences as a pilot demonstration of how this methodology can

aid in identification of species for which habitat quality is a primary factor for rarity, as well as prioritization of areas for protection and/or restoration. EIAs were conducted at five sites with occurrences of the high priority target species *Phlox solivaga* and *Astragalus asotinensis* (Appendix B). Ecological integrity is a broad and useful endpoint for ecological assessment that can be defined as "the structure, composition, and function of an ecosystem operating within the bounds of natural or historical range of variation." The goal of an EIA is to provide a succinct assessment of the current status of the composition, structure, processes, and connectivity of a particular occurrence of an ecosystem type. It is a multi-metric index of ecological integrity based on measures of biotic and abiotic condition, size, and landscape context designed to document degradation of key biotic and abiotic attributes along a continuum from reference standard to highly degraded. Each metric is rated by comparing measured values with the expected values under relatively unimpaired conditions (i.e., operating within the natural range of variation). Once metrics are scored, they are rolled up into five Major Ecological Factors: Landscape, Edge, Vegetation, Soils, and Size. These Major Ecological Factor scores are in turn rolled up into three Primary Rank Factors: Landscape Context, Condition, and size. These three factors are then combined to calculate an overall EIA score/rank. These scores are also used to determine Element Occurrences (EO). An EO is an occurrence of a tracked element (plant, animal or ecosystem) with practical conservation value as determined by a combination of Conservation Status Rank (rarity and imperilment of the ecosystem across its range) and EIA Rank (condition of the specific occurrence). While the rapid nature of Level 2 assessments necessitates primarily qualitative metrics, it provides a repeatable structure that will aid in evaluation of baseline ecological integrity of occurrences, as well as monitoring to establish trends. This information can then be used for setting conservation priorities, identifying restoration strategies, and monitoring the effectiveness of conservation actions (Rocchio and Crawford 2011).

EIAs were conducted using methodology outlined in Rocchio et al. (2020a, 2020b). Rare plant source features (i.e., mapped populations) were used as assessment areas. Additional EIA surveys were conducted for the full extent of ecosystem occurrences of conservation interest that extended beyond the rare plant source features, or were observed in the process of rare plant surveys.

Areas in need of conservaiton were identified within the Blue Mountains ecoregion based on element occurrence (EO) data and digital maps from the WNHP Biotics database. An emphasis was placed on identifying sites for species that currently lack protection elsewhere in the state and areas with high concentrations of rare species on unprotected federal or state lands.

Results and Discussion

Surveys for Seven Target Species

Surveys from 2018-2021 focused on seven target species identified as high priority by USFWS and WNHP. Five of the species were successfully relocated. Survey results are summarized for each species in the following section.

Astragalus asotinensis (Asotin milkvetch) is endemic to limestone-capped ridges along the Idaho-Washington border near the confluence of the Grande Ronde and Snake rivers. The species was first collected in 1925 by Washington State University botanist Harold St. John, but was mistaken for *Astragalus arthurii*, another rare, local endemic found on volcanic-derived soils in the vicinity. Curtis Björk rediscovered the species on Lime Hill in Asotin County, Washington, in 1999 and it was described as a new species in 2006 (Björk and Fishbein 2006). Additional populations were discovered in Nez Perce and Idaho counties, Idaho, in 2003 and 2006. The entire known range of the species covers about 7 square km and is restricted to limestone and shale outcrops of the Hurwal and Martin Bridge formations (Björk 2010).

In Washington, *Astragalus asotinensis* is known from a single occurrence, consisting of two small subpopulations on the upper north-facing slopes of Lime Hill. This species is limited to whitish chalky soils of an old road cut and steep slopes of a *Pseudoroegneria spicata-Festuca idahoensis-Gutierrezia sarothrae* community on limey clay soils with scattered limestone rubble. Asotin milkvetch is not found on the limestone flatirons on the north side of Lime Hill, or in surrounding brown volcanic basalt slopes, where it appears to be ecologically displaced by *A. arthurii*.

Björk and Fishbein (2006) estimated the total population of *Astragalus asotinensis* in Washington and Idaho at several thousand individuals. Björk (2010) revisited the Lime Hill site in 2010 and reported the population decreasing by 80-90% from 2005. Joe Arnett surveyed the area in 2011 and found the population to be larger than Björk had reported (Fertig 2020a). More recent visits by Roger Ferriel in 2015 and Walter Fertig in 2019 reported about 500 plants, though in only a subset of the entire occurrence (Fertig 2020a).

On 10 June 2021, WNHP staff revisited Lime Hill and mapped *A. asotinensis* at two main sites. This species was found to be locally common, with an average density of 2-3 plants per square meter of occupied habitat. The entire population was estimated at 7500-10,000 individuals. An EIA for *Festuca idahoensis - Symphoricarpos albus* Grassland and *Pseudoroegneria spicata - Festuca idahoensis* Canyon Grassland habitats of *A. asotinensis* was conducted and given an overall rank of B- due to impacts from the decommissioned road to the summit of Lime Hill and the scattered patches of invasive annual plants. However, even with these impacts, this site remains within the natural range of variation for this ecosystem type. Because this species only occurs at one site in Washington, we are unable to draw conclusions about the impact of ecological integrity on species rarity or population health. Expanded results from this EIA are available in Appendix B. Competition from weeds and the potential for wildfire from the dense cover of annual graminoids are two of the primary threats to this species (Fertig 2020a). These stressors may continue to impact the ecological integrity of the site.

The fluctuating population size of *Astragalus asotinensis* is unusual, given that the species is a perennial. Some variation in numbers may be the result of observer bias. A set of permanent demographic plots would be valuable to assess the longevity of individual plants and document impacts from stressors, such as drought, fire, or competition. Tagging individual plants would also

be useful to determine if *A. asotinensis* is capable of prolonged dormancy (existing below-ground for one or more years, often following a heavy fruiting year). Prolonged dormancy could explain the fluctuations observed in population numbers from year to year (Fertig 2020a).

Lomatium rollinsii (Rollins' biscuitroot) is a regional endemic restricted to the Snake and Salmon River drainages of southeastern Washington, west-central Idaho, and northeastern Oregon. Within Washington, it is known from 7 extant and 3 historical occurrences in the Blue Mountains and Columbia Plateau ecoregions of Asotin County. This species is found in canyon grasslands, on gentle to steep slopes with deep loam to shallow rocky soils. Much of the original habitat of *L. rollinsii* has been lost to agricultural development.

Two occurrences of *Lomatium rollinsii* were relocated during surveys in 2020-21. In September 2020, a small population of about 50 plants was observed at the south end of Puffer Butte in Fields Spring State Park. Plants were observed in late fruit on an east-facing rocky slope at the edge of *Pinus ponderosa* woods with *Symphoricarpos albus, Amelanchier alnifolia, Penstemon glandulosus, P. pennellianus, Silene oregana, Solidago missouriensis*, and another Palouse endemic, *Pyrrocoma scaberula*. The Puffer Butte occurrence had first been documented in 1995, with just a single plant noted. At least five *Lomatium* species occur on Puffer Butte, including *L. ambiguum, L. leptocarpum, L. macrocarpum*, and *L. cous*. *Lomatium* were significant food plants for Native American cultures in the region. Of the five species at Puffer Butte, *L. rollinsii* appears to be the least abundant.

In June 2021, WNHP staff documented several small patches of *L. rollinsii* in the foothills of Lime Hill, in rocky bunchgrass communities *of Pseudoroegneria spicata, Aristida purpurea*, and *Hesperostipa comata* with high cover of non-native grasses. Individual patches contained mostly 1-25 individuals. The Lime Hill plants were in late fruit, or past fruiting, and may have been more abundant than suspected because of the difficulty in observing senescent plants amid the dense grass cover.

Two additional private-land occurrences along the Snake River were observed by ocular survey from a parked vehicle in 2021, but were not relocated. Additional potential habitat may occur on steep canyons draining into the Snake River on private rangelands. This species is potentially at risk from grazing, plowing, or increased wildfire.

Lomatium serpentinum (Snake Canyon desert parsley) is also endemic to the Snake River drainage in southeastern Washington, northeastern Oregon, and western Idaho, where it occurs near river level in deep sand or basalt ledges and talus. Additional reports from the Columbia River in Grant and Walla Walla counties are based on specimens that need verification. Eight of the 13 reported occurrences in Washington are historical and some may be extirpated following dam and reservoir construction.

In June 2021, 6 known sites were visited along the Snake River in Asotin County. Only one occurrence was successfully relocated along the rocky shore north of Perkins Gulch. This occurrence contained 57 plants on moss-covered boulders above the high water flood line. These plants were in late fruit and most had already dried out. Other areas of potential habitat along the river may have contained plants earlier in the spring, before becoming senescent due to hot and dry conditions.

Petrophytum caespitosum ssp. *caespitosum* (Rocky Mountain rockmat) is a wide-ranging species in western North America, but reaches the edge of its range at Lime Hill, in extreme southeastern Washington. It was formerly considered "state endangered" in Washington, but was moved to the state Sensitive list in 2019 in recognition of its global distribution. In Washington, it is restricted to dry limestone cliffs of the Martin Bridge or Doyle Creek Limestone along the west side of Lime Hill, near the Snake River. Curtis Björk first documented this population in 1999. It contained only 25-100 plants when revisited in 2003. Surveys by WNHP staff of Lime Hill in 2019 and 2021 failed to relocate this species on limestone flatirons on the west rim and north slope of Lime Hill. The west base was not revisited; however, due to accessibility issues (the private road into the area was gated). The current status of the population is thus not known.

Phlox solivaga (yeti phlox) is endemic to the Blue Mountains of southeastern Washington, though potential habitat extends into northern Oregon. Yeti phlox (named for the white, wavy hairs on the surface of the leaves) was first collected in 1923 on Lewis Peak, but was misidentified for over 75 years. The species was described as new to science in 2015 (Ferguson et al. 2015, as *Phlox solivagus*) when it was known from just three extant occurrences with approximately 2,000-3,000 individuals. At the time it was published, *P. solivaga* was thought to be limited to flat, paleo-surfaces of basalt lithosol dominated by cushion plants and bunchgrasses.

From 2018 to 2021, WNHP staff discovered four new occurrences of *Phlox solivaga* in the Blue Mountains in Umatilla National Forest (Fertig 2020a). These new populations were also found in a wider variety of habitats. One occurrence on the west end of Tam Tam Ridge was found in an abandoned gravel road bed across compacted, red volcanic cobbles that mimicked the lithosol flats of more "natural" occurrences, such as the populations on the summit of Cape Horn and Griffin peaks. Other populations were found on west and southwest-facing slopes of volcanic bedrock and rubble with thin soils exposed to high winds. One small occurrence was also discovered in a small, rocky opening within the *Pseudoroegneria spicata-Festuca idahoensis* Grassland of the Pataha Bunchgrass Research Natural Area.

Presently, *Phlox solivaga* is known from at least 9 extant occurrences (including two new sites documented by Umatilla National Forest botany staff in 2019). The population is currently estimated at 11,975-14,350 plants (Fertig 2020a). This species is probably more common than we

currently know, with additional likely habitat along north-south trending ridges in the Wenaha-Tucannon Wilderness Area. The present Conservation Status Rank of G1/S1 will likely be revised to G2/S2 with the discovery of more occurrences. The species is threatened by competition from invasive annual grasses (especially *Ventenata dubia, Bromus hordeaceus*, and *Apera interrupta*), increased likelihood of wildfire, and potential impacts from vehicle trampling or over-collection (*Phlox* species are popular as rock garden plants).

EIA Results at Phlox solivaga sites

EIAs were conducted at 4 extant occurrences of *Phlox solivaga*: Pataha Bunchgrass Research Natural Area, Sawtooth Ridge, Griffin Peak, and Tam Tam Ridge. The overall ecological integrity of these sites ranged in rank from A+ to B- (Table 3). The EIA ranks of the Pataha, Sawtooth Ridge and Griffin Peak sites were all very similar, with very little invasive species cover or impacts from other stressors. This is likely due, in part, to the windswept, thin soiled nature of these ecosystems. Tam Tam Ridge had more impacts from non-native species and grazing. As stated above, *P. solivaga* was only observed along a crushed rock road on Tam Tam Ridge that mimicked the thin soiled features of the other *P. solivaga* sites we evaluated.

Based on these limited results, it is difficult to make an assessment on the influence of ecological integrity of plant communities on *P. solivaga* presence or abundance as there was little variation in EIA scores between the sites visited. *P. solivaga* is known to grow on lithisols and, based on the population at Tam Tam Ridge; this species may be successful on disturbed substrates that mimic shallow rocky soils. It was unclear if the road at Tam Tam Ridge was built on naturally occurring shallow rocky soil, as it would be easier to navigate than the surrounding grassland, or if crushed rock was imported to the site to create the road, thereby also creating habitat for *P. solivaga*. The population at Tam Tam Ridge indicates that areas with poor EIA soil metric ratings may still be viable *P. soivaga* habitat if the anthropogenic stressor results in substrate that mimics the naturally occurring lithosol. Restoration of such a site that closes old roads may unintentionally negatively impact *P. solivaga* populations if nearby natural lithosol areas have also been lost or damaged. Conversely, areas with poor EIA soil metric ratings from stressors like tilling or conversion to agriculture that results in loss of shallow rocky soils would have a negative impact on *P. solivaga* populations. Invasive species may pose less of a threat to existing populations of this species as shallow rocky soils are difficult to colonize and *P. solivaga* is a perennial plant, however new plants may have difficulty establishing in areas where invasive annual species fill all disturbance niches. In summary, our EIA observations show that *P. solivaga* may persist in areas of reduced ecological integrity, but long-term effects on population dynamics are unclear and may vary based on stressor type.

Table 3. Summarized EIA Results from *Phlox solivaga* sites.

Site Name	USNVC Code	USNVC Association Name	Conservation Status Rank	Landscape Context MEF Rank	Condition MEF Rank	Overall EIA Rank
Pataha	CEGL001624	Festuca idahoensis - Pseudoroegneria spicata Grassland	G4/S2	A	A	A+
Sawtooth Ridge	CTWA003382	Festuca idahoensis - Pseudoroegneria spicata - Phlox spp. Grassland	GNR/SNR	A	A	A+
Griffin Peak	CTWA003382	Festuca idahoensis - Pseudoroegneria spicata - Phlox spp. Grassland	GNR/SNR	A	A	A+
Tam Tam Ridge	CEGL001624	Festuca idahoensis - Pseudoroegneria spicata Grassland	G4/S2	B	C	B-

Rubus nigerrimus (northwest raspberry) is a local endemic of the Snake River drainage in southeastern Washington in Asotin, Garfield and Whitman counties (WNHP 2022). Additional reports from northeastern Oregon and Idaho have not been confirmed (Alice et al. 2014). The entire range of the species is restricted to an area of approximately 32 x 6 km (Kemper 2005), where it is found in steep, narrow canyons that are seasonally moist but become dry by summer. Northwest raspberry is known from 16 extant and two historical occurrences, most of which are in the Columbia Plateau ecoregion (Fertig 2020a).

In 2019, Fertig (2020a) surveyed five occurrences along the Snake River and Wawawai Canyon in the Columbia Plateau ecoregion, but failed to document any *R. nigerrimus* plants. Each population had become over-grown with the aggressive introduced Himalayan blackberry (*R. bifrons*). One population in Wawawai Canyon that was initially thought to contain *R. nigerrimus* was found to consist only of *R. leucodermis* (a related, native species) and *R. bifrons*. Two populations in the Blue Mountains occur on private lands or near Lime Hill in an area that is presently not easily accessible across private property.

Population counts are difficult to make for *Rubus nigerrimus* and other perennial raspberries because of their clonal growth habit. Kemper (2005) estimated the total population in Washington to be about 700 genets. This number may be even lower today, due to displacement by *R. bifrons*. Some populations of *R. nigerrimus* may persist in the drier portions of tributary canyons of the Snake River (Alex Wright, personal communication 2021). Due to its limited geographic range, significant threats from competition with *R. bifrons,* possible hybridization issues with *R.*

leucodermis (Kemper 2005), or potential loss of pollinators or native fruit dispersers (Rush 1999), *R. nigerrimus* is a high priority for additional surveys and conservation attention (Fertig 2020a).

Trifolium douglasii (Douglas's clover) is a regional endemic of eastern Washington, northeastern Oregon, and western Idaho. Historically, it was found in moist to wet meadows, forested wetlands, and streambanks, many of which have been converted to agricultural uses. In Washington, at least five occurrences are now historical or extirpated. Of the two extant populations, one on Umatilla National Forest contained an estimated 1,000 plants in 2012 and another had just 6 individuals (WNHP 2022).

The Umatilla National Forest occurrence was revisited in June 2021 as part of this project. The population was fenced by the Forest Service to prevent livestock or vehicles from impacting the site. Unfortunately, no Trifolium douglasii plants could be found within the fenced exclosure in 2021. Eight plants were found in a wet depression leading to a small stream immediately outside of the fenced area. No other individuals were found in the vicinity. The significant drop in population size is poorly understood, especially given the protection of the site. Perhaps this species is dependent on some degree of disturbance, or is being crowded out by competing vegetation. Long-term monitoring may be necessary to assess the longevity of plants, rates of seedling establishment, and population trends in response to management changes.

Ecological Integrity Assessments at Rare Plant Sites

Based on the limited EIA surveys performed as a part of this project, ecological integrity correlation was found to vary both between species and between sites. Likely, the correlation of ecological integrity is species dependent and, in some cases, individual metrics of integrity (i.e. soil disturbance) or the presence/absence of specific stressors may provide better insight into species impacts than the rolled-up EIA rank. In the case of *P. solivaga*, some stressors that reduced the score for the soil metric (a road that mimicked lithosols) had little effect on one *P. solivaga* population, but a stressor that reduces cover of shallow rocky soils would likely have a negative impact on this species. On a larger scale, EIA measures the deviation of a given ecosystem from the natural range of variation. Using EIA for prioritizing conservation on sites that have little deviation from the natural range of variation (sites that have higher ecological integrity) is the most likely way to conserve rare species that rely upon these ecosystems, as these have been the least impacted by anthropogenic stressors. Areas of lower ecological integrity that still contain crucial rare plant populations, can use individual EIA metrics to determine what restoration actions may help promote the health of the species as described for *P. solivaga* above.

Surveys of Other Rare Plant Species and Rare/High-Quality ecosystems in Blue Mountains Ecoregion

Several additional rare plant species tracked by WNHP were encountered during surveys of the Blue Mountains ecoregion from 2018-2021. Each of these species is briefly summarized below:

Arabis crucisetosa (cross-haired rockcress) is a regional endemic of the Blue Mountains of southeastern Washington and extends into eastern Oregon and western Idaho. It is presently known from two extant occurrences in Washington, including a large population on Lime Hill that was

relocated in June 2021. This species is found on limestone cliffs and flatirons on the north and west slopes of Lime Hill, often co-occurring with *Myriopteris gracilis*, another rare species. About 200 individuals were observed at several scattered locations on Lime Hill.

Astragalus arthurii (Arthur's milkvetch, sometimes spelled *A. arthuri*) is a regional endemic of southeastern Washington (Asotin County), northeastern Oregon, and western Idaho, where is occurs in rocky, Palouse grasslands on volcanic-derived soils. Much of its historic range has been altered by farming, wildfire, and competition from introduced weeds. It is currently known from 13 extant and 6 historical occurrences in Washington. One large population, consisting of more than one dozen smaller subpopulations, is found in the Lime Hill area near the occurrence of *Astragalus asotinensis*. The two species are ecologically isolated by their differing substrate preferences, with *A. asotinensis* replacing *arthurii* on limestone-derived soils. In June 2021, both *Astragalus* species were documented along the old two-track road that ascends the north side of Lime Hill. Arthur's milkvetch is more common on the ridge just north of Lime Hill where volcanic soils predominate. Five subpopulations of *A. arthurii* were observed in 2021, including two new ones bordering the two track. These subpopulations were relatively small, often with only 2-5 individuals. The total population of the Lime Hill occurrence was estimated at 500-1000 plants in 1999.

This population of *A. arthurii* was included in the EIA performed for *A. asotinensis*. This area was given an overall rank of B- due to impacts from the old two-track to the summit of Lime Hill and the scattered abundance of weedy invasive annual plants, however, this site remains within the natural range of variation for this ecosystem type. Expanded results from this EIA are available in Appendix B.

Astragalus cusickii var. *cusickii* (Cusick's milkvetch) is a regional endemic of southeastern Washington (Asotin County), and adjacent Idaho and Oregon. It is known from 9 extant occurrences in Washington, all in the Blue Mountains ecoregion, where it is typically found on dry, grassy slopes, talus fields, and basalt ledges and outcrops. Two occurrences were relocated in June 2021 at Lime Hill and on the switchbacks along Highway 129 near Rattlesnake Creek, north of the Grande Ronde River. These populations have been reported to contain several thousand plants in previous surveys. Individual patches observed in 2021 were often small and localized with only 5-10 individuals. Extensive areas of suitable habitat are present, however, and the species was not formally surveyed. Populations north of Lime Hill may have been impacted by recent wildfires and the increase in density of annual introduced grasses that have occurred after these fires.

Boechera cascadensis (littleleaf rockcress, Cascade rockcress) is a regional endemic of northeastern Oregon, southeastern and central Washington, and southern British Columbia. This species was not known to occur in the Blue Mountains until 2018, when a small population was discovered growing on an intrusive mafic dike on the north side of Griffin Peak as part of this project. The population was revisited in June 2021 and about 50 plants were counted at the site. Additional habitat may be scattered at other locations in the Blue Mountains. *Boechera cascadensis* is considered an apomictic hybrid between *B. microphylla* and *B. paupercula*

(Windham and Al-Shehbaz 2007) and so may have reduced fecundity or poor seedling survival (Fertig 2020a, WNHP 2022).

Calochortus macrocarpus var. *maculosus* (sagebrush mariposa lily) is the white-flowered variety of the more widespread purple-flowered form of *C. macrocarpus* (var. *macrocarpus*) and is endemic to the Blue Mountains and buttes in the Palouse grasslands of southeastern Washington, western Idaho, and northeastern Oregon. It is found primarily on rocky, basaltic hillsides, cliffs, and grasslands, often at the edge of *Pinus ponderosa* woods. The species is presently known from 31 extant occurrences in the state, 10 of which have been documented since 2018 as part of this study or recent field work by Umatilla NF personnel. Although ranked T2/S2, this taxon should probably be re-ranked as G3/S3. Some populations recently burned, and monitoring studies are needed to assess their response to fire and other potential impacts, such as grazing and competition from invasive weeds. Reports of *Calochortus nitidus* from the Blue Mountains may be based on var. maculosus (WNHP 2022).

Erigeron disparipilus (Snake River daisy) is a regional endemic of the Blue Mountain in southeastern Washington, eastern Oregon, and western Idaho. This species is found on ridgetops and slopes of brownish basalt rubble and thin clay soils associated with *Festuca idahoensis* and *Pseudoroegneria spicata*. It often co-occurs with *Phlox solivaga* and *Penstemon pennellianus* (two other Blue Mountain endemics). This species is currently known from 11 extant and 2 historical occurrences in Washington. Eight of these populations have been discovered since 2018, suggesting that E. disparipilus may be more common in the area than previously suspected. Individual occurrences may contain 100-5,000 plants (WNHP 2022).

Myriopteris gracilis (*Cheilanthes feei*, Fee's lip-fern) occurs widely across western North America from southern Canada to northern Mexico, but is at the edge of its overall range in southeastern Washington (WNHP 2022). It is known from one extant occurrence in the Blue Mountains and one historical record in the Columbia Plateau ecoregion. The population at Lime Hill was relocated in June 2021 and found to contain over 500 individuals. It co-occurs with *Arabis crucisetosa* on limestone fins and flatirons, mostly on the north slope of Lime Hill.

Oenothera caespitosa var. *marginata* (tufted evening-primrose) is at the edge of its global range in southeastern Washington, but occurs more widely from Idaho to Colorado, California, and Texas. One of the four extant occurrences in Washington was relocated in June 2021 on a lens of gray clayey soil amid weedy Palouse grasslands on a low ridge north of Lime Hill. Only ten plants were observed, though additional potential habitat occurs in the vicinity. Historically, this species may have been more common in southeastern Washington but has been adversely impacted by conversion of native grasslands to agriculture, competition from invasive weeds, or increased frequency of wildfire.

Penstemon pennellianus (Blue Mountain penstemon) is endemic to the Blue Mountains of southeastern Washington and northeastern Oregon. It is found in windswept, sparsely vegetated rocky meadows, south and west-facing volcanic talus slopes, and road cuts in cushion plant communities of *Eriogonum douglasii, Pyrrocoma carthamoides*, and *Pseudoroegneria spicata*. Fifteen of the 25 known extant occurrences of *P. pennellianus* have been discovered or relocated

since 2018. Most populations are relatively small, numbering between 4 and 200 individuals. Two historical occurrences could not be relocated in recent surveys and may be based on misidentifications of *P. attenuatus*. Blue Mountain penstemon remains threatened by livestock grazing, competition from weedy species, reduction in pollinators, and roadside spraying of herbicides (WNHP 2022).

Polygonum austiniae (Austin's knotweed) ranges from southern Canada to California, Nevada, and Wyoming, but is infrequent in eastern Washington. Three new occurrences were discovered in the Blue Mountains during this study in 2018 and 2019, increasing the total number of populations in the state to seven (WNHP 2022). This species is a dwarf annual found on barren volcanic scree and may be more widespread than presently known. Its continued status as a species of conservation concern should be re-evaluated if additional occurrences are found.

Pyrrocoma scaberula (Palouse goldenweed) is a G2/S1 species recently upgraded to Washington State Endangered status. It is endemic to the Snake River drainage of southeastern Washington, northeastern Oregon, and western Idaho, where it occurs at the ecotone between *Pinus ponderosa* woodlands and *Festuca idahoensis/Pseudoroegneria spicata* grasslands on loess soils over basalt or limestone bedrock (Fertig 2020a). Historically, *P. scaberula* has been included in *P. liatriformis*, another rare endemic of lower elevation Palouse grasslands in eastern Washington and western Idaho, but the two taxa differ genetically and in morphological characters of stem pubescence and involucre shape (Björk and Darrach 2009; Smith et al. 2010).

Palouse goldenweed is known from 7 extant occurrences, three of which were resurveyed for this project in September 2020. Populations were found to be small, but stable compared with earlier surveys. Individual occurrences range in size from 12 to 141 plants and the statewide population is estimated at about 1,300 (Fertig 2020a). Additional habitat may be present along the east flank of the Blue Mountains, though much of this area has been altered by past grazing (resulting in an increase in competing cover of non-native annual grasses) or conversion to agriculture.

Ribes oxyacanthoides var. *irriguum* (Idaho gooseberry) occurs from British Columbia to western Montana, south to Oregon and north-central Idaho. In Washington, it is known from five extant and seven historical or extirpated populations, primarily in the vicinity of Spokane, Palouse, and the Blue Mountains. This spiny shrub is associated with narrow, moist canyons and streambanks within partly shaded *Pinus ponderosa/Pseudotsuga menziesii* forests. Individual populations are often small, with just 1 to 8 plants (Fertig and Kleinknecht 2020). One occurrence on the slopes of Puffer Butte in Fields Spring State Park was relocated during surveys targeting *Pyrrocoma scaberula* in 2020.

Silene scouleri ssp. *scouleri* (Scouler's catchfly) ranges from British Columbia to northern Idaho and south to California. Although widely distributed in Washington, nearly 2/3 of known populations are historical or extirpated, especially in the Puget Trough and East Cascades foothills (Fertig and Kleinknecht 2020). In 2019, David Woodall of the WA Department of Fish and Wildlife discovered the first known population of Scouler's catchfly in the Blue Mountains ecoregion in the Asotin Creek Wildlife Area. WNHP staff located a second occurrence (with just 3 plants) on Puffer Butte in Fields Spring State Park in 2020. In the Blue Mountains, Scouler's

catchfly occurs in small openings in dense thickets of snowberry and rose or at the edge of *Pinus ponderosa* woodlands and Palouse grasslands. This species is threatened by conversion of its habitat to agriculture and human development, as well as fire suppression and competition from invasive plants. *Silene scouleri* can be easily overlooked in dense vegetation, and so might be more widespread within the Blue Mountains than presently known.

Silene spaldingii (Spalding's catchfly) is a federally Threatened species found in Festuca idahoensis grasslands on north-facing knobs or slopes from southern British Columbia to western Montana, eastern Washington, central Idaho, and northeastern Oregon. Historically, it was known from 54 occurrences in Washington, of which at least 8 are now likely extirpated. Most populations are small and widely scattered, consisting of numerous, small subpopulations with 1-50 or more plants (Niggemann and Fertig 2018). The largest known occurrence in the state was discovered in the eastern foothills of the Blue Mountains at Asotin Creek Wildlife Area in 2008 and contained over 10,000 individuals. Additional populations in Umatilla National Forest have been periodically monitored for over 25 years, including 2018 and 2020 (Fertig 2021). Most of the survey plots are designed for demographic monitoring of specific individuals to assess longevity and seedling establishment, rather than estimating overall abundance. Much of the Sourdough Ridge and Warner Gulch occurrences were severely burned in an extensive wildfire in late summer 2021. These areas need to be resurveyed to verify their current status. In addition to wildfire, this species is threatened by conversion of its prairie habitat to agriculture, grazing and trampling by livestock, herbivory by rodents, competition from introduced weeds, and habitat fragmentation (Fertig 2021).

Philadelphus lewisii / Symphoricarpos albus Wet Shrubland (G1G2/S1S2)

This area is a 2.09 acre intermittent dry riparian drainage located in a draw between two ridges with inputs likely from precipitation and some groundwater seepage. The vegetation community is dominated by *Philadelphus lewisii*, *Holodiscus discolor*, *Amelanchier alnifolia*, and *Symphoricarpos albus*. The draw is more densely shrubby towards base of drainage and is surrounded by *Festuca idahoensis* - *Pseudoroegneria spicata* grassland outside of the assessment area. The drainage is crisscrossed by revegetated old roads that sees little foot traffic. Within the waterway, there is no obvious scour or channel. The immediately surrounding grasslands are in good condition but become more invaded downslope. Based on the G/S ranks for this association and the EIA score for this area, it would be considered an EO. More information on this ecosystem is available in Appendix B.

Glossopetalon spinescens var. *aridum / Pseudoroegneria spicata* Shrubland (G4/SNR)

This is the first documented occurrence of this plant association in Washington, although it is known to occur nearby in Idaho. This 20.96 acre association was found in a step in slope on a steep northwest-facing aspect with limestone outcroppings. *Glossopetalon spinescens var. aridum* dominates the patchy, short shrub layer with *Pseudoroegneria spicata* establishing on areas of soil development. An old road bisects the stand, but it has been decommissioned and revegetated. Relatively few non-native or invasive plants were observed aside from scattered bromes. Based on the G/S ranks for this association and the EIA score for this area, it would be considered an EO. More information on this ecosystem is available in Appendix B.

Areas with Protection Needs in the Blue Mountains Ecoregion

Compared to other ecoregions of Washington, the Blue Mountains contain relatively few formally protected areas (WDNR 2007). Buffalo Rock along the Snake River south of Asotin is protected within the Nez Perce National Historical Park, managed by the National Park Service. The Wenaha-Tucannon Wilderness Area, managed by Umatilla National Forest, is the largest protected area, covering over 176,000 acres along the Washington and Oregon state lines. Pataha Bunchgrass and Rainbow Creek are small research natural areas also present on the Washington side of the Umatilla National Forest. The Washington Department of Fish and Wildlife manages three wildlife areas (Asotin Creek, Chief Joseph, and William T. Wooten) along the east and northern flanks of the Blue Mountains. The Lime Hill area and other public lands managed by the Vale District of the Bureau of Land Management have been designated as the Grande Ronde Area of Critical Environmental Concern. Washington State Parks protects a portion of Puffer Butte within Fields Spring State Park. Other DNR and DFW lands in the Lime Hill and Grande Ronde areas have been recommended for protection as a state natural area preserve (Arnett 2014), but no formal designation has occurred. Scattered private parcels in the foothills of the Blue Mountains are protected by the Blue Mountains and Palouse land trusts (Fertig and Kleinknecht 2022).

Table 4 summarizes the distribution of vascular plant species of conservation concern in Washington among existing protected areas in the Blue Mountains ecoregion. Thirty-two of the 45 rare plant species known from the ecoregion (71%) are found in at least one protected area at present. All 45 species would be represented if the protected area network were expanded to include 17 areas with high concentrations of rare plant species (Table 5 and Figure 2). Most of these areas are on public lands that are currently managed for multiple use. These data may be used to develop Essential Conservation Areas in the future. Essential Conservation Areas (ECAs) estimate the primary area supporting the long-term survival of targeted rare elements, including suitable habitat and buffers from human-induced stressors. Informed by each species' habitat needs and sensitive to stressors, remote sensing data were used to estimate ECA boundaries around each rare plant occurrence.

Although the Blue Mountains is the smallest and least species rich ecoregion in Washington, the area has high conservation significance due to the number of rare plant species that occur here and nowhere else in the state. Future surveys may identify additional areas of high conservation value. Assessment tools, such as EIA, will be useful in identifying which of these areas may be in the best ecological condition and present the best opportunities for successful conservation.

Table 4. Distribution of Vascular Plant Species of Conservation Concern in the Blue Mountains Ecoregion by Protected Areas

Species	Common Name	Protected Area						
		AC WA	CJ WA	FS SP	GRA CEC	PBR NA	WT WA	WW WA
Allium campanulatum	Sierra onion							
Allium dictuon	Blue Mountain onion						P	
Antennaria corymbosa	Meadow pussytoes						P	
Arabis crucisetosa	Cross-haired rockcress				P			
Asclepias cryptoceras	Pallid milkweed		P					
Astragalus arthurii	Arthur's milkvetch		P		P			
Astragalus asotinensis	Asotin milkvetch				P			
Astragalus cusickii var. *cusickii*	Cusick's milkvetch		P		P			
Boechera cascadensis	Cascades rockcress							
Bolandra oregana	Oregon bolandra		P		P		P	
Calochortus macrocarpus var. *maculosus*	Sagebrush mariposa lily	P	P	P	P		P	
Calochortus nitidus	Broad-fruit mariposa lily							
Carex cordillerana	Cordilleran sedge							
Crepis bakeri	Idaho hawksbeard	P	P					
Cryptantha grandiflora	Clearwater cryptantha		P					
Cryptantha rostellata	Beaked cryptantha		P					
Diplacus cusickioides	Nesom's monkeyflower		P					
Erigeron davisii	Davis's fleabane				P			P
Erigeron disparipilus	Snake River daisy	P		P				P
Erythranthe ampliata	Nez Perce monkeyflower							
Erythranthe patula	Stalk-leaved monkeyflower	P			P			
Hackelia diffusa var. *diffusa*	Diffuse stickseed							
Hackelia hispida var. *hispida*	Rough stickseed				P			
Lomatium rollinsii	Rollins' biscuitroot	P	P	P	P			
Lomatium serpentinum	Snake Canyon biscuitroot		P		P			
Lupinus sabinianus	Sabin's lupine							
Myriopteris gracilis	Slender lipfern				P			
Oenothera cespitosa ssp. *marginata*	Tufted evening-primrose		P		P			
Pedicularis bracteosa var. *siifolia*	Smoothflower bracted lousewort							
Penstemon pennellianus	Blue Mountain beardtongue		P	P			P	
Penstemon wilcoxii	Wilcox penstemon							
Petrophytum caespitosum ssp. *caespitosum*	Rocky Mountain rockmat				P			
Phlox solivaga	Yeti phlox	P				P	P	
Polygonum austiniae	Austin's knotweed							
Pyrrocoma scaberula	Palouse goldenweed		P	P	P			
Ranunculus populago	Mountain buttercup						P	
Ribes cereum var. *colubrinum*	Snake wax currant	P			P			
Ribes oxyacanthoides var. *irriguum*	Idaho gooseberry		P	P				

Species	Common Name	Protected Area						
		AC WA	CJ WA	FS SP	GRA CEC	PBR NA	WT WA	WW WA
Ribes wolfii	Wolf's currant							
Rubus nigerrimus	Northwest raspberry				?			
Silene scouleri ssp. *scouleri*	Scouler's catchfly	P		P				
Silene spaldingii	Spalding's catchfly	P						
Spartina pectinata (*Sporobolus michauxianus*)	Prairie cordgrass		P		P			
Trifolium douglasii	Douglas' clover							
Trifolium plumosum var. *plumosum*	Plumed clover							

Protected Areas: ACWA = Asotin Creek Wildlife Area, CJWA = Chief Joseph Wildlife Area, FSSP = Fields Spring State Park, GRACEC = Grande Ronde Area of Critical Environmental Concern, PBRNA = Pataha Bunchgrass Research Natural Area, WTWA = Wenaha-Tucannon Wilderness Area, WWWA = William T. Wooten Wildlife Area. Other protected areas in the Blue Mountains which do not contain any known occurrences of rare plant species are omitted.
Presence in Protected Area: ? = questionable occurrence – needs confirmation; P = Present.

Table 5. Areas with Protection Needs for Vascular Plant Species of Conservation Concern in the Blue Mountains Ecoregion (see Figure 2 for locations and Appendix B for full EIA results).

Map Code	Conservation Site	Rare Species Known to be Present	Rare Species Potentially Present	EIA Ranks
A	Alder Gulch/ West Tam Tam Ridge	*Calochortus macrocarpus* var. *maculosus, Erigeron disparipilus, Penstemon pennellianus, Phlox solivaga, Polygonum austiniae, Ribes wolfii*		Association: CEGL001624 *Festuca idahoensis - Pseudoroegneria spicata* Grassland G4/S2 Landscape context: B, Condition: C, EIA Rank B-, EO Rank C-
B	Cape Horn/Cabin Ridge	*Calochortus macrocarpus* var. *maculosus, Erigeron disparipilus, Phlox solivaga, Silene spaldingii*	*Astragalus arthurii, Calochortus nitidus*	*Not assessed*
C	Crooked Creek	*Allium dictuon, Bolandra oregana, Calochortus macrocarpus* var. *maculosus, Trifolium douglasii*	*Hackelia diffusa* var. *diffusa, Penstemon pennellianus*	*Not assessed*
D	Godman Spring	*Penstemon pennellianus, Penstemon wilcoxii*	*Ranunculus populago*	*Not assessed*
E	Grande Ronde Canyon	*Astragalus cusickii* var. *cusickii, Bolandra oregana, Calochortus macrocarpus* var. *maculosus, Erythranthe ampliata, Hackelia hispida* var. *hispida, Ribes cereum*	*Rubus nigerrimus*	*Not assessed*

Map Code	Conservation Site	Rare Species Known to be Present	Rare Species Potentially Present	EIA Ranks
		var. *colubrinum, Spartina pectinata*		
F	Griffin Peak	*Boechera cascadensis, Erigeron disparipilus, Penstemon pennellianus, Phlox solivaga*		Association: CTWA003382 *Festuca idahoensis - Pseudoroegneria spicata - Phlox* spp. GNR/SNR Landscape context: A, Condition: A, EIA Rank A+, EO Rank A-
G	Hard-to-Get-To Ridge	*Calochortus macrocarpus* var. *maculosus, Ribes wolfii*	*Carex cordillerana, Erigeron disparipilus, Penstemon pennellianus, Polygonum austiniae, Ranunculus populago*	*Not assessed*
H	Kooskooskie	*Lupinus sabinianus, Trifolium plumosum* var. *plumosum*		*Not assessed*
I	Lime Hill	*Arabis crucisetosa, Asclepias cryptoceras, Astragalus arthurii, Astragalus asotinensis, Astragalus cusickii* var. *cusickii, Bolandra oregana, Calochortus maculosus* var. *macrocarpus, Crepis bakeri, Diplacus cusickioides, Erythranthe patula, Hackelia hispida* var. *hispida, Lomatium rollinsii, Lomatium serpentinum, Myriopteris gracilis, Oenothera cespitosa ssp. marginata, Petrophytum caespitosum, Pyrrocoma scaberula, Ribes cereum* var. *colubrinum, Rubus nigerrimus, Spartina pectinata*	*Cryptantha rostellata*	Association: Upper slopes: *Festuca idahoensis - Symphoricarpos albus* Grassland G1/S1. Lower slopes: Pseudoroegneria spicata – Festuca idahoensis Canyon Grassland G3/S2 Landscape context: B, Condition: C, EIA Rank B-, EO Rank B+ Association: *Philadelphus lewisii* / *Symphoricarpos albus* Wet Shrubland G1G2/S1S2 Landscape context: B, Condition: A, EIA Rank A-, EO Rank B+ Association: Glossopetalon spinescens var. aridum / Pseudoroegneria spicata Shrubland G4/SNR Landscape context: A, Condition: A. EIA Rank A-, EO Rank A+
J	Mount Wilson	*Arabis crucisetosa, Calochortus macrocarpus* var. *maculosus, Erigeron davisii, Polygonum austiniae*	*Asclepias cryptoceras, Cryptantha rostellata*	*Not assessed*
K	Puffer Butte	*Calochortus macrocarpus* var.	*Erythranthe ampliata, Lupinus sabinianus,*	*Not assessed*

Map Code	Conservation Site	Rare Species Known to be Present	Rare Species Potentially Present	EIA Ranks
		maculosus, Erigeron disparipilus, Lomatium rollinsii, Penstemon pennellianus, Pyrrocoma scaberula, Ribes oxyacanthoides var. *irriguum, Silene scouleri*	*Pedicularis bracteosa* var. *siifolia*	
L	Sawtooth Ridge	*Antennaria corymbosa, Penstemon pennellianus, Phlox solivaga*	*Boechera cascadensis, Erigeron disparipilus, Ranunculus populago*	Association: CTWA003382 Festuca idahoensis - Pseudoroegneria spicata - Phlox spp. GNR/SNR Landscape context: A, Condition: A. EIA Rank A+, EO Rank A+
M	Snake River (Asotin to confluence with Grande Ronde)	*Astragalus arthurii, Calochortus macrocarpus* var. *maculosus, Lomatium rollinsii, Lomatium serpentinum, Rubus nigerrimus, Silene spaldingii*	*Diplacus cusickioides, Erythranthe ampliata*	*Not assessed*
N	Sourdough Ridge/Lick Creek	*Astragalus arthurii, Calochortus macrocarpus* var. *maculosus, Cryptantha grandiflora, Erigeron disparipilus, Lomatium rollinsii, Ribes oxyacanthoides* var. *irriguum, Silene spaldingii*	*Crepis bakeri, Phlox solivaga*	*Not assessed*
O	Table Rock/Skyline	*Allium campanulatum, Erigeron disparipilus, Penstemon pennellianus, Phlox solivaga, Ranunculus populago*	*Antennaria corymbosa, Boechera cascadensis*	*Not assessed*
P	Warner Gulch/Smoothing Iron Ridge	*Calochortus macrocarpus* var. *maculosus*, *Crepis bakeri, Erythranthe patula, Ribes cereum* var. *colubrinum, Silene spaldingii*	*Astragalus arthurii, Carex cordillerana, Cryptantha grandiflora, Erigeron disparipilus, Phlox solivaga*	*Not assessed*
Q	Weller Butte	*Allium dictuon, Bolandra oregana, Penstemon pennellianus*	*Hackelia diffusa* var. *diffusa*	*Not assessed*

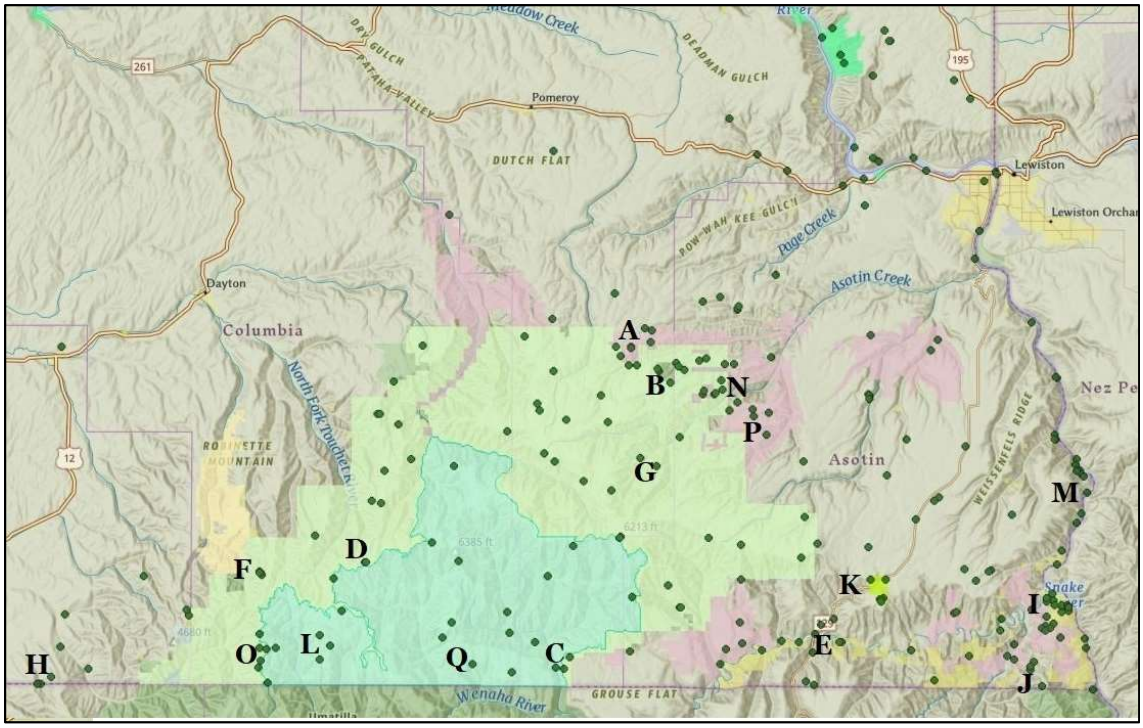

Figure 2. Potential Conservation Sites in the Blue Mountains Ecoregion of Washington. (See Table 4 for the name of each site and vascular plant species known to be present or potentially present.)

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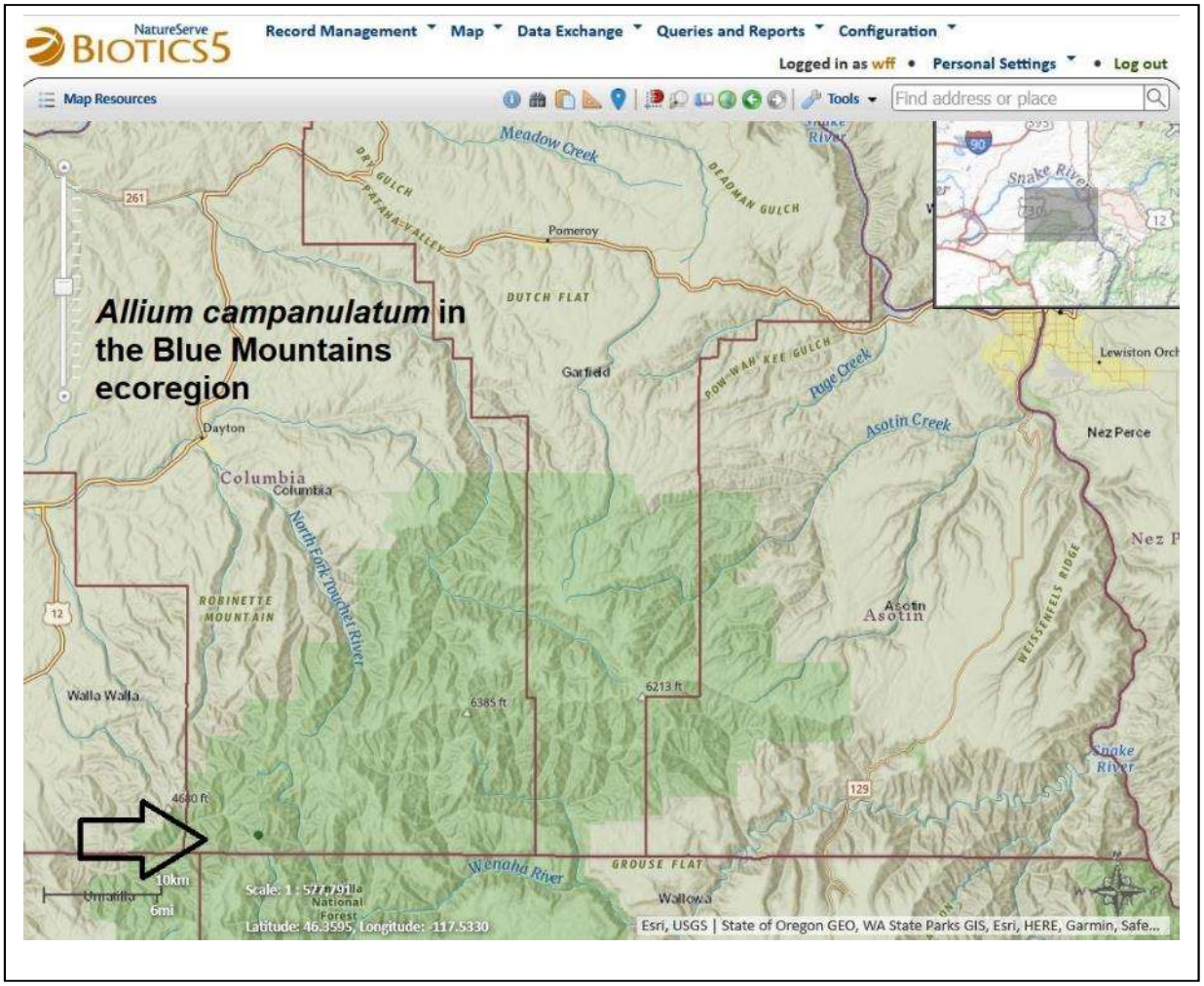
Appendix A. Species Status Summaries

Allium campanulatum (Sierra onion)

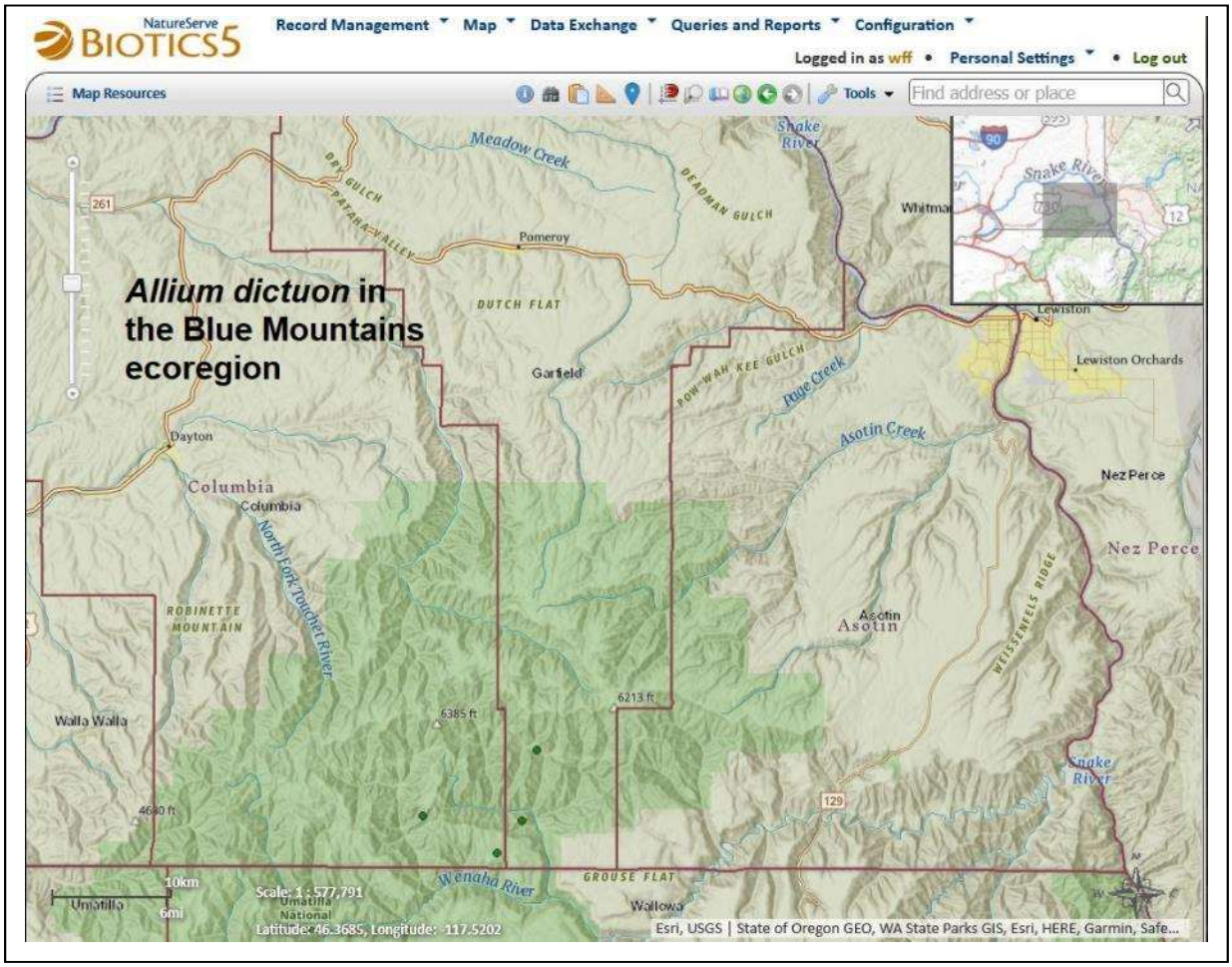
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4/S1; WA Sensitive (formerly Threatened)
Range: Southern Washington (Columbia and Yakima counties) to California and Nevada. Peripheral in Washington.
WA Ecoregions: Blue Mountains, East Cascades
Number of Occurrences: Known from three extant occurrences in Washington, all discovered or relocated since 2005 (most recently in 2010). One occurrence is found in the Blue Mountains (WNHP 2022).
Abundance: Populations are small, ranging from a dozen to several hundred plants. The entire state population is probably less than 2,500 individuals (Fertig and Kleinknecht 2020).
Habitat: Dry meadows and drainage channels on thin, rocky or sandy soil.
Threats: Grazing, impacts from roads and off-road recreation, and forest encroachment. Ranked as "Less Vulnerable" to climate change (Fertig 2020b).
Trends: Not known. The Blue Mountains occurrence could not be relocated in 2019 By UW Rare Care volunteers.
Managed Areas in WA: Okanogan-Wenatchee National Forest, Umatilla National Forest, WA DNR.



Protection Status in Blue Mountains: Unprotected. The single occurrence found in the Blue Mountains is on public lands managed for multiple use (Umatilla NF) and is not formally protected. No populations are protected elsewhere in the state. Two occurrences (including the Blue Mountains occurrence) are within 5 km of federally designated wilderness areas (William O. Douglas and Wenaha-Tuccanon) (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Table Rock/Skyline
Additional References: Camp and Gamon 2011; Hitchcock and Cronquist 2018.

Allium dictuon (Blue Mountain onion)

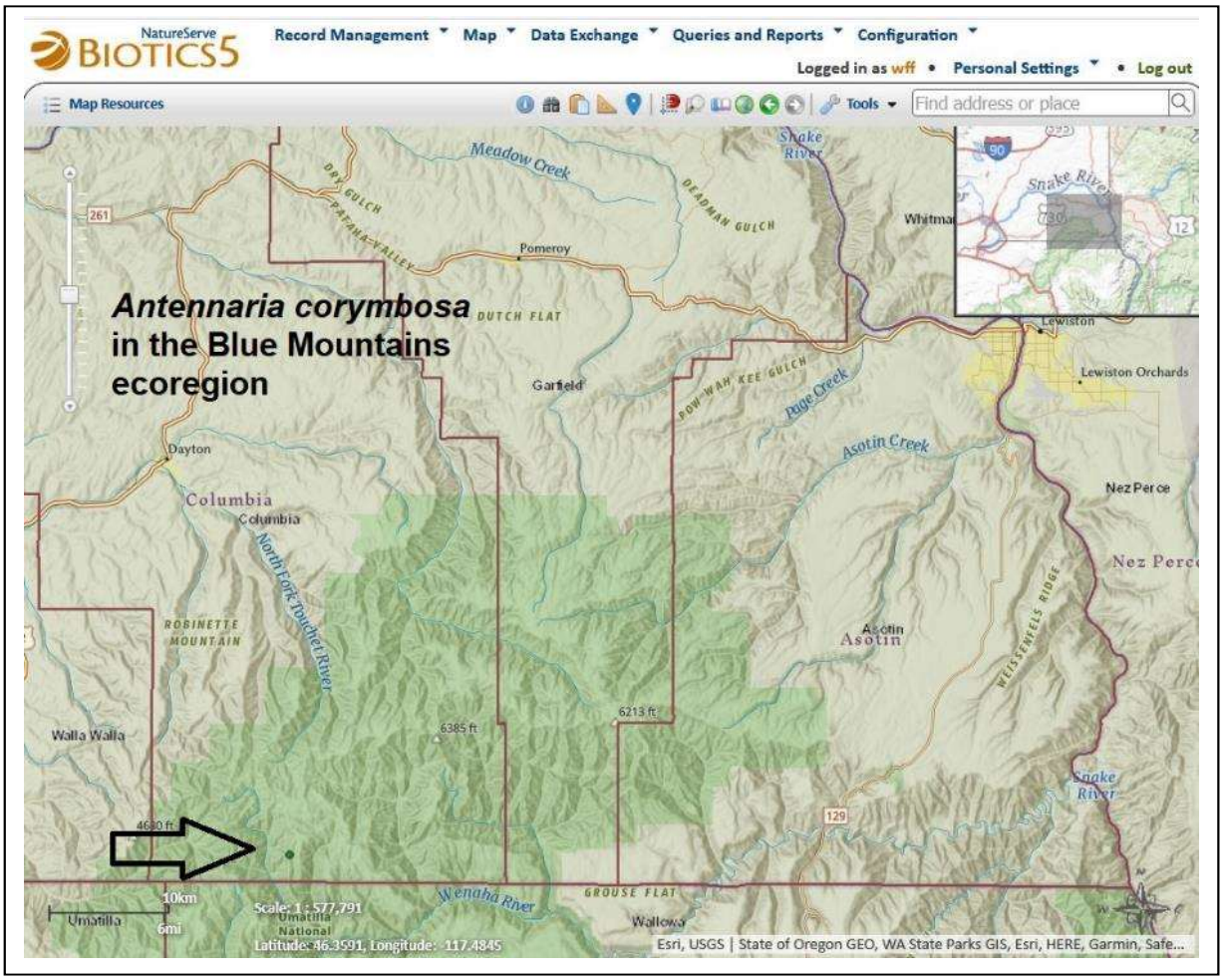
Synonym: *Allium douglasii* var. *constrictum*
Legal Status: USFS Sensitive
Conservation Status Rank: G2/S2; WA Threatened
Range: Local endemic of the Blue Mountains of southeastern Washington (Columbia and Garfield counties), though also reported from northeastern Oregon and west-central Idaho (WNHP 2022).
WA Ecoregions: Blue Mountains.
Number of Occurrences: Known from four extant occurrences in Washington, all found in the Blue Mountains.
Abundance: Populations range in size from 7-525 individuals (Fertig 2020a).
Habitat: Sparsely vegetated, steep, rocky slopes and basalt rock outcrops.
Threats: Habitat disturbance by livestock, reductions in winter snow pack, over-harvest for edible bulbs (Fertig 2020a).
Trends: Not known.



Managed Areas in WA: Umatilla National Forest, Wenaha-Tucannon Wilderness Area.
Protection Status in Blue Mountains: All 4 known occurrences in the Blue Mountains (and in Washington State) are found within the Wenaha-Tucannon Wilderness Area. Additional habitat may occur in the Chief Joseph Wildlife Area. Statewide, this species was considered "inadequately protected" by Fertig and Kleinknecht (2022) based on fewer than 5 occurrences being in protected areas.
Potential Inventory or Conservation Areas: Crooked Creek, Weller Butte
Additional References: Camp and Gamon 2011; Gamon 1986; McNeal and Jacobsen 2002.

Antennaria corymbosa (Meadow pussytoes)

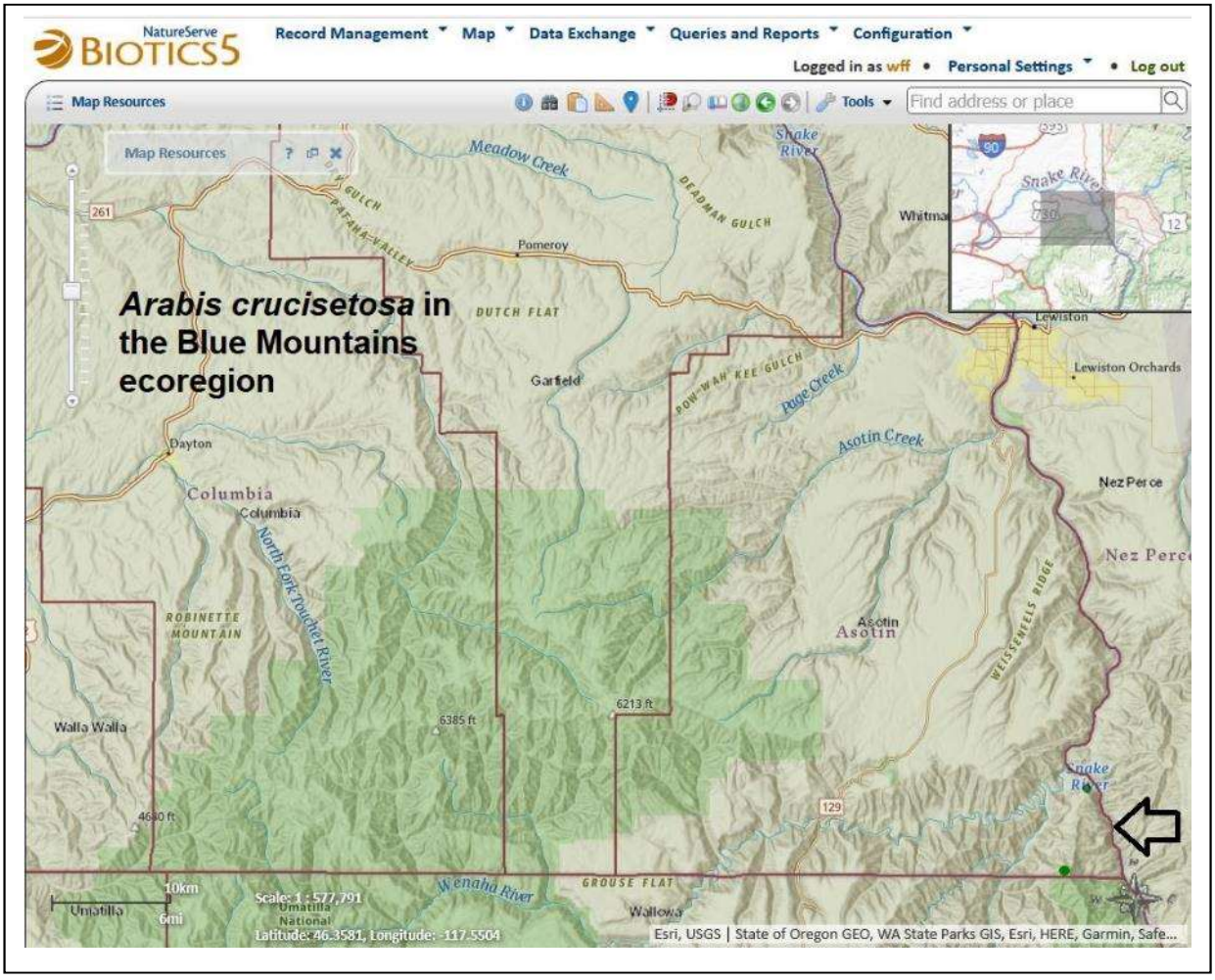
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G5/S1; WA Sensitive
Range: Alberta to Saskatchewan, south to California, Utah, and New Mexico. Peripheral in Washington, where found in Columbia, Okanogan, and Pend Oreille counties.
WA Ecoregions: Blue Mountains, Canadian Rockies, and Okanogan
Number of Occurrences: Known from 5 extant occurrences in Washington, all discovered since 2003 (most recently in 2021).
Abundance: Populations range in size from 25-100 plants to over 1,500 (WNHP 2022).
Habitat: Moist meadows, streamsides, and woodlands in mountains.
Threats: Grazing, herbicides, and alteration of hydrology.
Trends: Probably stable at present.



Managed Areas in WA: Bunchgrass Meadows Research Natural Area, Colville National Forest, Okanogan-Wenatchee National Forest, Umatilla National Forest, and Wenaha-Tucannon Wilderness Area.
Protection Status in Blue Mountains: The single occurrence in the Blue Mountains is protected within the Wenaha-Tucannon Wilderness Area. Protection in Washington State is considered inadequate due to the number of protected occurrences being less than 5 (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Sawtooth Ridge, Table Rock/Skyline
Additional References: Camp and Gamon 2011; Hitchcock and Cronquist 2018

Arabis crucisetosa (Cross-haired rockcress)

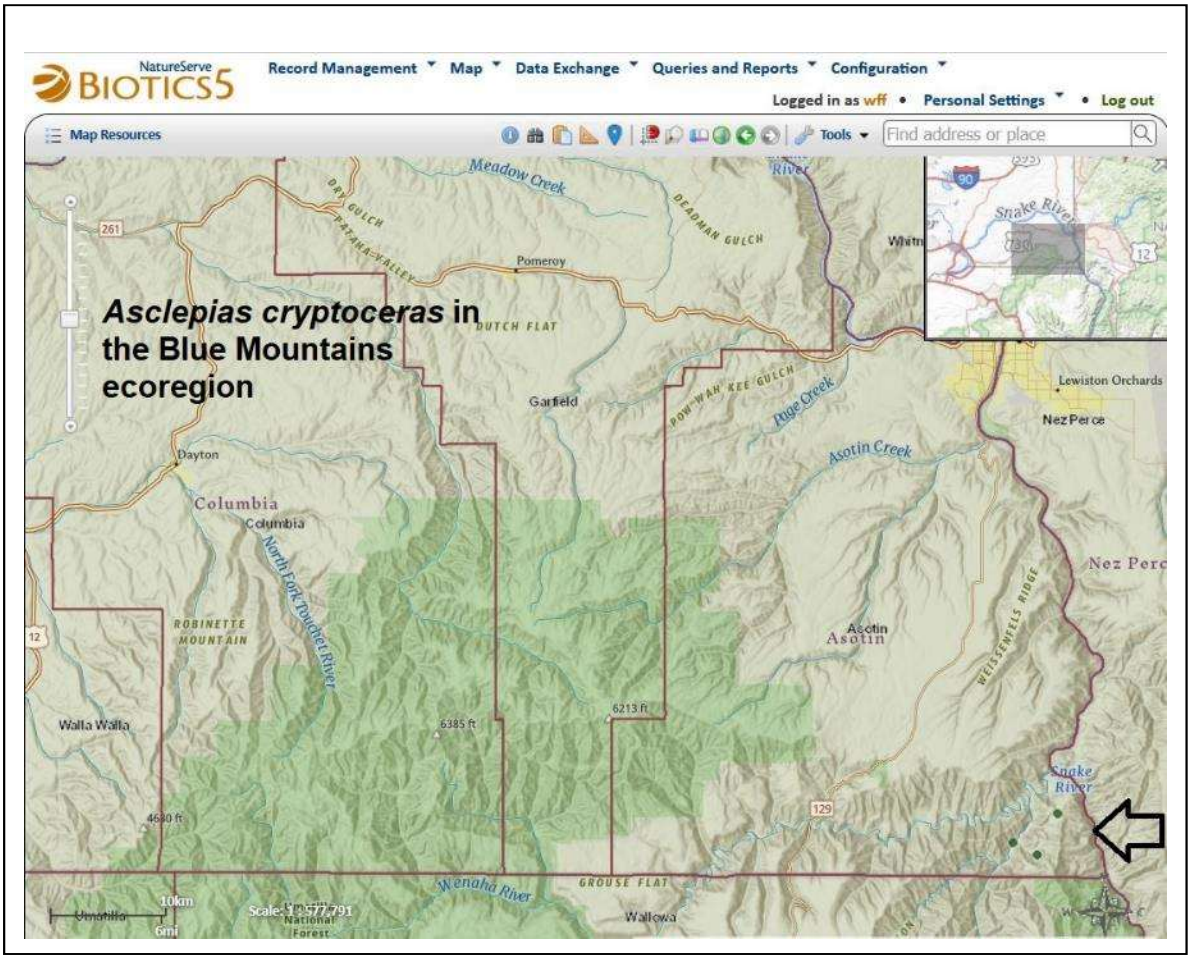
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4G5/S1; WA Sensitive
Range: Regional endemic of the Blue Mountains of southeastern Washington (Asotin County), eastern Oregon, and western Idaho. A report from Franklin County is believed to be a misidentification (WNHP 2022).
WA Ecoregions: Blue Mountains.
Number of Occurrences: Known from two extant occurrences in Washington, both discovered or relocated since 2010 (most recently in 2021) (WNHP 2022).



Abundance: Population size estimated at 1,227 plants in 2013 (WNHP 2022). The occurrence was revisited in June 2021 with about 200 individuals observed, but most plants were already in late fruit, making accurate counts difficult.
Habitat: Limestone rock ledges and flatirons within a steep canyon grassland community of *Festuca idahoensis*.
Threats: Competition from invasive weeds, mining. Historically, construction of dams and reservoirs may have reduced the amount of habitat.
Trends: Probably stable.
Managed Areas in WA: Grande Ronde Area of Critical Environmental Concern, Vale BLM.
Protection Status in Blue Mountains: One occurrence is found within the Grande Ronde ACEC, and a second is on private lands at the base of Mount Wilson. Potential habitat may occur in the Chief Joseph Wildlife Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Lime Hill, Mount Wilson.
Additional References: Al-Shehbaz 2010, Camp and Gamon 2011, Rollins 1993.

Asclepias cryptoceras (Pallid milkweed)

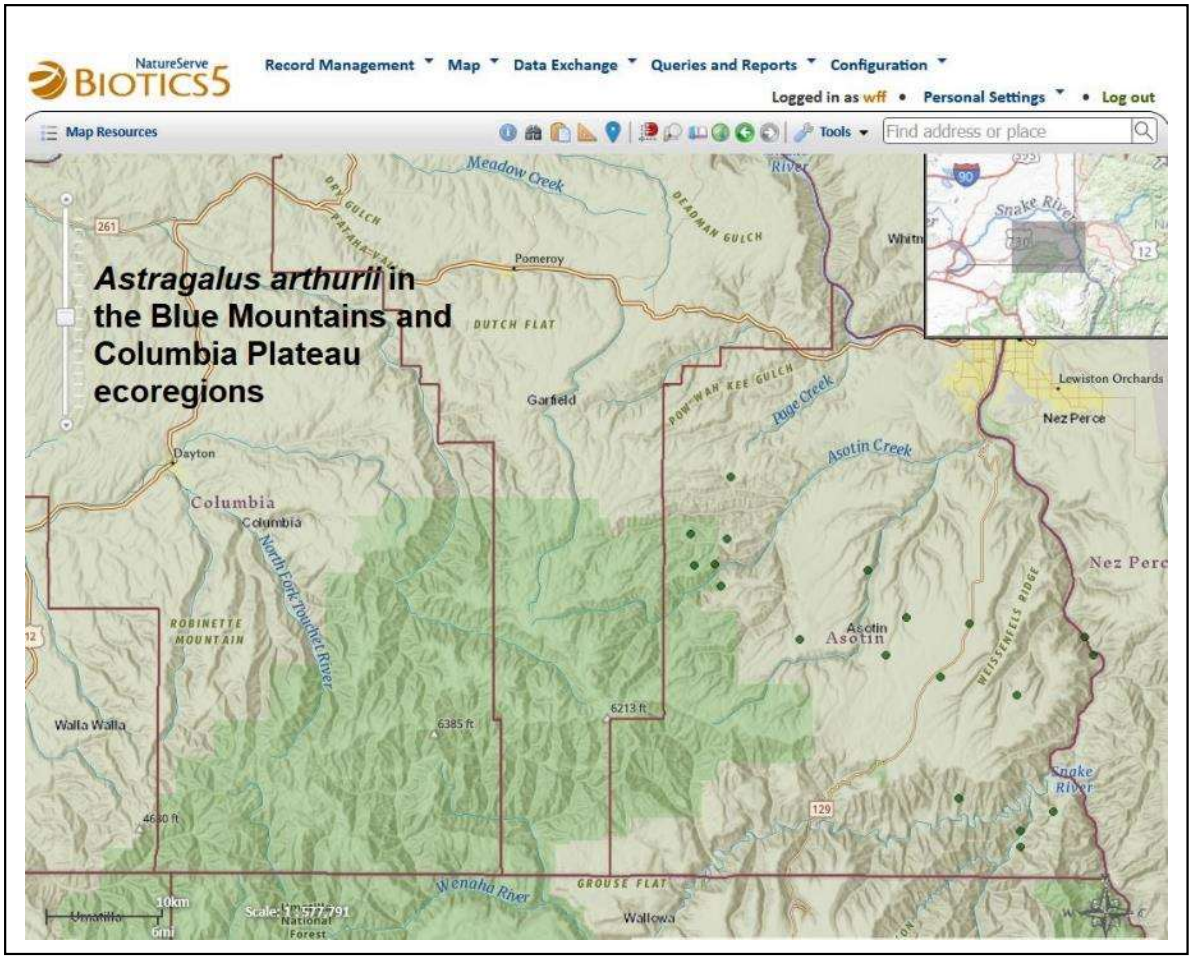
Synonym: *Asclepias cryptoceras* ssp. *davisii*
Legal Status: none
Conservation Status Rank: G4/S1; WA Sensitive
Range: Southeastern Washington (Asotin County) to southern Idaho, south to California, Nevada, Wyoming, and Arizona.
WA Ecoregions: Blue Mountains.



Number of Occurrences: Known from 2 extant and 1 historical occurrence in Washington, last observed in 2013 (WNHP 2022).
Abundance: Populations range in size from 60-100 plants.
Habitat: Dry hills and slopes on basalt scree or clay.
Threats: Competition from weedy annuals, wildfire, and trampling.
Trends: Not known.
Managed Areas in WA: Chief Joseph Wildlife Area.
Protection Status in Blue Mountains: Completely protected. All 3 occurrences in the state are found within the Chief Joseph Wildlife Area. Additional potential habitat may occur in the Grande Ronde ACEC (Fertig and Kleinknecht 2022). The species was considered inadequately protected statewide by Fertig and Kleinknecht (2022) based on there being fewer than 5 occurrences in highly protected areas.
Potential Inventory or Conservation Areas: Lime Hill, Mount Wilson
Additional References: Camp and Gamon 2011, Hitchcock and Cronquist 2018.

Astragalus arthurii (Arthur's milkvetch)

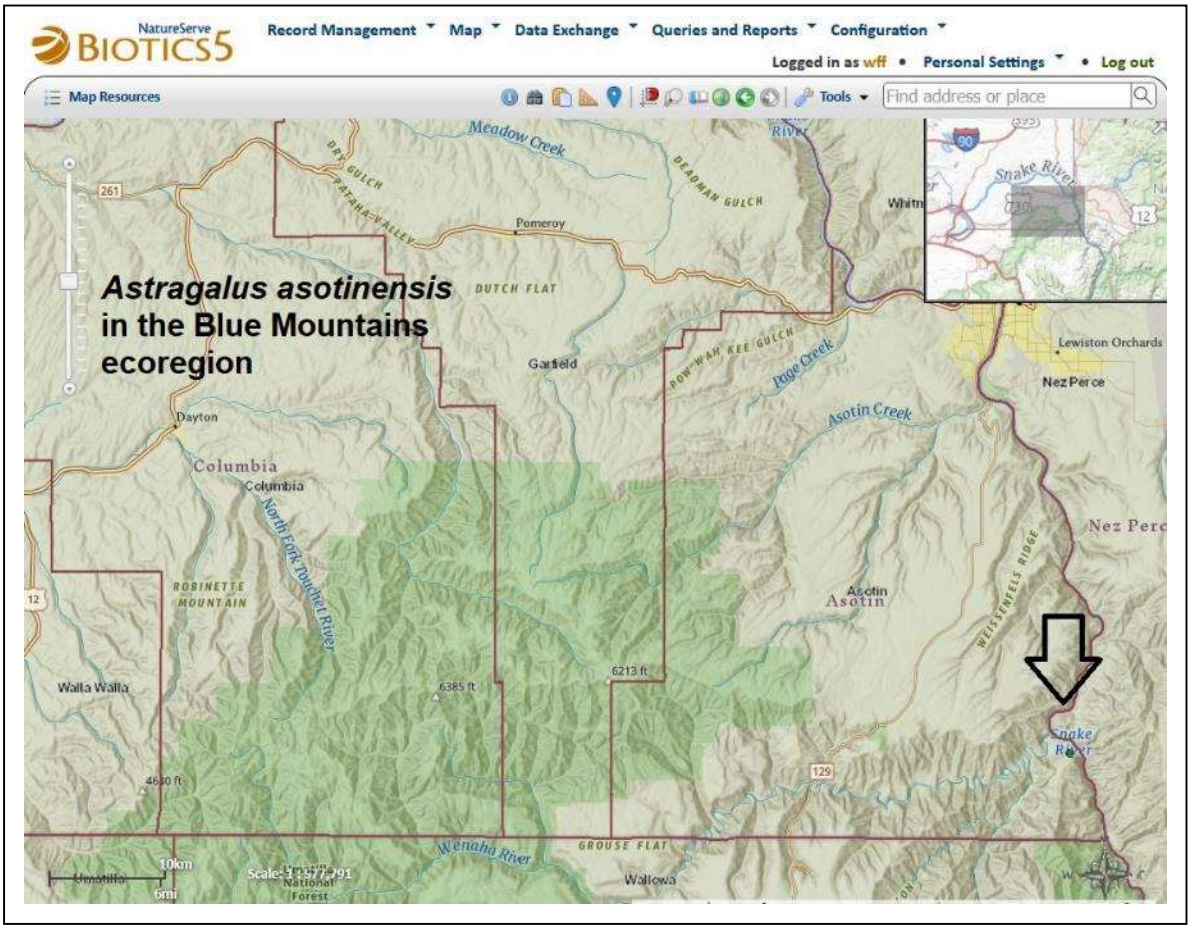
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4/S2; WA Sensitive
Range: Regional endemic of southeastern Washington (Asotin County) and adjacent northeastern Oregon and western Idaho.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from 13 extant occurrences (most recently observed in 2021) and six historical populations (WNHP 2022).



Abundance: Total population in Washington is probably 2,000-3,000. Individual occurrences contain 10-750 plants (Fertig and Kleinknecht 2020).
Habitat: Dry grassy hills and rocky meadows on basalt.
Threats: Loss of habitat to agriculture, wildfire, competition from invasive weeds, herbicide drift. This species is ranked moderately vulnerable for climate change (Fertig 2022).
Trends: Poorly known. Few occurrences have been revisited; of those that have, two show a population decrease and one shows an increase.
Managed Areas in WA: Chief Joseph Wildlife Area, Grande Ronde Area of Critical Environmental Concern, Nez Perce National Historic Park, Umatilla National Forest, Vale BLM, WA DNR.
Protection Status in Blue Mountains: Eight occurrences are protected in the Chief Joseph SWA, Grande Ronde ACEC, and Nez Perce NHP. Also considered adequately protected statewide (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Cape Horn/Cabin Ridge, Lime Hill, Snake River, Sourdough Ridge/Lick Creek, Warner Gulch/Smoothing Iron Ridge.
Additional References: Barneby 1964, Camp and Gamon 2011.

Astragalus asotinensis (Asotin milkvetch)

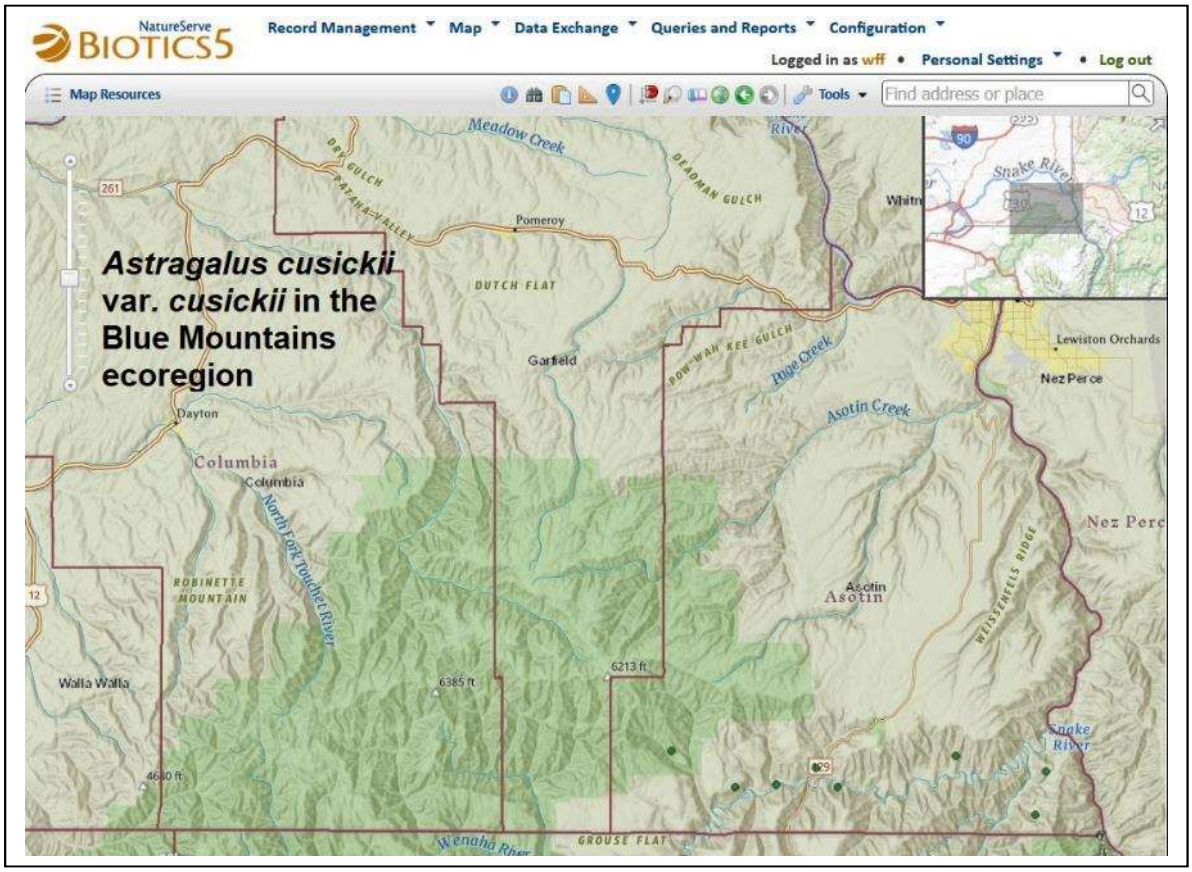
Legal Status: BLM Sensitive
Conservation Status Rank: G2/S1; WA Endangered
Range: Narrow endemic of the confluence of the Grande Ronde and Columbia rivers in extreme southeastern Washington (Asotin County) and adjacent west-central Idaho (Nez Perce and Idaho counties). Reports from Wallowa County Oregon are erroneous (WNHP 2022).
WA Ecoregions: Blue Mountains



Number of Occurrences: Known from a single occurrence in Washington, first documented in 1925 but not recognized as a distinct species until 2006 (Björk and Fishbein 2006).
Abundance: Björk and Fishbein (2006) estimated the total population in Washington and Idaho as "several thousand individuals". An estimated 7,500-10,000 fruiting plants were observed in surveys in 2021 at Lime Hill.
Habitat: Grassy slopes of bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*) and chalky road cuts on outcrops of white limestone and shale of the Hurwal and Martin Bridge formations (Björk and Fishbein 2006; Fertig 2020a).
Threats: Threatened by competition from invasive weed species, increased wildfire (largely from dense cover of flammable annual weeds), off-road vehicle recreation (trampling of plants or erosion of soils and spread of invasive weeds), and mortality from herbicide drift (Björk 2010; Björk and Fishbein 2006, Fertig 2020a). Ranked as Highly Vulnerable to climate change based on the NatureServe Climate Change Vulnerability Index (Fertig 2020b).
Trends: Population numbers may vary significantly from year–to-year. This may be the result of observer bias or prolonged dormancy. More study is needed with permanent, long-term demographic monitoring plots.
Managed Areas in WA: Grande Ronde Area of Critical Environmental Concern, Vale BLM.
Protection Status in Blue Mountains: Completely protected. The single Washington occurrence is within the Grande Ronde ACEC. This species was considered inadequately protected statewide by Fertig and Kleinknecht (2022) based on there being a single protected population (the threshold for adequately protected in their study was 5 occurrences in Gap Status 1 or 2 protected areas).
Potential Inventory or Conservation Areas: Lime Hill
Additional References: Camp and Gamon 2011; Hitchcock and Cronquist 2018

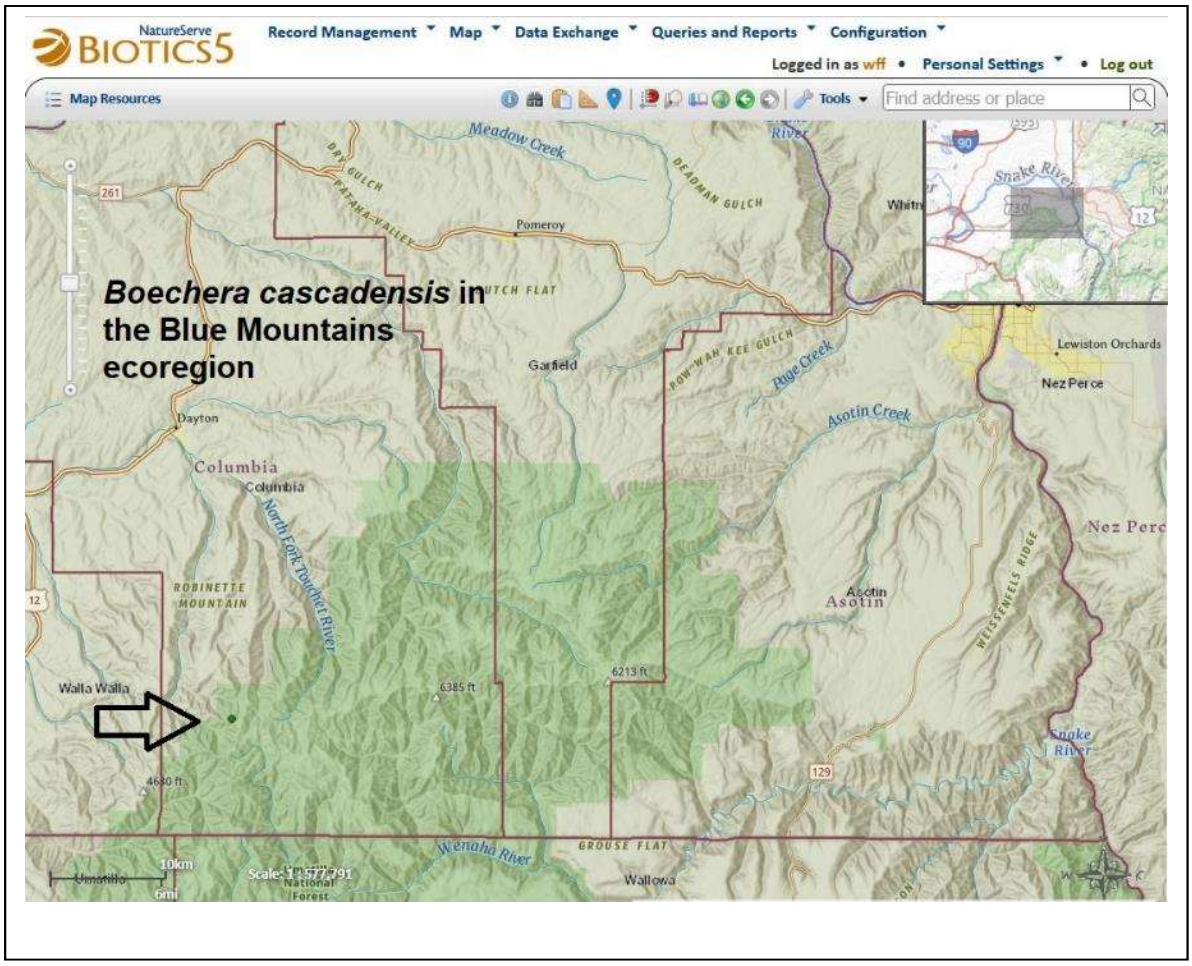
Astragalus cusickii var. cusickii (Cusick's milkvetch)

Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G5T4/S2
Range: Regional endemic of west-central Idaho, northwestern Oregon, and southeastern Washington (Asotin County) in the Snake River drainage. Additional reports from Franklin and Garfield counties, Washington, have not been verified (WNHP 2022).
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from 9 extant occurrences in Washington, all discovered or relocated since 1991 (most recently in 2021).
Abundance: Most populations range in size from 50 to 5,000 individuals.
Habitat: Dry, grassy slopes or basalt talus with low vegetative cover, including road banks.
Threats: Conversion of native grasslands to agriculture, competition with introduced plants, wildfire, overgrazing by livestock or elk.
Trends: Probably downward due to historic loss of habitat.
Managed Areas in WA: Chief Joseph Wildlife Area, Grande Ronde Area of Critical Environmental Concern, Vale BLM, Umatilla National Forest
Protection Status in Blue Mountains: At least 7 occurrences are protected within the Chief Joseph Wildlife Area and Grande Ronde ACEC. Additional habitat may occur within the Wenaha-Tucannon Wilderness Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Grande Ronde Canyon, Lime Hill.
Additional References: Camp and Gamon 2011.



Boechera cascadensis (Littleleaf rockcress)

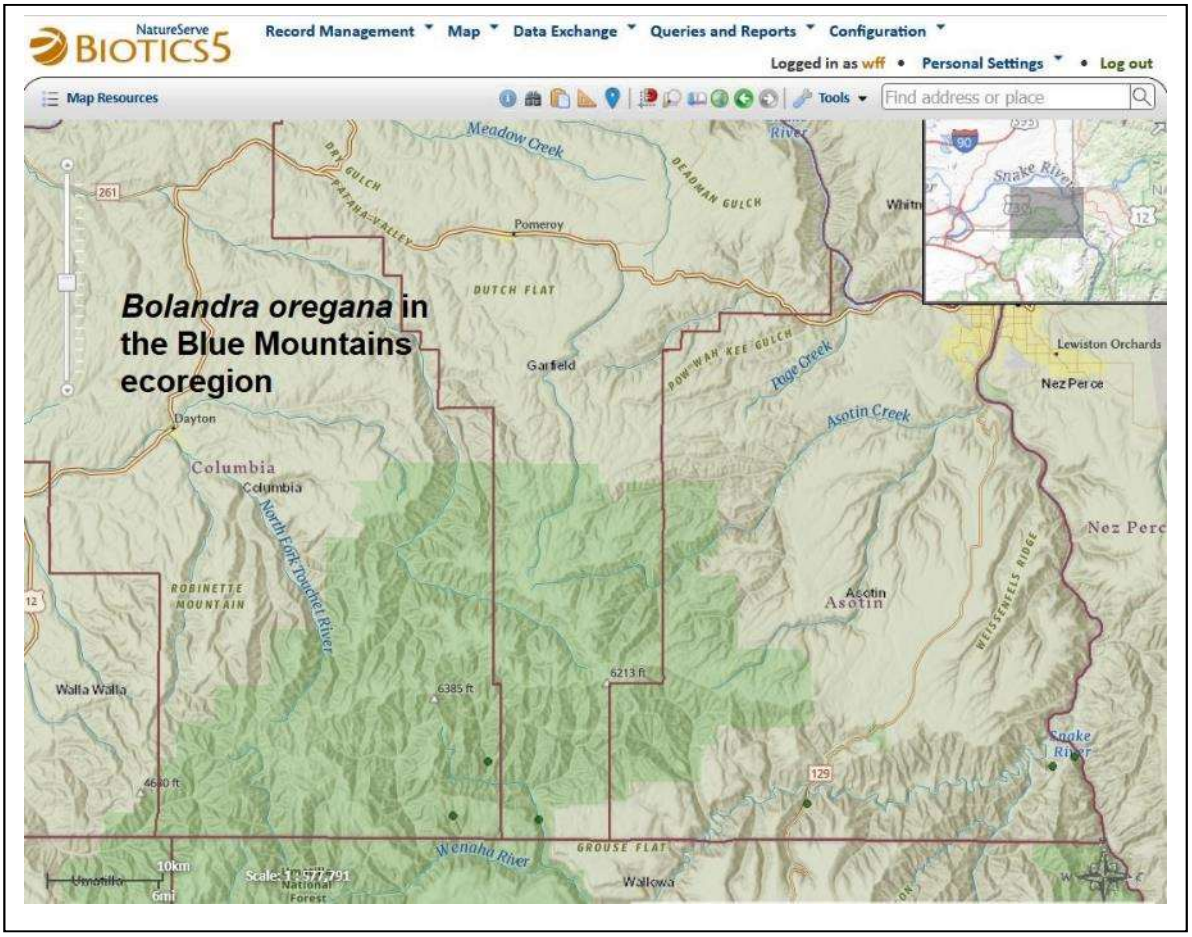
Synonyms: *Arabis microphylla* var. *thompsonii*
Legal Status: none
Conservation Status Rank: G1G2/S1; WA Endangered
Range: Regional endemic of central Washington, NE Oregon, and southern British Columbia. In Washington, known from Columbia, Kittitas, and Yakima counties (WNHP 2022).
WA Ecoregions: Blue Mountains, East Cascades
Number of Occurrences: Known from 3 extant and 1 historical occurrence in Washington. This species was thought to be historical in the state until 2020, when a population from the East Cascades in Yakima County was discovered in the University of Washington herbarium (Fertig 2020a). The only occurrence from the Blue Mountains was discovered by W. Fertig on Griffin Peak in 2018 and relocated in 2021.
Abundance: The Griffin Peak population contained at least 50 plants when surveyed in 2021. Abundance data are not available for other occurrences in the state.
Habitat: In Washington, found on thin, ashy soil associated with basaltic cliffs and in ledges of intrusive mafic dikes (WNHP 2022).
Threats: Not known.
Trends: Not known. This species is probably more common than presently known. Surveyors should focus on intrusive dikes within basalt slopes along the east flank of the Cascades and in the Blue Mountains for additional occurrences.
Managed Areas in WA: Okanogan-Wenatchee National Forest, Umatilla National Forest.
Protection Status in Blue Mountains: Unprotected. The single occurrence from the Blue Mountains is on Umatilla NF lands managed for multiple use. Additional habitat is likely to be present in the



Wenaha-Tuccanon Wilderness Area. Statewide, *B. cascadensis* protected in the William O. Douglas Wilderness Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Griffin Peak, Sawtooth Ridge, Table Rock/Skyline.
Comments: Based on morphologic evidence, *Boechera cascadensis* is believed to be an apomictic species derived from hybridization between *B. microphylla* and *B. paupercula* (Windham and Al-Shehbaz 2007, 2010). It was originally recognized as a variety of *Arabis microphylla* by Rollins in 1941. Recent discoveries of new populations in southern British Columbia indicate that a change in G rank is necessary, perhaps to G2 or G3 (Fertig 2020a).
Additional References: Hitchcock and Cronquist 2018

Bolandra oregana (Bolandra)

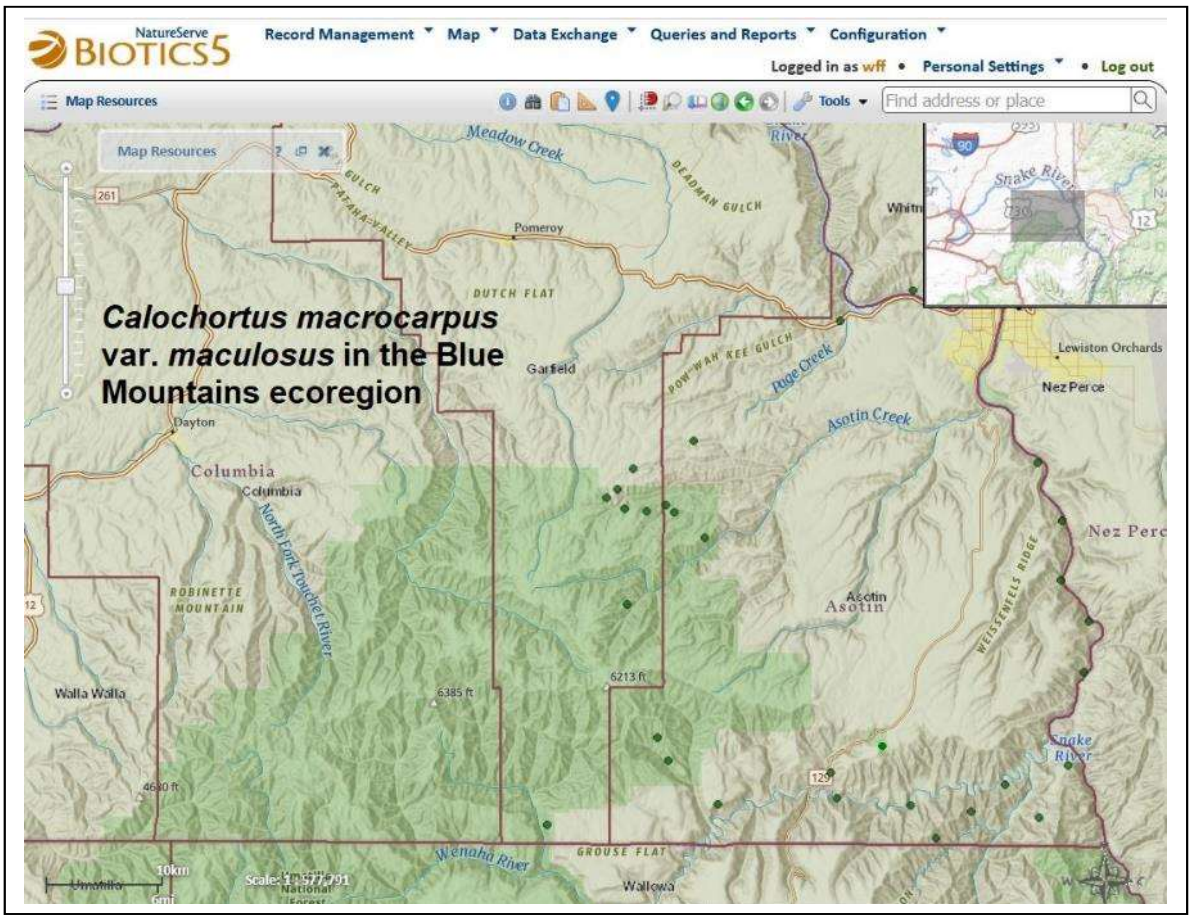
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G3/S2; WA Threatened
Range: Endemic to the lower Columbia and Snake River drainages in southern Washington, northeastern Oregon, and western Idaho. Known from Asotin, Clark, Columbia, Garfield, Klickitat, and Skamania counties in Washington.
WA Ecoregions: Blue Mountains, East Cascades, West Cascades



Number of Occurrences: Known from 18 occurrences in Washington, of which 12 are extant and 6 historical.
Abundance: Poorly known, as fewer than half of the known populations have been censused. These occurrences range in size from 10-100 plants (Fertig and Kleinknecht 2020).
Habitat: Moist, shaded cliffs or rocky places near streams or waterfalls.
Threats: Habitat degradation from timber harvest or recreation.
Trends: Not known, but probably downward based on the number of historical occurrences.
Managed Areas in WA: Beacon Rock State Park, Chief Joseph Wildlife Area, Columbia Falls Natural Area Preserve, Columbia Gorge National Scenic Area, Gifford Pinchot National Forest, Grande Ronde Area of Critical Environmental Concern, Umatilla National Forest, Vale BLM, Wenaha-Tucannon Wilderness Area.
Protection Status in Blue Mountains: At least five occurrences are protected in the Chief Joseph Wildlife Area, Grande Ronde ACEC, and Wenaha-Tucannon Wilderness Area (83% of the occurrences in the Blue Mountains). Two additional occurrences are protected elsewhere in the state (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Crooked Creek, Grande Ronde Canyon, Lime Hill, Weller Butte.
Additional References: Camp and Gamon 2011, Hitchcock and Cronquist 2018.

Calochortus macrocarpus var. maculosus (Sagebrush mariposa-lily)

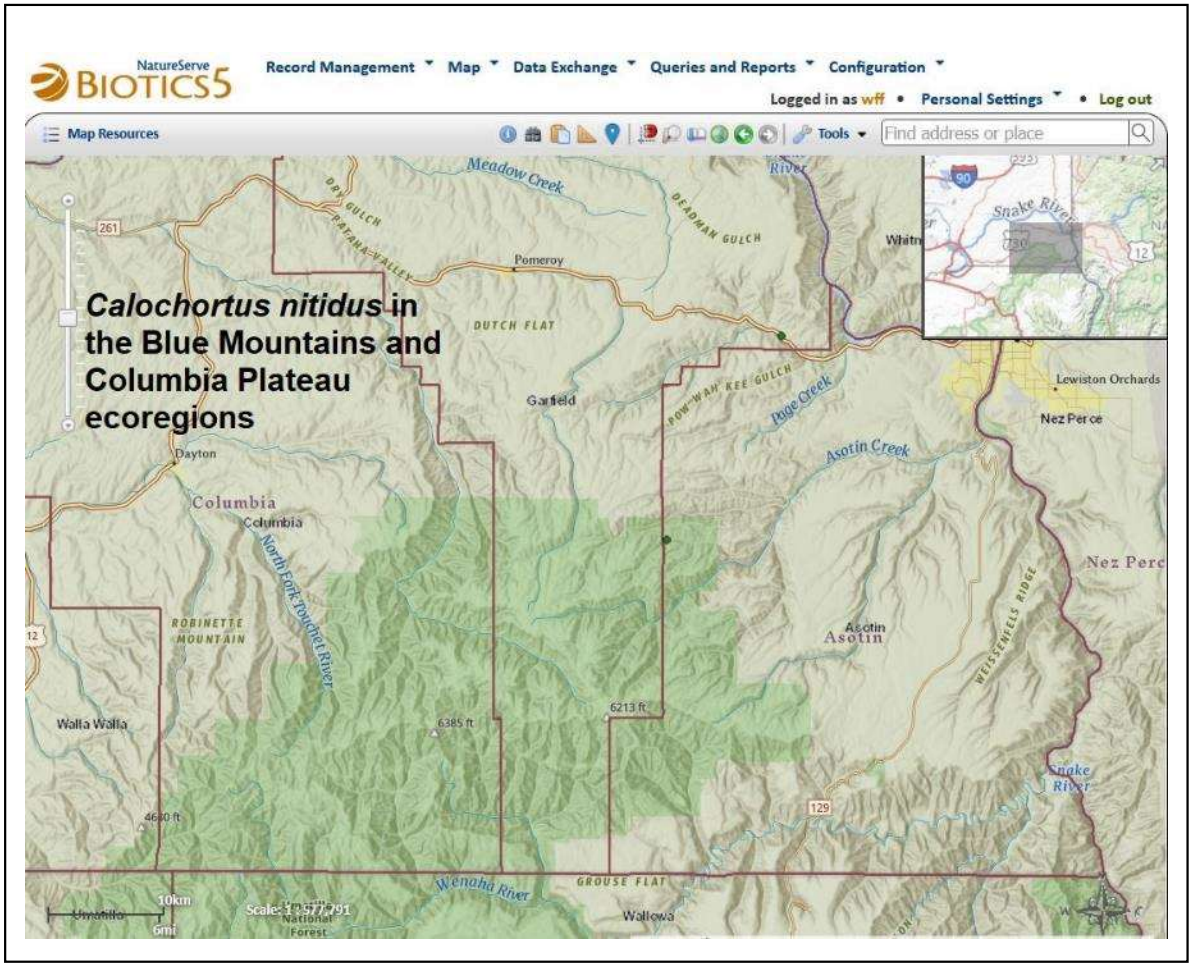
Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G5T2/S2; WA Threatened
Range: Southeastern Washington, northeastern Oregon, and western Idaho. In Washington, found in Asotin, Garfield, and Whitman counties.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from 31 extant occurrences in Washington, all discovered or re-surveyed since 1997 (most recently in 2021).
Abundance: The total population in Washington was estimated at less than 1,000 by Camp and Gamon (2011). Recent surveys have documented more populations in the Blue Mountains, some of which (Chief Joseph WA and Grande Ronde ACEC) are locally abundant (Fertig and Kleinknecht 2020).
Habitat: Undisturbed, dry grasslands on rocky hillsides and slopes with basalt outcrops.
Threats: Grazing (plant is highly palatable to livestock), competition from invasive weeds, habitat loss due to wildfire.
Trends: Poorly known, many sites lack long-term monitoring data.
Managed Areas in WA: Asotin Wildlife Area, Chief Joseph Wildlife Area, Fields Spring State Park, Grande Ronde Area of Critical Environmental Concern, Joseph Creek Area of Critical Environmental Concern, Kamiak Butte County Park, Spokane BLM, Umatilla National Forest, Vale BLM, Wenaha-Tucannon Wilderness Area.
Protection Status in Blue Mountains: At least 11 occurrences are in protected areas in the Blue Mountains ecoregion and statewide.



Potential Inventory or Conservation Areas: Alder Gulch/West Tam Tam Ridge, Cape Horn/Cabin Ridge, Crooked Creek, Grande Ronde Canyon, Hard-to-Get-to Ridge, Lime Hill, Mount Wilson, Puffer Butte, Snake River, Sourdough Ridge/Lick Creek, Warner Gulch/Smoothing Iron Ridge
Comments: With the discovery of many new occurrences in recent years, the T rank for var. *maculosus* may need to be changed to T3 (and S rank to S3) (WNHP 2022).
Additional References: Camp and Gamon 2011.

Calochortus nitidus (Broadfruit mariposa lily)

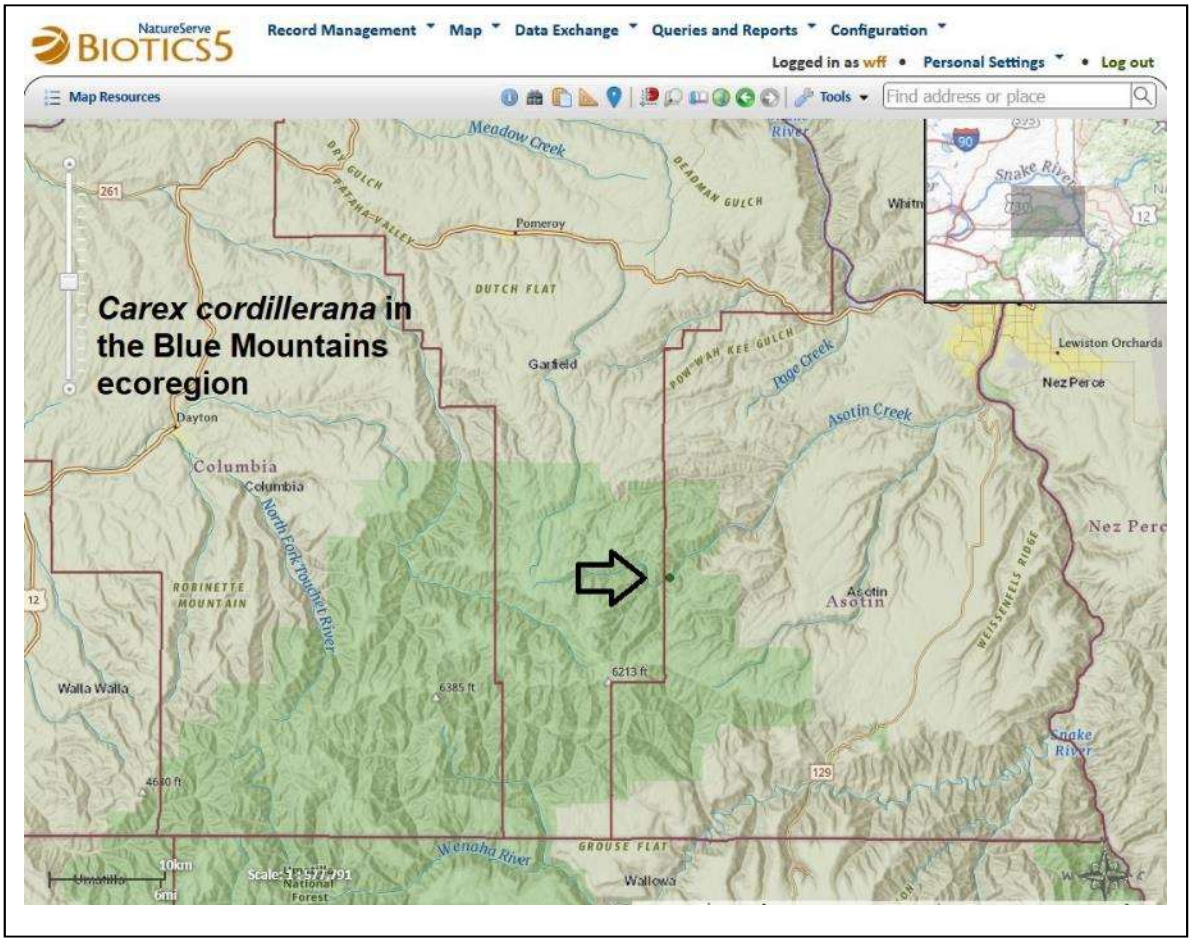
Legal Status: none
Conservation Status Rank: G3/S1; WA Endangered
Range: Regional endemic of southeast Washington (Asotin, Garfield?, and Whitman counties), northeast Oregon, and north-central Idaho.
WA Ecoregions: Blue Mountains (?), Columbia Plateau
Number of Occurrences: Known from two extant occurrences in Washington (Riser 2019). One other recent occurrence (discovered in 1995) from Umatilla National Forest has not been relocated in recent surveys and may be extirpated or misidentified (Fertig 2020a, Riser 2019). Two other occurrences are historical and presumed extirpated. Additional historical reports from Walla Walla County and a 1987 collection from Pullman (*B. Hunter s.n.*, WTU) need corroboration.
Abundance: This species had been considered extirpated in Washington as recently as 1995 (Baxter and Gamon 1995). Approximately 300 plants occur in the Steptoe Butte area (WNHP 2022).
Habitat: Rolling hills and moist swales in Palouse grasslands on loess and alluvium.



Threats: Habitat loss from conversion of Palouse grasslands to agriculture or urbanization, competition from invasive annual plants, grazing by livestock, herbivory by gophers (Caicco 1988).
Trends: Downward. Based on the number of collections from the Pullman area from 1892-1916, this species appears to have declined sharply as its prairie habitat was converted to agriculture in the early 20th Century.
Managed Areas in WA: Steptoe Butte NAP, Umatilla National Forest?, private.
Protection Status in Blue Mountains: The single occurrence from the Blue Mountains is on Umatilla National Forest lands managed for multiple use. This population was revisited in 2019, but only *C. macrocarpus* var. *maculosus* was found at the site. The Blue Mountain report may be erroneous or extirpated. Elsewhere in Washington, one occurrence is protected within the new Steptoe Butte Natural Area Preserve. The species is considered inadequately protected statewide because fewer than 5 occurrences are in special management areas (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Cape Horn/Cabin Ridge
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020, Mancuso 1996.

Carex cordillerana (Cordilleran sedge)

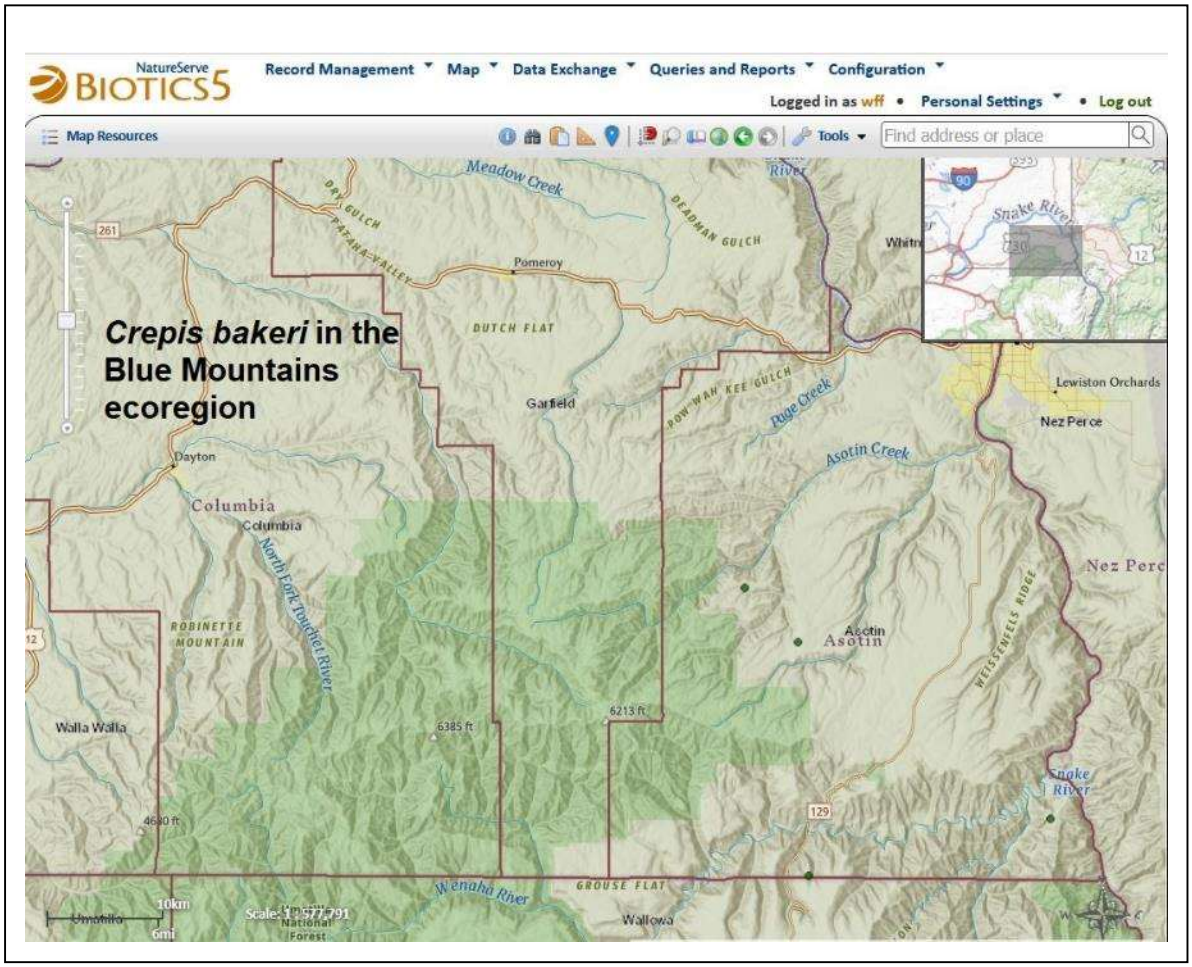
Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G3G4/S1; WA Sensitive
Range: British Columbia to Alberta, south to Oregon, Utah, and Wyoming. In Washington, known from Asotin, Ferry, Okanogan, Pend Oreille, Spokane, and Stevens counties.
WA Ecoregions: Blue Mountains, Canadian Rockies, Columbia Plateau, Okanogan



Number of Occurrences: Known from 10 occurrences in Washington, of which three are historical and seven extant (these discovered or relocated from 1991-2006).
Abundance: Poorly known, most populations are probably small.
Habitat: Shady deciduous forests (or occasionally with juniper) on rocky slopes and with deep leaf litter.
Threats: Grazing (highly palatable to livestock).
Trends: Not known, but probably downward over much of the northwest (Wilson et al. 2008).
Managed Areas in WA: Colville National Forest, Okanogan-Wenatchee National Forest, Pasayten Wilderness Area, Sinlahekin Wildlife Area, and Umatilla National Forest.
Protection Status in Blue Mountains: Unprotected. The single occurrence of *C. cordillerana* in the Blue Mountains ecoregion is on Umatilla National Forest lands managed for multiple use. Statewide, the species is ranked as inadequately protected based on just 2 occurrences being found in protected lands (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Hard-to-Get-to Ridge, Warner Gulch/Smoothing Iron Ridge
Additional References: Fertig and Kleinknecht 2020, Wilson et al. 2008.

Crepis bakeri (Baker's hawksbeard)

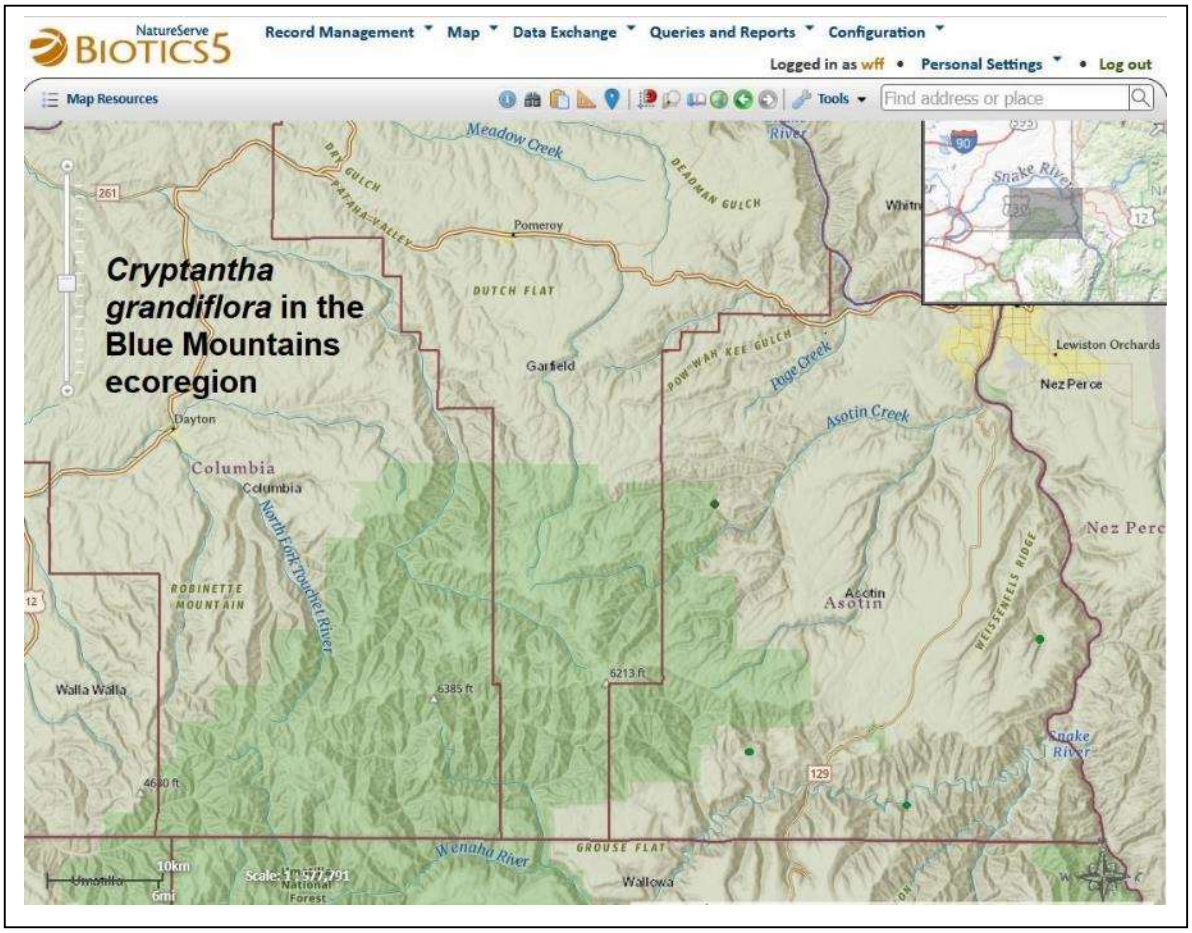
Synonym: *Crepis bakeri* ssp. *idahoensis*
Legal Status: none
Conservation Status Rank: G4/S1; WA Sensitive
Range: Southern Washington to California, east to Idaho and Nevada (Hitchcock and Cronquist 2018). If recognized, ssp. *idahoensis* is a regional endemic of SE Washington and adjacent Idaho, but disjunct in



California. In Washington, this species is known from Asotin and Klickitat counties. Additional historical reports from Whitman and Yakima counties need confirmation.
WA Ecoregions: Blue Mountains, Columbia Plateau, East Cascades
Number of Occurrences: Known from eight confirmed occurrences, all discovered since 1999 (most recently observed in 2020) (WNHP 2022).
Abundance: Populations in the Blue Mountains range from 15 to 130 individuals. Approximately 50 plants were observed in Brooks Memorial State Park by Paul Slichter in 2019.
Habitat: Usually found on dry, rocky slopes with bluebunch wheatgrass and sagebrush, but also reported from riparian thickets.
Threats: Destruction of bunchgrass prairie habitat for agriculture, competition from invasive weeds, and wildfire.
Trends: Not known, but historically probably downward due to loss of grassland habitat in eastern Washington.
Managed Areas in WA: Asotin Creek Wildlife Area, Brooks Memorial State Park, Chief Joseph Wildlife Area, Okanogan-Wenatchee National Forest.
Protection Status in Blue Mountains: Two occurrences are protected within Asotin Creek and Chief Joseph wildlife areas. Statewide, 3 populations are protected (including a recently discovered occurrence in Brooks Memorial State Park) (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Lime Hill, Sourdough Ridge/Lick Creek, Warner Gulch/Smoothing Iron Ridge.
Additional References: Fertig and Kleinknecht 2020.

Cryptantha grandiflora (Clearwater cryptantha)

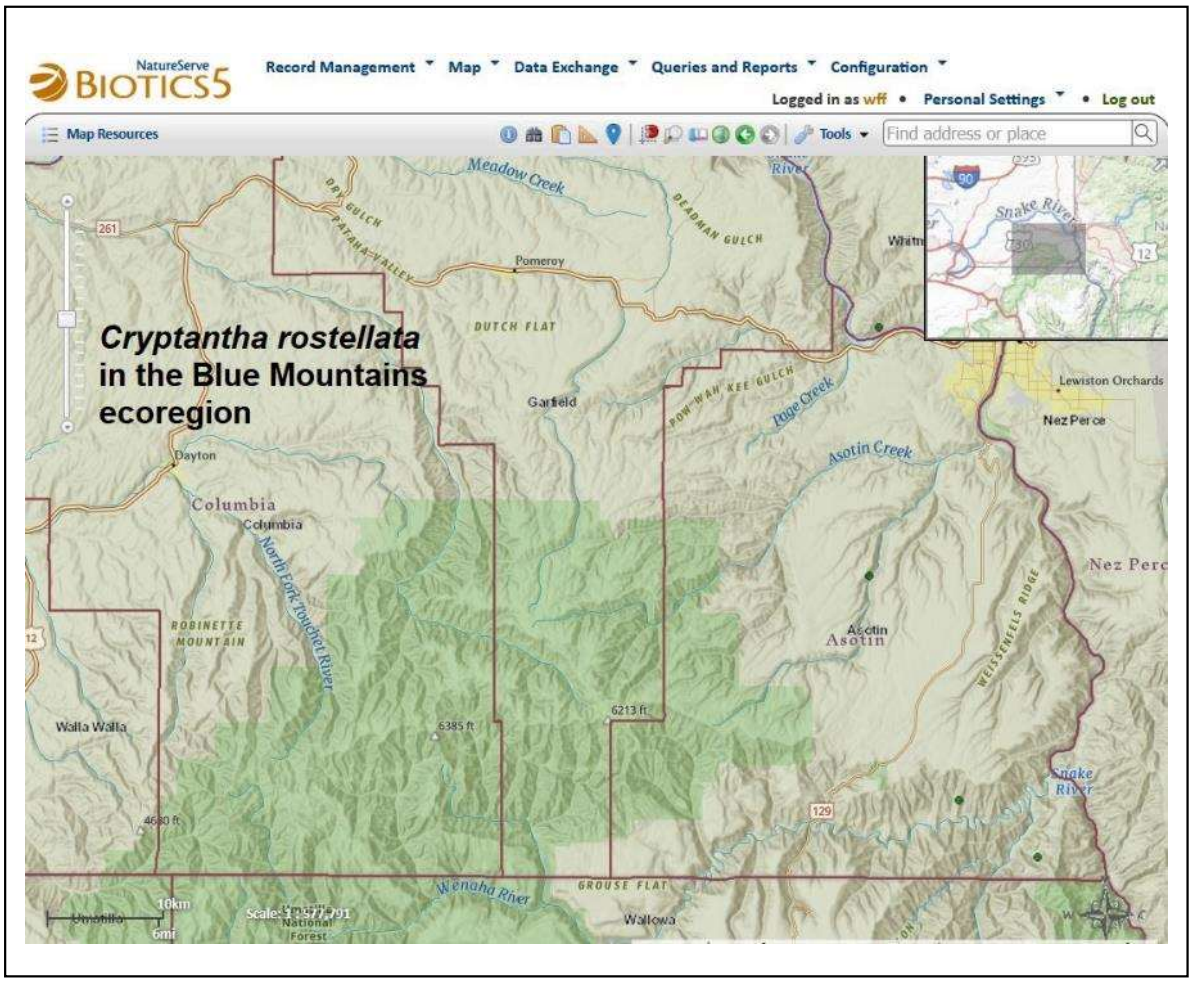
Synonym: *Cryptantha intermedia* var. *grandiflora*
Legal Status: none
Conservation Status Rank: G2G3/S1; WA Endangered
Range: Regional endemic of southeastern Washington, northeastern Oregon, and central Idaho. In Washington, confirmed only from the foothills of the Blue Mountains in Asotin County, but reported from Wawawai in Whitman County (Rydberg 1909). Additional reports from western Washington in Grays Harbor, Klickitat, Lewis, Mason, Pierce, and Skamania counties are referable to *C. intermedia* var. *hendersonii*.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from 3 extant and one historical occurrences in Washington. All of the extant occurrences have been discovered since 2010 (most recently in 2016). Two of these occurrences were initially misidentified as *Cryptantha gracilis* (WNHP 2022).
Abundance: One population contained 120 plants in 2016. Data are lacking for other occurrences.
Habitat: Grasslands, road cuts, and barren rock outcrops or talus derived from Columbia River basalt with Sandberg's bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*).
Threats: Competition from *Ventenata dubia* and other non-native annual weeds, wildfire, grazing, and vehicle trampling.
Trends: Not known.
Managed Areas in WA: Chief Joseph Wildlife Area, Umatilla National Forest.
Protection Status in Blue Mountains: Inadequately protected. One occurrence is found in the Chief Joseph Wildlife Area. Additional habitat may be present in the Asotin Creek Wildlife Area (Fertig and Kleinknecht 2022).
Comments: This species may be more widespread in the Blue Mountains and vicinity than previously reported if recent specimens from the Washington State University Herbarium are confirmed. These collections are presently on loan to *Cryptantha* expert Michael Simpson of San Diego State University.
Potential Inventory or Conservation Areas: Sourdough Ridge/Lick Creek, Warner Gulch/Smoothing Iron Ridge.



Cryptantha rostellata (Beaked cryptantha)

Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4/S2; WA Threatened
Range: Occurs from central and eastern Washington to eastern Oregon and central California. In Washington, known from Asotin, Kittitas, Klickitat, Walla Walla, Whitman, and Yakima counties.
WA Ecoregions: Blue Mountains, Columbia Plateau, East Cascades
Number of Occurrences: Known from 17 occurrences in Washington, of which 14 are extant and three historical.
Abundance: Salstrom (1996) documented fewer than 500 plants at eight sites surveyed in 1995. Most populations contain less than 50 individuals.
Habitat: Semi-barren sagebrush steppe on coarse-textured substrates derived from basalt.
Threats: Impacts from military training exercises, grazing, and competition from invasive weeds. Scored as Moderately Vulnerable to climate change (Fertig 2022).
Trends: Not known.
Managed Areas in WA: Badger Gap Natural Area Preserve, Chief Joseph Wildlife Area, Columbia River Gorge National Scenic Area, Spokane BLM, WA DNR, Yakima Training Center.
Protection Status in Blue Mountains: The only occurrence from the Blue Mountains is protected within the Chief Joseph Wildlife Area. Statewide, only 3 of 18 occurrences are in protected areas and the species is considered inadequately protected.
Potential Inventory or Conservation Areas: Mount Wilson.

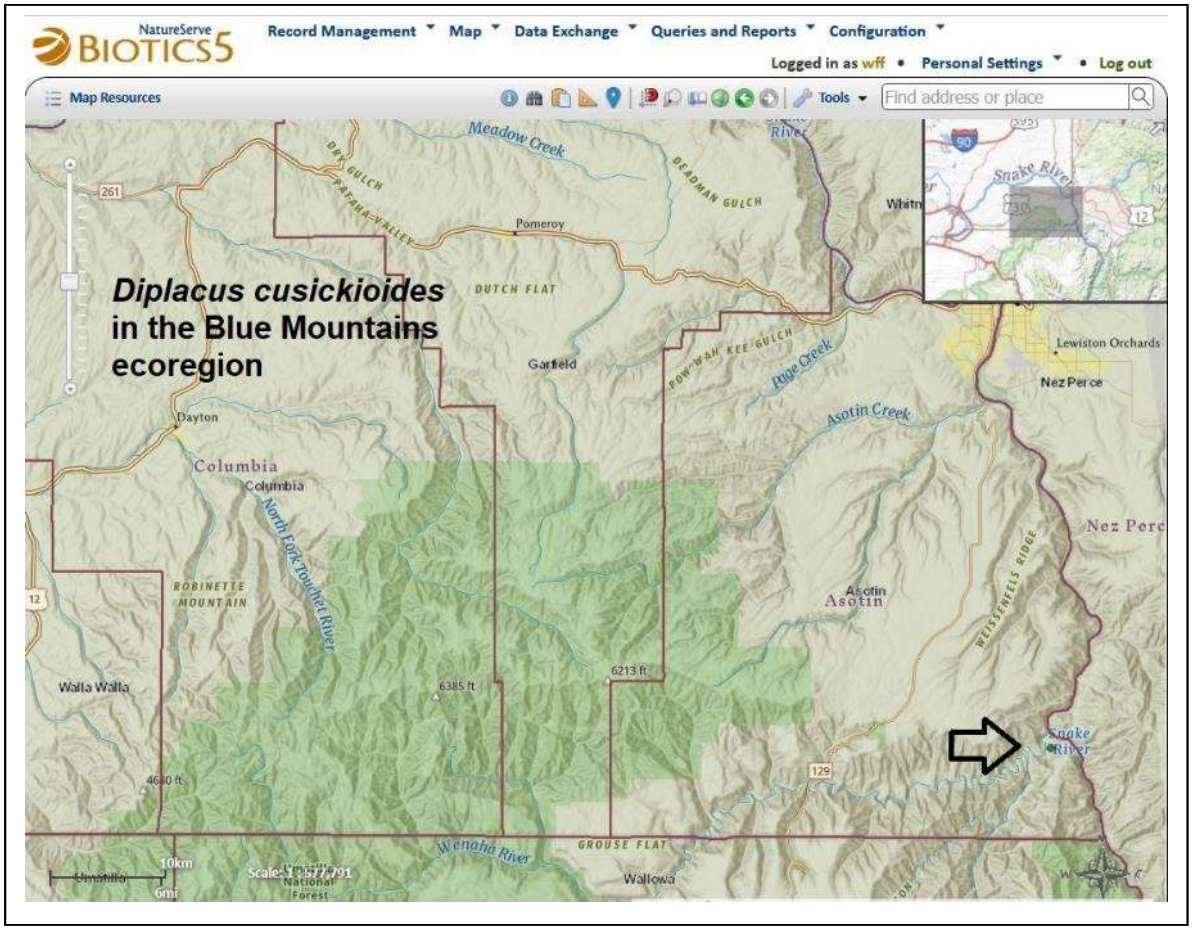
Additional References: Fertig & Kleinknecht 2020.



Diplacus cusickioides (Cusick's monkeyflower)

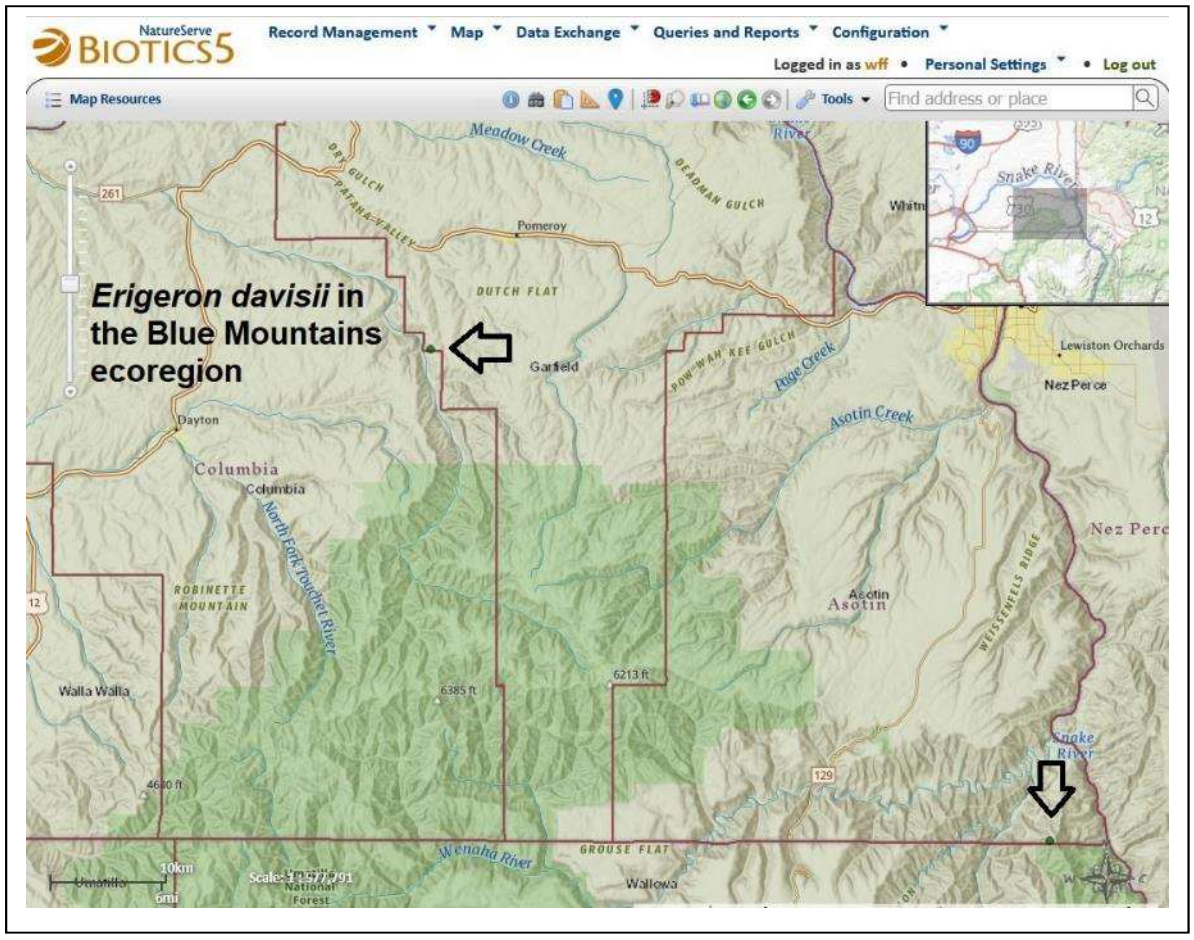
Synonym: *Mimulus cusickii* (misapplied), *Diplacus cusickii* (misapplied)
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4G5/S1; WA Threatened
Range: Washington, eastern Oregon, southwestern Idaho, and northern California. In Washington, known from Asotin and Klickitat counties (an historical report from Chelan County is based on a misidentified specimen [WNHP 2022]). The range map from Nesom (2013) only includes reports from Klickitat County.
WA Ecoregions: Blue Mountains, Columbia Plateau, and East Cascades.
Number of Occurrences: Known from 3 extant occurrences (most recently observed in 2018) and one historical population from 1895.
Abundance: Not known for most populations, but the Lime Hill occurrence in the Blue Mountains ecoregion contained an estimated 2,500 plants in 2013.
Habitat: Bottomlands, sandy areas, basalt scree, or volcanic pumice.
Threats: Competition from invasive weeds and loss of habitat to agriculture or development.
Trends: Not known. The Lime Hill occurrence showed a population increase from 2010 to 2013, but this might be an artifact of different climatic conditions between the two surveys (as an annual, *D. cusickioides* may vary in numbers from year to year depending on precipitation levels).

Managed Areas in WA: Chief Joseph SWA, Columbia River Gorge NSA, Okanogan-Wenatchee NF.
Protection Status in Blue Mountains: The single occurrence in the Blue Mountains is protected within the Chief Joseph SWA. Three occurrences from the Columbia Plateau and East Cascades are from public and private lands managed for multiple use.
Potential Inventory or Conservation Areas: Lime Hill, Snake River.
Comments: Traditionally considered part of *Diplacus* (*Mimulus*) *cusickii*, Nesom (2013) provided evidence that *D. cusickii* is actually a narrow endemic of Malheur County, Oregon and adjacent southwest Idaho, while plants from southern Washington to California belong to a new species, *D. cusickioides*. The two taxa differ in leaf pubescence, with *D. cusickii* having glabrous to sparsely glandular surfaces, while *D. cusickioides* is prominently glandular hairy.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020.



Erigeron davisii (Davis' fleabane)

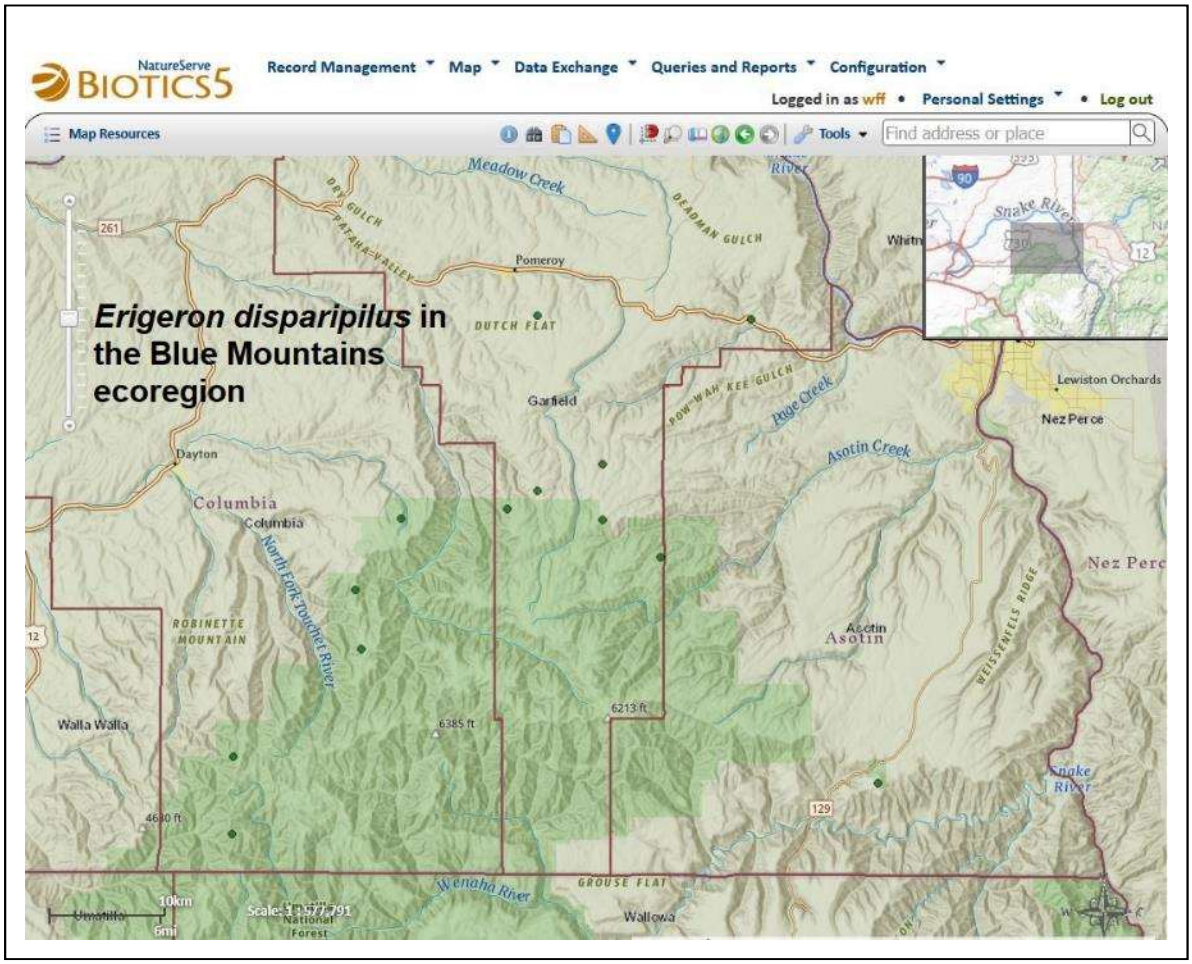
Synonym: *Erigeron engelmannii* var. *davisii*
Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G5T3/S1
Range: Regional endemic of southeastern Washington (Asotin and Garfield counties), northeastern Oregon, and west-central Idaho.
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from 2 occurrences in Washington, both discovered or relocated since 2003 (most recently in 2011).
Abundance: Reported as "locally abundant" at one site in Wooten Wildlife Area in 2011. Abundance data are not available elsewhere.
Habitat: Bluebunch wheatgrass grasslands and open woodlands on basalt slopes.
Threats: Conversion of habitat to agriculture, grazing, competition from introduced plants, and wildfire.
Trends: Not known.
Managed Areas in WA: Grande Ronde Area of Critical Environmental Concern, William T. Wooten Wildlife Area, Vale BLM. This species is found within 5 km of Chief Joseph SWA and might be sought there (Fertig and Kleinknecht 2022).
Protection Status in Blue Mountains: Both known occurrences in the Blue Mountains ecoregion are within protected areas. These are also the only known populations in Washington State. Fertig and



Kleinknecht (2022), however, considered the species inadequately protected based on a threshold of 5 protected occurrences.
Potential Inventory or Conservation Areas: Mount Wilson.
Comments: Riser and Meyers (2020) consider *Erigeron davisii* to be synonymous with *E. disparipilus* based on their sympatric range. The two species differ in the orientation and length of hairs on the stem (Hitchcock and Cronquist 2018). More critical study of Washington specimens is needed to confirm if one or two taxa occur in the state.

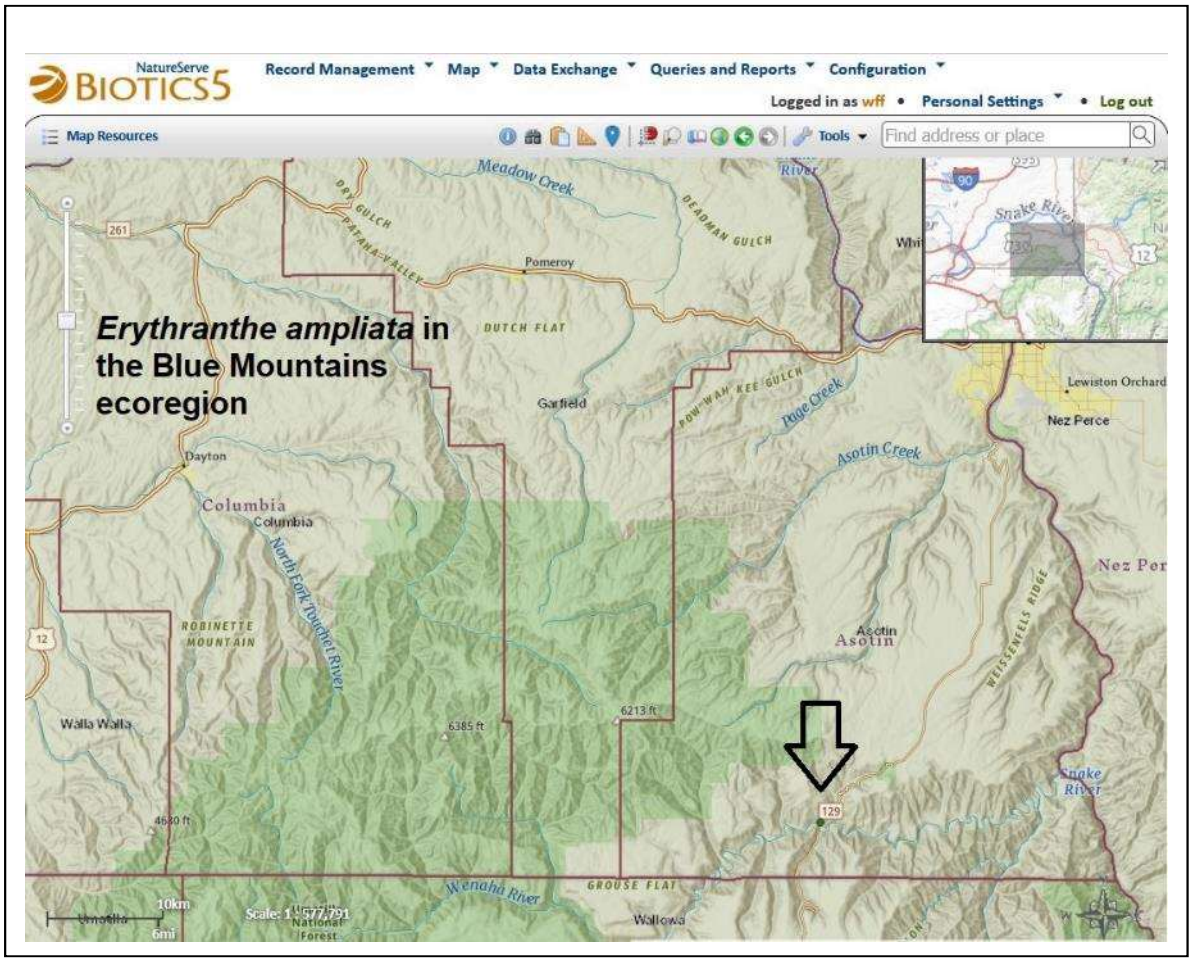
Erigeron disparipilus (Snake River daisy)

Legal Status: USFS Sensitive
Conservation Status Rank: G5/S2; WA Sensitive
Range: Regional endemic of southeastern Washington (Asotin, Columbia, and Garfield counties), eastern Oregon, and central and southern Idaho. A report from Spokane County appears to be a misidentification (WNHP 2022).
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from at least 11 extant and 2 historical occurrences in Washington. Eight occurrences have been discovered or relocated since 2014 (most recently in 2021).
Abundance: Populations may contain 100 to over 5,000 plants.
Habitat: Open, rocky areas with bare clay soil and windswept rims of mesas in cushion plant communities with Idaho fescue and bluebunch wheatgrass.
Threats: Wildfire, competition from introduced annual plants, grazing, recreation.
Trends: Probably stable.
Managed Areas in WA: Asotin Creek Wildlife Area, Fields Spring State Park, William T. Wooten Wildlife Area, Umatilla National Forest, WA DNR.
Protection Status in Blue Mountains: Only 3 occurrences are presently found in protected areas in Washington. Additional habitat may occur in the Chief Joseph Wildlife Area and Wenaha-Tucannon Wilderness Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Alder Gulch/West Tam Tam Ridge, Cape Horn/Cabin Ridge, Griffin Peak, Hard-to-Get-to Ridge, Puffer Butte, Sawtooth Ridge, Sourdough Ridge/Lick Creek, Table Rock/Skyline, Warner Gulch/Shooting Iron Ridge
Comments: The G rank of this species (G5) appears to be too high based on its status as a S2 species in Washington and Oregon and S3 in Idaho. G3 may be more appropriate. See comments under *Erigeron davisii*.
Additional References: Cronquist 1955, Hitchcock and Cronquist 2018, Nesom 2006, Riser and Meyers 2020.



Erythranthe ampliata (Nez Perce monkeyflower)

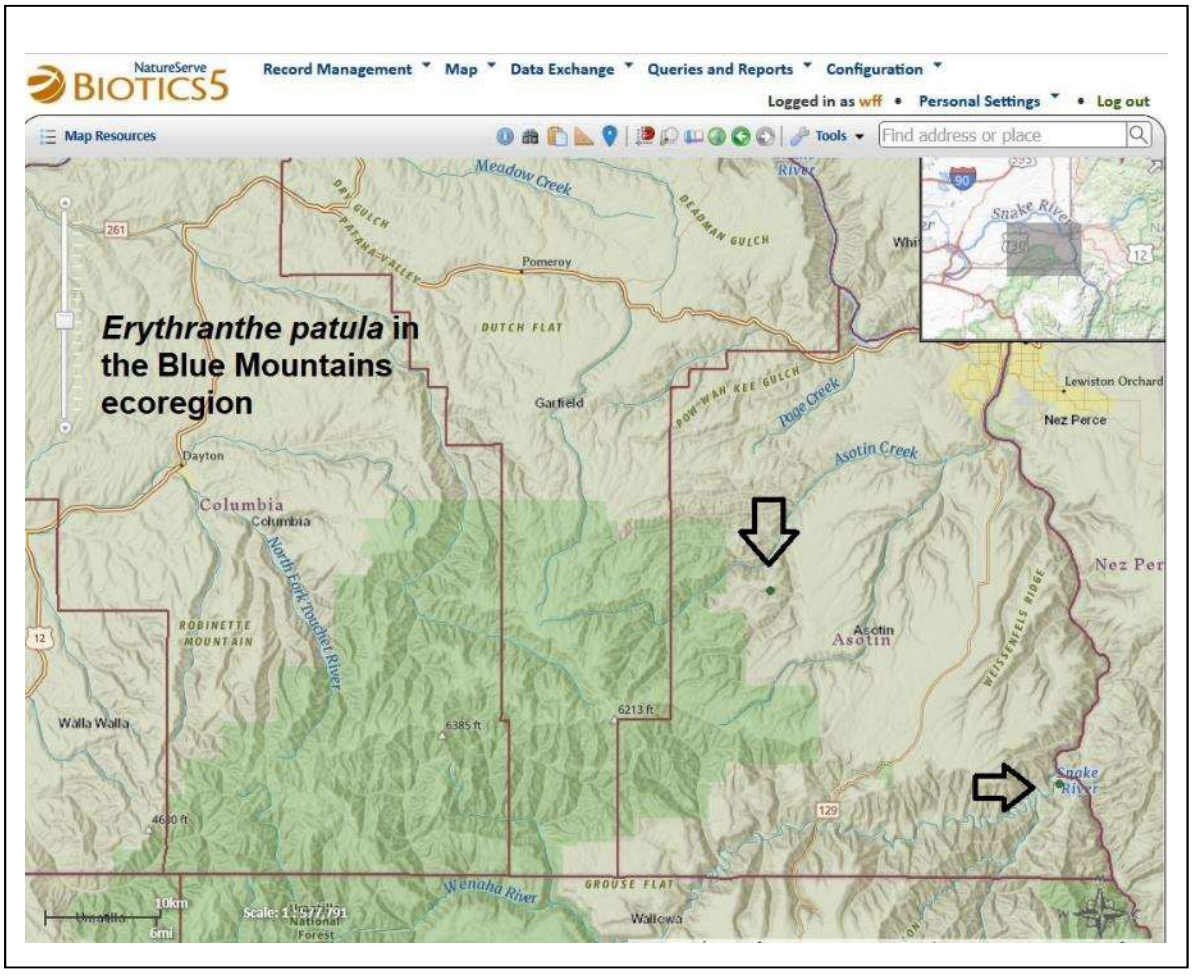
Synonyms: *Mimulus ampliata* (formerly included in *Mimulus patulus* and *M. washingtonensis*)
Legal Status: none
Conservation Status Rank: G3/SH (WA Extirpated)
Range: Regional endemic of northern Idaho, northwestern Montana, and southeastern Washington (Asotin County).
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from one historical occurrence in Washington, last observed in 1946.
Abundance: Not known; may be extirpated in Washington.
Habitat: Basalt outcrops and seeps in meadows, riverbanks, and road cuts.
Threats: Destruction of wetland habitat due to changes in hydrology or development and competition from introduced species.
Trends: Not known, but presumed downward.
Managed Areas in WA: May have occurred on lands managed by Vale BLM (precise location of population is poorly known).
Protection Status in Blue Mountains: Unprotected.
Potential Inventory or Conservation Areas: Grande Ronde Canyon, Puffer Butte, Snake River.
Additional References: WNHP 2022



Erythranthe patula (Stalk-leaved monkeyflower)

Synonym: *Mimulus patulus*
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G3?/S2?; WA: Threatened
Range: Nesom (2012) considers the range of *E. patula* to be from southeastern Washington (Asotin and Whitman counties) and northeastern Oregon to northern Idaho, western Montana, southern Alberta, and northwestern Wyoming. Additional reports from Okanogan and Spokane counties may represent specimens of *Erythranthe pulsiferae*.
WA Ecoregions: Blue Mountains, Columbia Plateau, reported from Okanogan
Number of Occurrences: Known from two confirmed occurrences (last observed in 2009 and 2017) and one questionable historical record in southeast Washington. Four other extant populations are reported from Okanogan County in north-central Washington.
Abundance: Most populations range from 20-200 plants. One population in Okanogan NF contained 1,500 plants before a wildfire in 2006 (but this occurrence may actually be *E. pulsiferae*) (Fertig and Kleinknecht 2020.
Habitat: Moist basalt outcrops or fine gravel in small drainages or seeps or seasonally moist canyon grasslands.
Threats: Habitat disturbance from changes in hydrology, conversion to agriculture, or wildfire.
Trends: Not known.

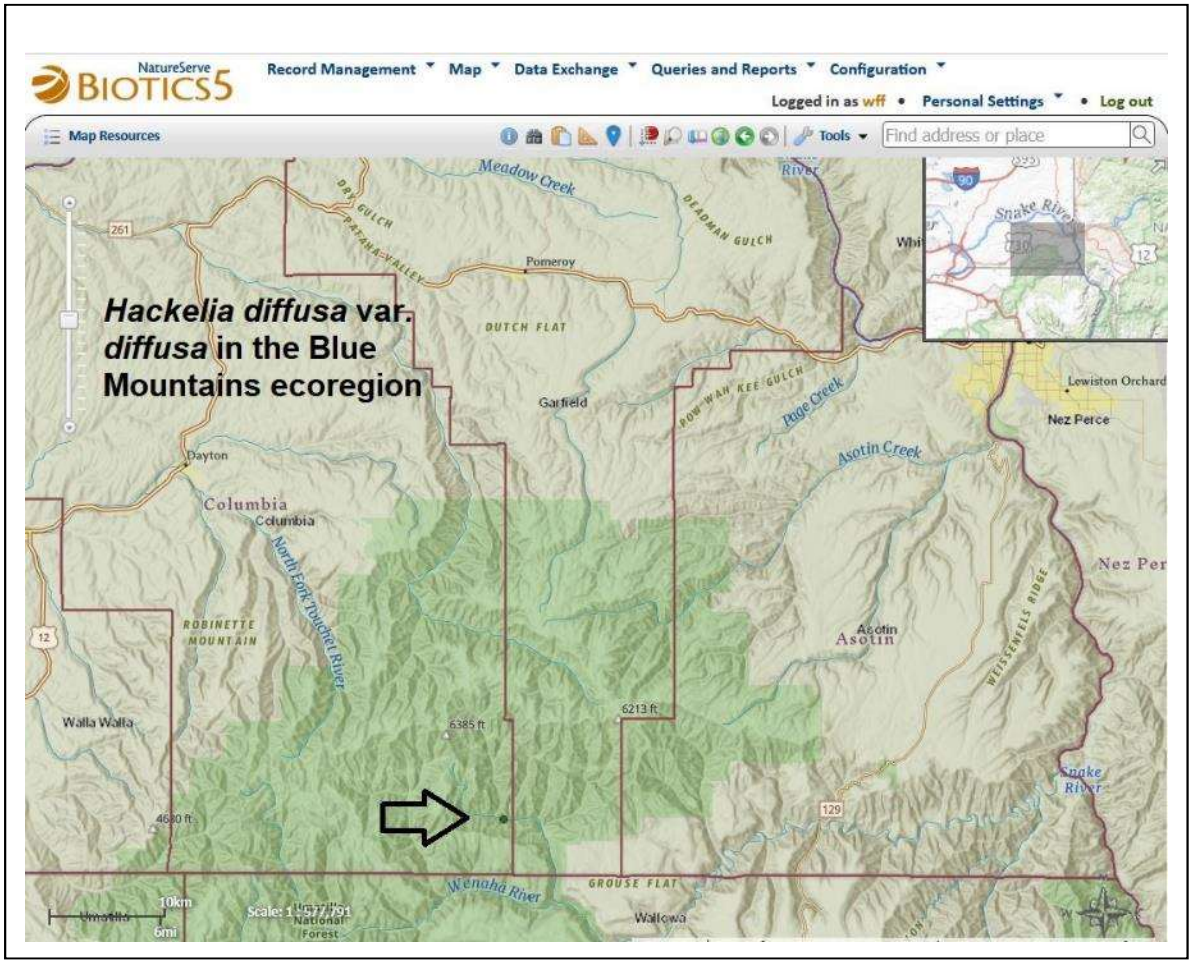
Managed Areas in WA: Asotin Creek Wildlife Area, Grande Ronde Area of Critical Environmental Concern, Okanogan-Wenatchee National Forest, Vale BLM.
Protection Status in Blue Mountains: Completely protected. Both populations from the Blue Mountains are protected in the Asotin Creek SWA and Grande Ronde ACEC. Additional potential habitat may exist in the Chief Joseph Wildlife Area (Fertig and Kleinknecht 2022). The species is considered inadequately protected statewide based on reports from Okanogan and Walla Walla counties that may belong to *Erythranthe pulsiferae*.
Potential Inventory or Conservation Areas: Lime Hill, Warner Gulch/Smoothing Iron Ridge.
Additional References: Camp and Gamon 2011.



Hackelia diffusa var. diffusa (Diffuse stickseed)

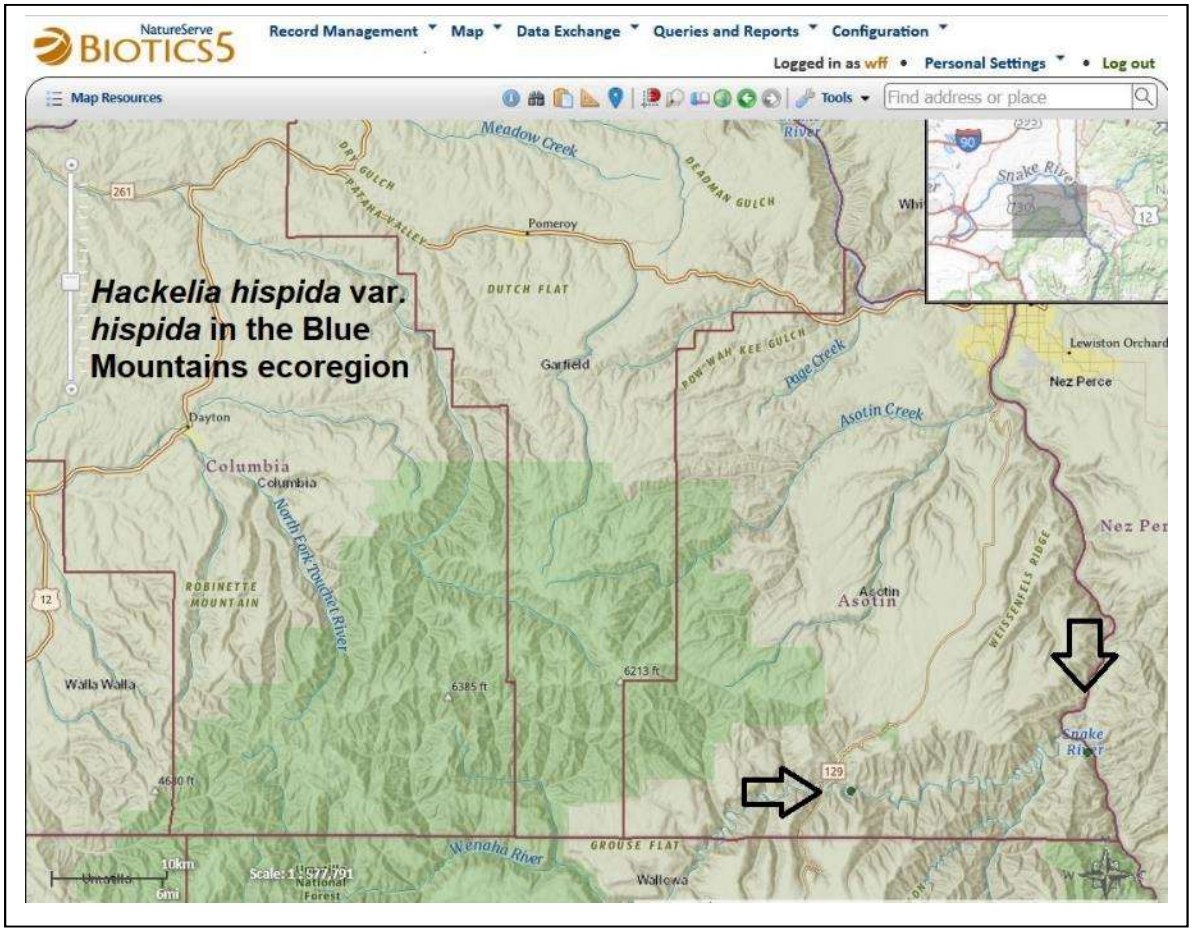
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4T3/S2; WA Threatened
Range: Southern Washington (Columbia, Kittitas, Klickitat, Yakima counties) and northern Oregon, with a disjunct population in southern British Columbia. Also reported for Spokane County, Washington.
WA Ecoregions: Blue Mountains, East Cascades
Number of Occurrences: Known from five extant and three historical occurrences in Washington. The report from the Blue Mountains in Columbia County needs confirmation (Camp and Gamon 2011).

Abundance: Populations range from 10 to 3,500 individuals.
Habitat: Cliffs, talus slopes, roadsides, and disturbed areas, mostly at 300-550 m (1,000-1,800 ft); found up to 800m (2,600 ft) in the Blue Mountains.
Threats: Probably low.
Trends: Not known.
Managed Areas in WA: Columbia River Gorge National Scenic Area, Ginkgo Petrified Forest SP, Klickitat Canyon NRCA, Klickitat SWA, Umatilla NF.
Protection Status in Blue Mountains: The single occurrence in the Blue Mountains is on lands managed for multiple use on Umatilla National Forest and needs confirmation. Two populations are protected in Gingko Petrified Forest SP, Klickitat River NRCA, and Klickitat SWA. Based on these occurrences, the species is considered inadequately protected statewide (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Crooked Creek, Weller Butte.
Additional References: Fertig and Kleinknecht 2020, Gentry and Carr 1976.



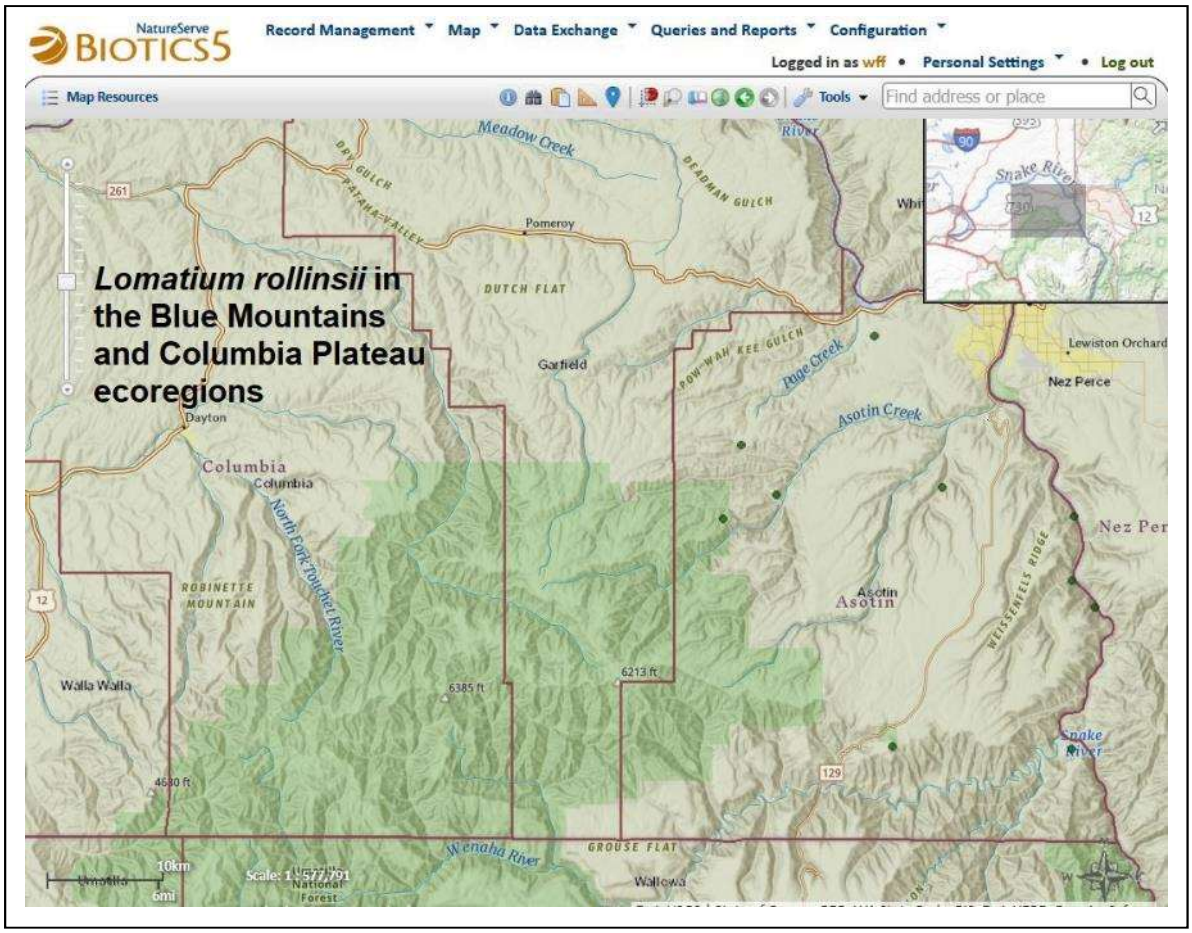
Hackelia hispida var. hispida (Rough stickseed)

Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4T4/S1; WA Sensitive
Range: Regional endemic of the Snake River Canyon area of west-central Idaho, northeastern Oregon, and southeastern Washington (Asotin County).
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from 2 extant occurrences in Washington, most recently surveyed in 2013.
Abundance: One population contained several hundred plants in 2010.
Habitat: Sparsely vegetated basalt talus slopes and cliffs.
Threats: Wildfire and competition from invasive plants.
Trends: Not known.
Managed Areas in WA: Grande Ronde Area of Critical Environmental Concern, Vale District BLM. Additional habitat may occur in the Chief Joseph Wildlife Area (Fertig and Kleinknecht 2022).
Protection Status in Blue Mountains: Completely protected. The two occurrences known from Washington State are protected in the Grande Ronde ACEC.
Potential Inventory or Conservation Areas: Grande Ronde Canyon, Lime Hill.
Additional References: Camp and Gamon 2011, Gentry and Carr 1976.



Lomatium rollinsii (Rollins' desert-parsley)

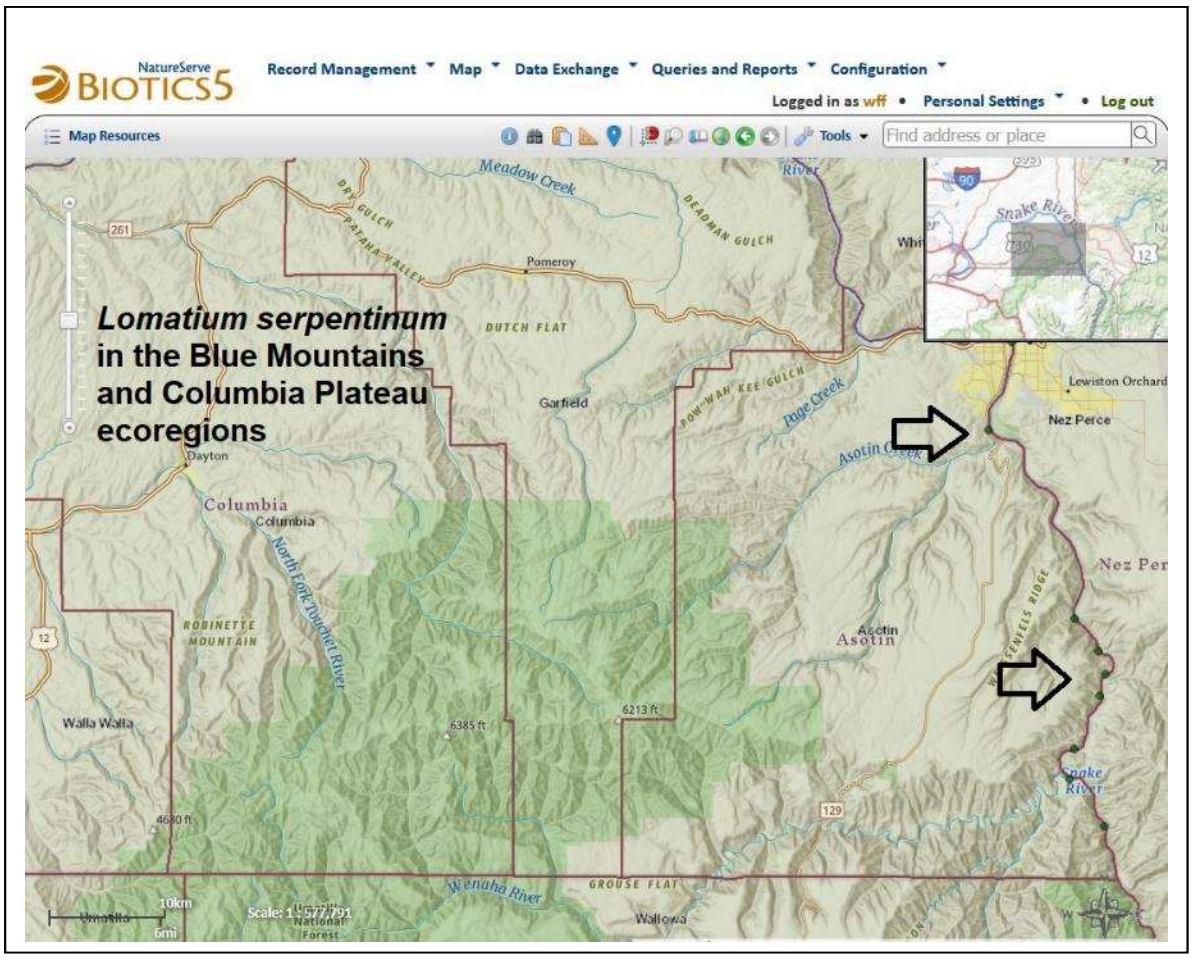
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G3/S2; WA Threatened
Range: Endemic to the Snake and Salmon River drainage in southeastern Washington (Asotin County), northeastern Oregon, and western Idaho.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from eight extant and two historical occurrences. Five populations have been surveyed since 2002 (most recently in 2021).
Abundance: Populations vary widely in size, with smaller sites containing 1 to 120 plants, and larger occurrences having up to 10,000 individuals.
Habitat: Gentle to steep slopes of rocky to loamy canyons in big sagebrush-bunchgrass grasslands.
Threats: Livestock grazing, conversion of habitat to agriculture, wildfire.
Trends: Probably downward over the past century. Current trends not well known due to lack of consistent monitoring data.
Managed Areas in WA: Asotin Creek Wildlife Area, Chief Joseph Wildlife Area, Fields Spring State Park, Grande Ronde Area of Critical Environmental Concern, Umatilla National Forest, Vale BLM.
Protection Status in Blue Mountains: Only four of nine occurrences from the Blue Mountains ecoregion are protected. The species is considered inadequately protected statewide (Fertig and Kleinknecht 2022).



Potential Inventory or Conservation Areas: Lime Hill, Puffer Butte, Snake River, Sourdough Ridge/Lick Creek.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020, Moseley 1988.

Lomatium serpentinum (Snake Canyon desert parsley)

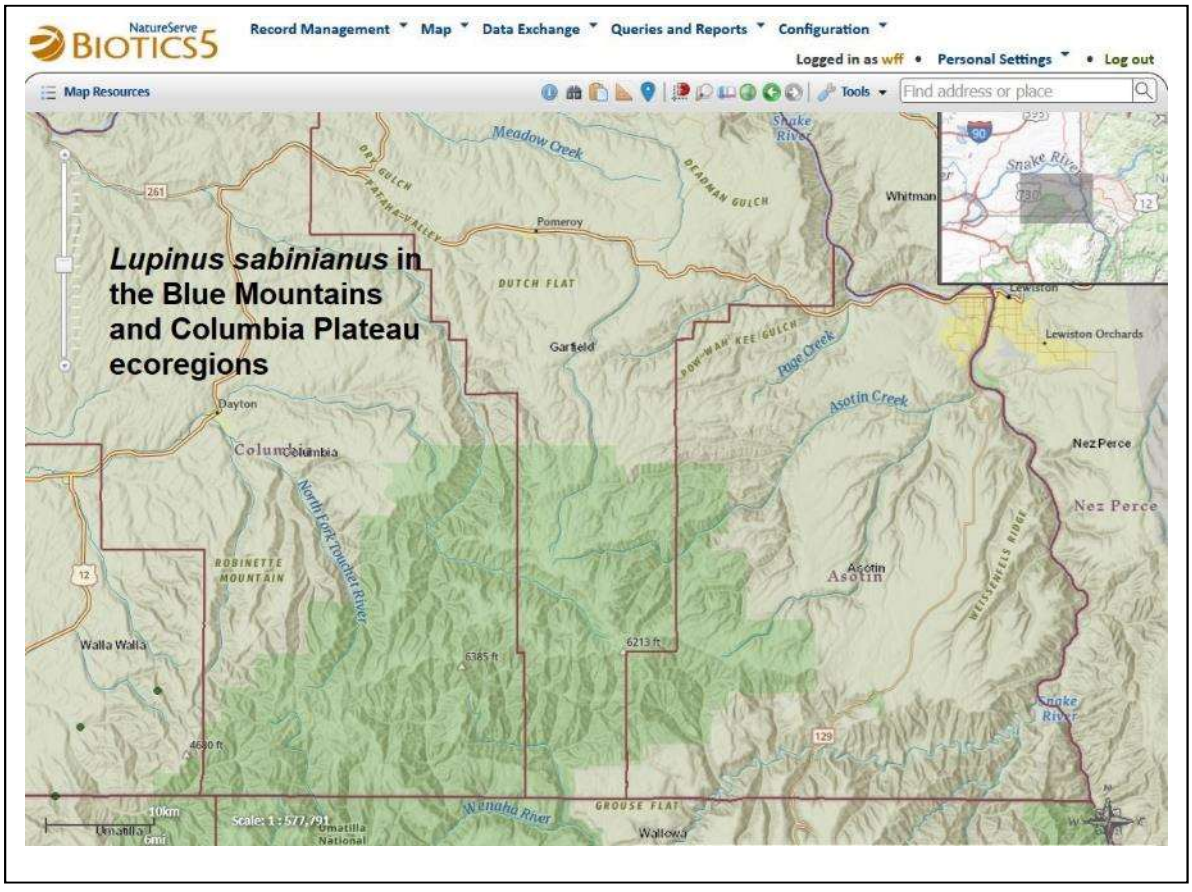
Legal Status: BLM Sensitive
Conservation Status Rank: G4/S2; WA Sensitive
Range: Regional endemic of the Snake River drainage in southeastern Washington, western Idaho, and eastern Oregon. Found in Asotin, Columbia, Garfield, Grant, Walla Walla, and Whitman counties in Washington. The historical occurrence from Grant County is well out of range and should be verified.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from 13 occurrences, of which five are extant (most recently observed in 2021) and eight historical.
Abundance: Extant populations contain between 89 and 470 individuals.
Habitat: Basalt ledges and talus or granite outcrops on old floodplains at 200-400m (750-1,200 ft) elevation.
Threats: Habitat loss from dam and reservoir construction, conversion of habitat to agriculture. This species was ranked as Highly Vulnerable to climate change by Fertig (2022) based on the NatureServe Climate Change Vulnerability Index protocol.



Trends: Several historical Washington populations have probably been destroyed by reservoirs. Extant populations that have been monitored are relatively stable at present.
Managed Areas in WA: Chief Joseph SWA, Grande Ronde ACEC, McNary SWA, Vale BLM.
Protection Status in Blue Mountains: Three occurrences are protected in the Blue Mountains. One additional occurrence is protected in the Columbia Plateau ecoregion, but the species is considered inadequately protected statewide (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Lime Hill, Snake River.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020

Lupinus sabinianus (Sabin's lupine)

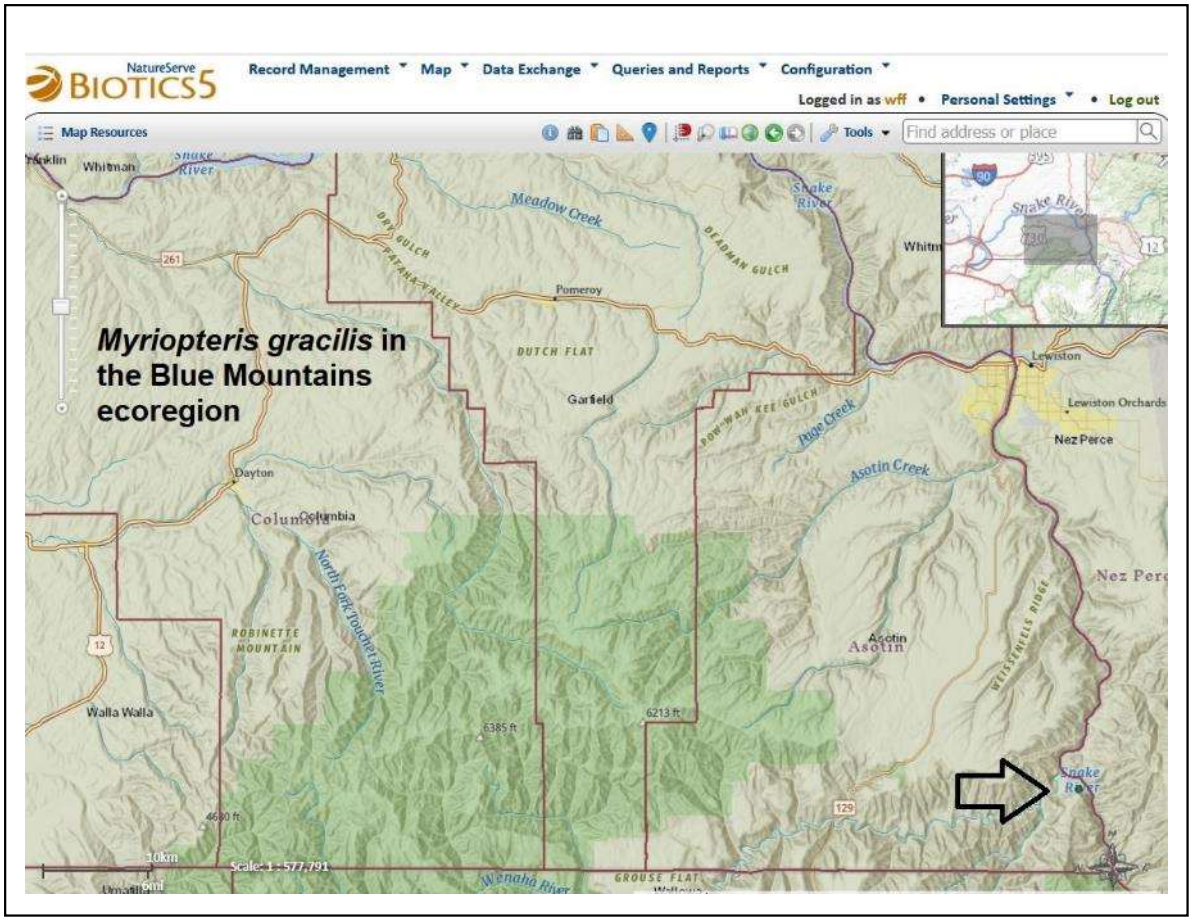
Legal Status: none
Conservation Status Rank: G3/S1; WA Endangered
Range: Endemic to the Blue Mountains of southeastern Washington (Walla Walla County) and northeastern Oregon. Reports from Asotin County are based on misidentified specimens of *L. sericeus* var. *asotinensis*. A recent report from Garfield County needs confirmation, but may be the ubiquitous *L. sulphureus* var. *sulphureus* (*L. sabinianus* and *L. sulphureus* are easily confused, but *L. sulphureus* can be distinguished by its glabrous banner petal which is little diverged from the wing and keel petals, creating a closed appearance to the flower; WNHP 2022).
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from two extant occurrences in Washington and one historic population. The species was last relocated in 1992 (WNHP 2022).



Abundance: One occurrence contained 90-100 plants in three subpopulations in 1992.
Habitat: Dry transition zone between grasslands and lower montane Douglas-fir, Ponderosa pine, or Grand fir forests.
Threats: Fire suppression, grazing, herbicides, conversion of habitat to agriculture or human developments.
Trends: Not known, but probably declining.
Managed Areas in WA: private.
Protection Status in Blue Mountains: No populations occur in protected areas in the Blue Mountains or elsewhere in Washington. One occurrence is found within 5 km of a protected area managed by the Blue Mountains Land Trust (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Kooskooskie, Puffer Butte.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020.

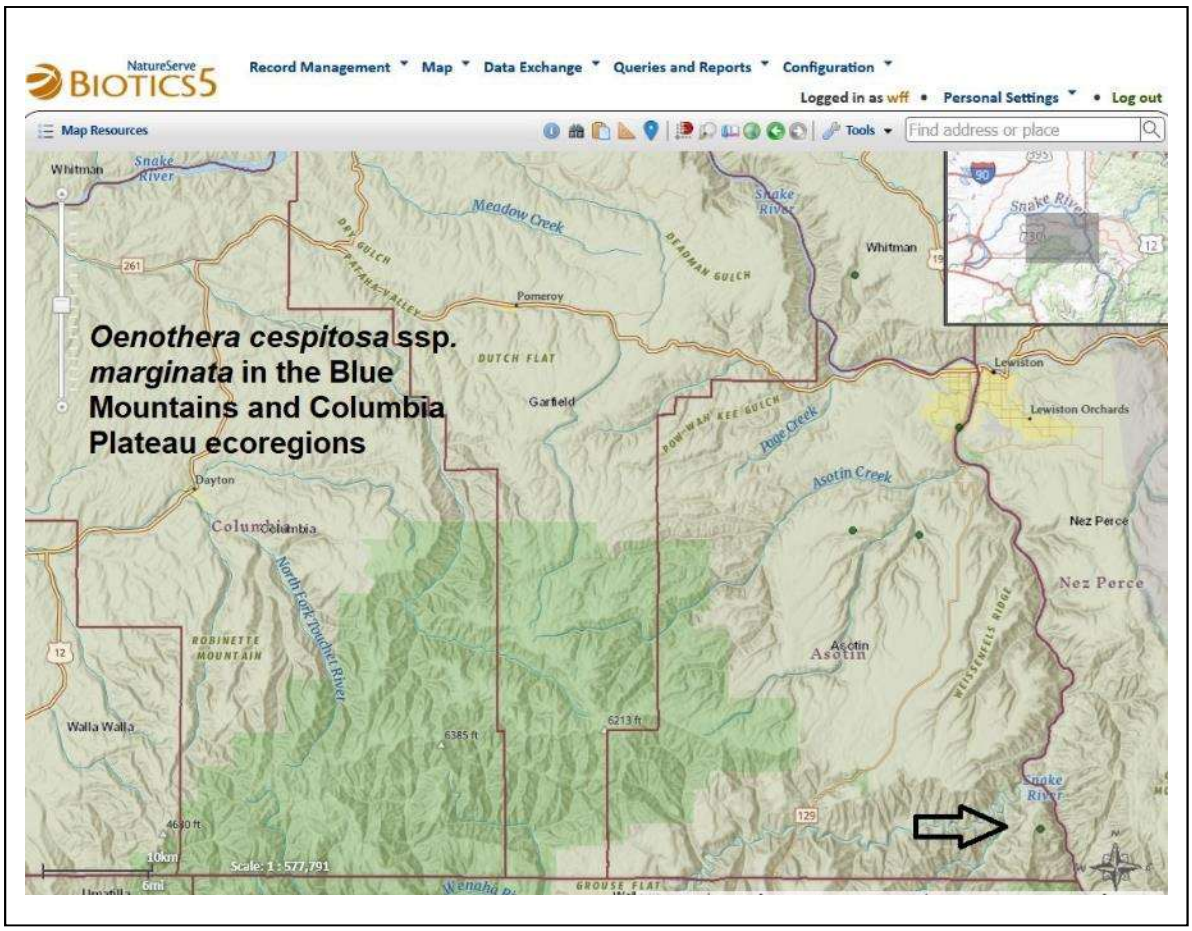
Myriopteris gracilis (Fee's lip-fern)

Synonym: *Cheilanthes feei*
Legal Status: BLM Sensitive
Conservation Status Rank: G5/S1; WA Threatened
Range: Southern British Columbia and Alberta to Montana, Minnesota, and Illinois, south to northern Mexico, Texas, and Arkansas. In Washington, known from Asotin and Whitman counties.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from one extant population in the Blue Mountains and one historical record at Almota in the Columbia Plateau (Whitman County), last observed in 1964.
Abundance: The Lime Hill population in the Blue Mountains contained approximately 500 plants (genets) in 2002. It was relocated in 2021, but a population estimate was not made.
Habitat: Found in shady crevices in limestone or sandstone cliffs or rocky talus slopes.
Threats: Loss of habitat from mining, flooding, or competition from invasive plants.
Trends: Not known, but probably stable at Lime Hill.
Managed Areas in WA: Grande Ronde ACEC, Vale BLM, private.
Protection Status in Blue Mountains: Completely protected, with the single population from the Blue Mountains contained within the Grande Ronde ACEC. The one population in the Columbia Plateau ecoregion is on private land. Statewide, the species is considered inadequately protected because no other occurrences are protected, and thus it does not meet the minimum goal of 5 protected sites (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Lime Hill.
Comments: Recent phylogenetic studies demonstrate that North American fern species previously ascribed to *Cheilanthes* belong to a separate genus, *Myriopteris* (Grusz and Windham 2013). *Cheilanthes feei* becomes *Myriopteris gracilis* based on this new classification. *Myriopteris gracilis* is an asexual triploid, which, despite its large geographic range, consists of numerous regional subpopulations that have arisen independently (Wickell 2015). The phase in Washington and adjacent states may represent a cryptic taxon with a relatively small geographic range and consequently a higher conservation significance (Fertig and Kleinknecht 2020).
Additional References: Camp and Gamon 2011



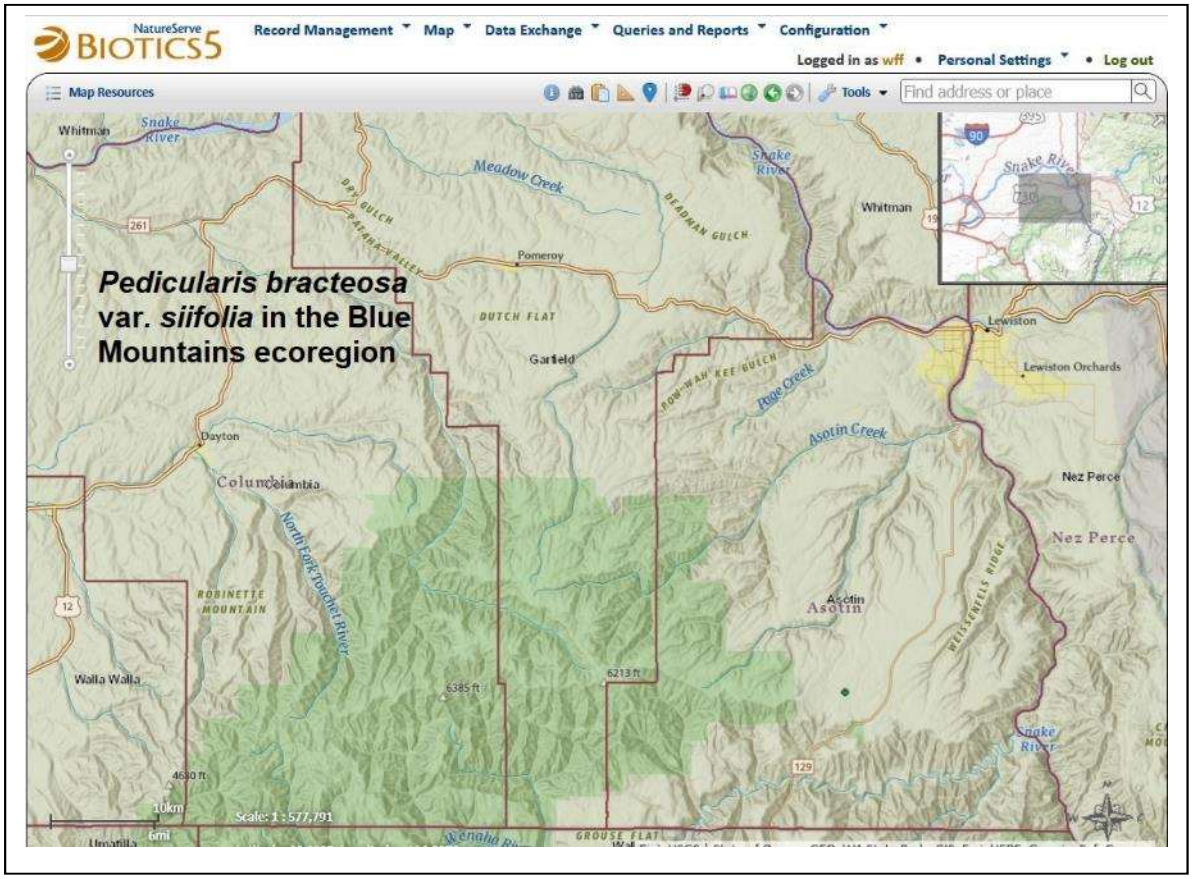
Oenothera cespitosa ssp. marginata (Tufted evening-primrose)

Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G5T3T5/S1; WA Threatened
Range: Southern Washington (Asotin, Klickitat, and Whitman counties) east to Idaho and Wyoming, south to California, Colorado, and Texas.
WA Ecoregions: Blue Mountains, Columbia Plateau, East Cascades
Number of Occurrences: Known from seven occurrences of which four are extant (most recently observed in 2021) and three historical.
Abundance: Washington populations vary from 12 to over 1,000 individuals (Fertig and Kleinknecht 2020).
Habitat: Dry hills, rocky slopes, road cuts, and dry washes in grasslands.
Threats: Herbicides, conversion of habitat to agriculture, trampling.
Trends: Not known.
Managed Areas in WA: Asotin Creek WA, Chief Joseph SWA, Grande Ronde ACEC, Vale BLM.
Protection Status in Blue Mountains: Completely protected, with the single known population found within the Chief Joseph Wildlife Area and Grande Ronde ACEC. Statewide, the species is considered inadequately protected because only 3 of 7 occurrences are in special management areas (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Lime Hill.
Additional References: Camp and Gamon 2011.



Pedicularis bracteosa var. siifolia (Smoothflower bracted lousewort)

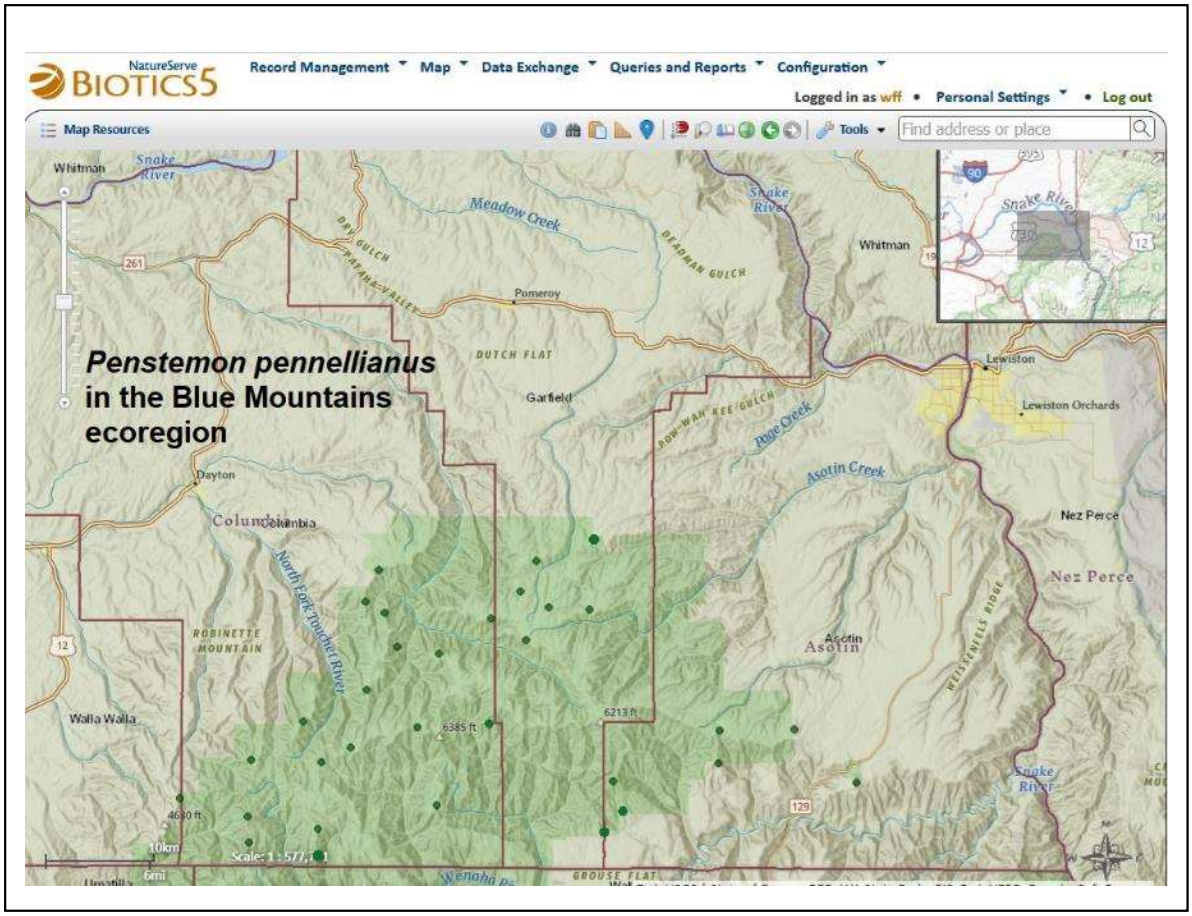
Legal Status: none
Conservation Status Rank: G5T1T3/SH; WA Extirpated
Range: Regional endemic of southeastern Washington (Asotin County), northern and central Idaho, and west-central Montana.
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from a single historical occurrence in Washington, last observed in 1928.
Abundance: Not known, but may be extirpated in the state.
Habitat: Range wide, found in marshy openings and wet meadows associated with subalpine fir, Engelmann spruce, or lodgepole pine forests in mountainous areas.
Threats: Loss of habitat from development, grazing, or logging.
Trends: Probably downward in Washington.
Managed Areas in WA: The single historical record is likely from Umatilla National Forest or adjacent private lands in the vicinity of Anatone Butte.



Protection Status in Blue Mountains: Unprotected.
Potential Inventory or Conservation Areas: Puffer Butte.
Additional References: WNHP 2022.

Penstemon pennellianus (Blue Mountain beardtongue)

Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G3/S2 WA Threatened
Range: Endemic to the Blue Mountains of southeastern Washington and northeastern Oregon. In Washington, known from Asotin, Columbia, and Garfield counties and an historical report from Walla Walla County. Additional reports from Grant County are based on misidentifications.
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from at least 25 extant and 7 historical occurrences in Washington. At least 18 occurrences have been discovered or relocated since 2012, most recently in 2021.
Abundance: Populations are often small, consisting of 4 to 200 individuals.
Habitat:
Threats: Over-collection for gardens, grazing by livestock, herbicides, competition from introduced plants, and reduction in pollinators.
Trends: Not known, but may be stable at present.
Managed Areas in WA: Chief Joseph Wildlife Area, Fields Spring State Park, Spokane BLM, Umatilla National Forest, Wenaha-Tucannon Wilderness Area.
Protection Status in Blue Mountains: At least 9 occurrences found in special management areas.

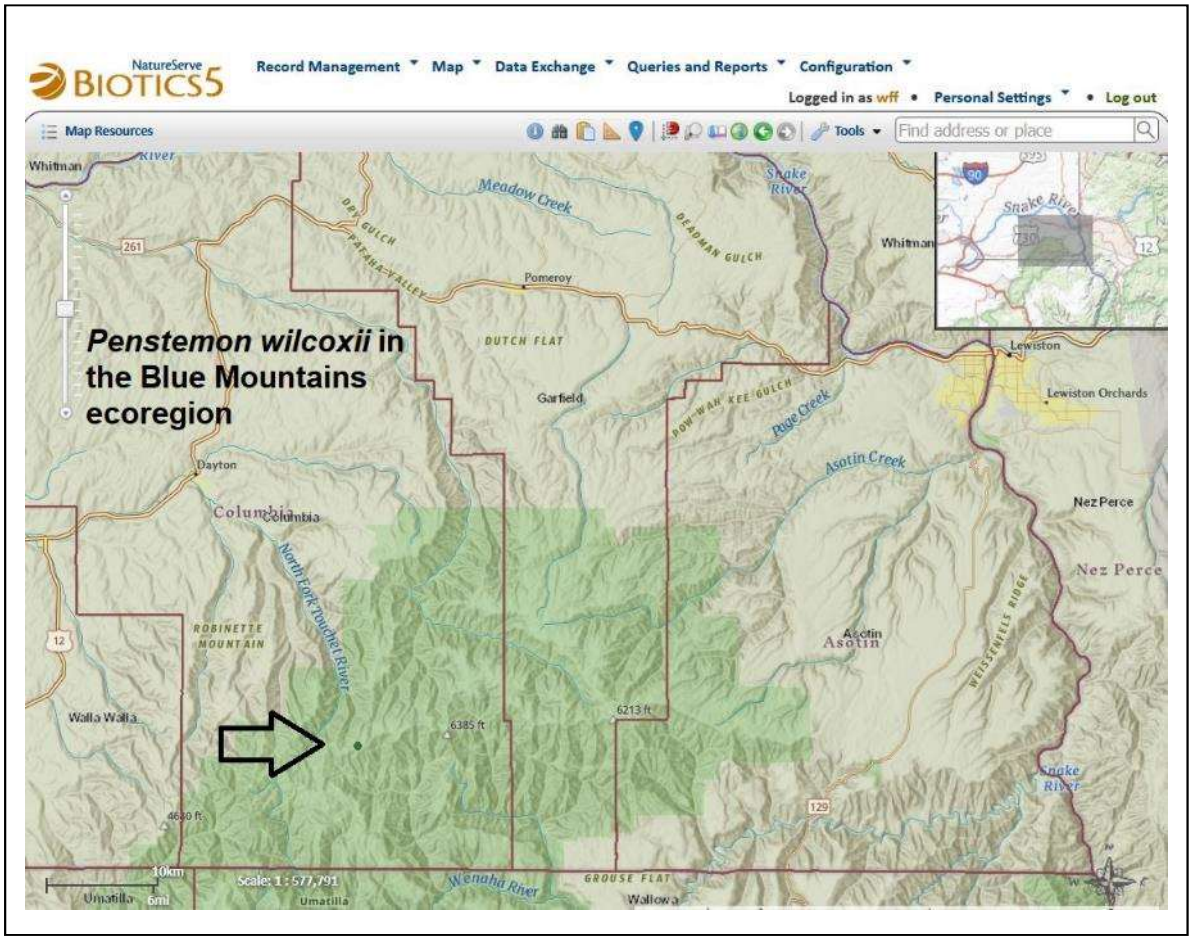


Potential Inventory or Conservation Areas: Alder Gulch/West Tam Tam Ridge, Crooked Creek, Godman Spring, Griffin Peak, Hard-to-Get-to Ridge, Puffer Butte, Sawtooth Ridge, Table Rock/Skyline, Weller Butte.
Comments: Penstemon pennellianus is thought to be of hybrid origin, involving a cross between *P. speciosus* and *P. payettensis*, two species not known to occur in the Blue Mountains today (Freeman 2019).
Additional References: WNHP 2022.

Penstemon wilcoxiii (Wilcox's beardtongue)

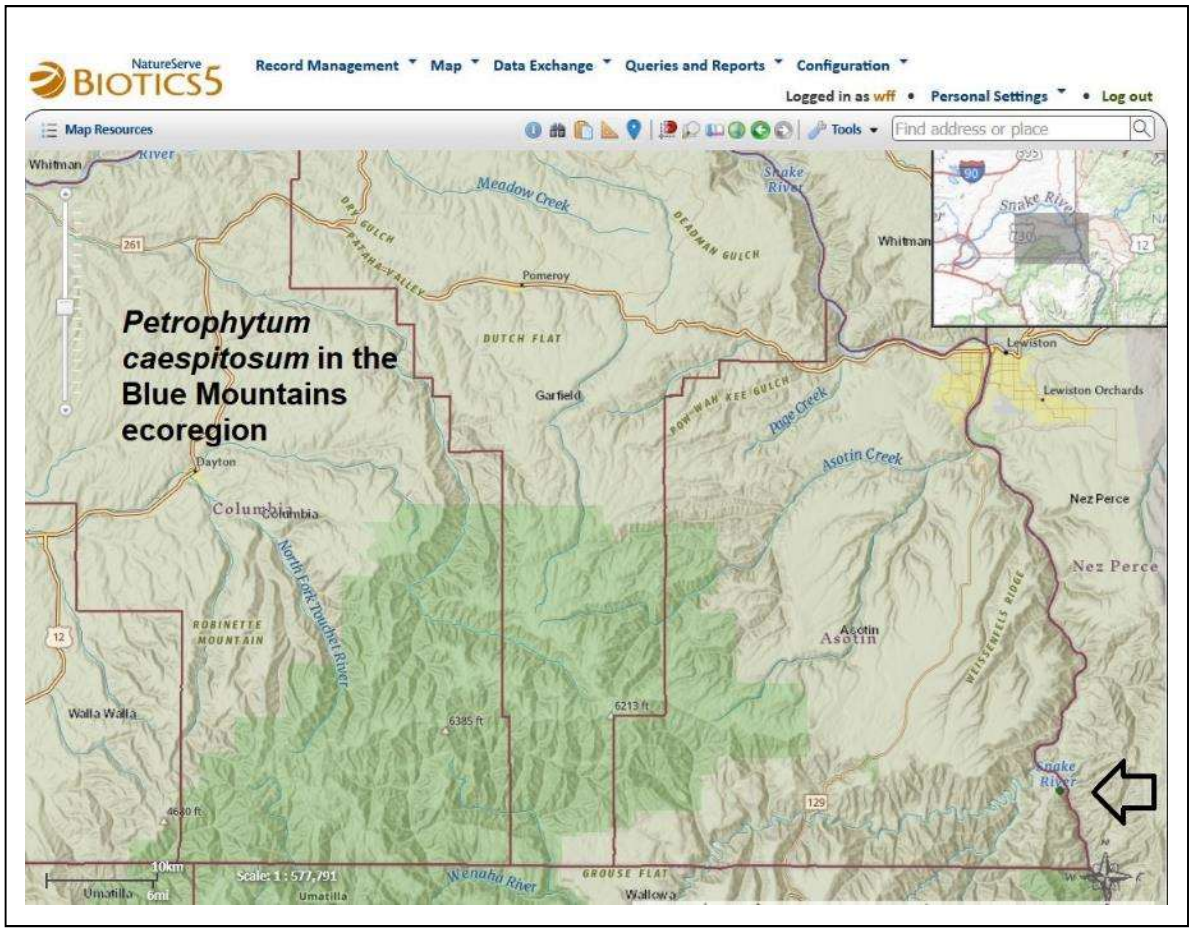
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G4/S1; WA Threatened
Range: Regional endemic of eastern Washington to northwestern Montana, south to northeastern Oregon and Idaho. In Washington, known from Columbia, Grant, Okanogan, Skamania, Spokane, and Whitman counties.
WA Ecoregions: Blue Mountains, Columbia Plateau, Okanogan, West Cascades
Number of Occurrences: Known from five extant occurrences in Washington and three historical populations. Most recently observed in 2019.
Abundance: Recent census data are lacking for most Washington populations. Those that have been surveyed range in size from 21 to 220 plants. A large population of 1,000-1,500 plants has not been relocated in recent surveys and may be extirpated.
Habitat: Forested slopes, shrubby areas, and open rocky sites from 700-1,280 meters (2,300-4,200 ft).

Threats: Habitat loss, hybridization, and over-collecting for nursery plants. Ranked as Moderately Vulnerable to climate change (Fertig 2020b).
Trends: Not known, may be downward based on the number of historic populations.
Managed Areas in WA: Columbia Basin Wildlife Area, Gifford Pinchot NF, Kamiak Butte County Park, Liberty Lake Regional Park, Okanogan-Wenatchee NF, Trapper Creek WA, and Umatilla NF.
Protection Status in Blue Mountains: Neither of the two occurrences in the Blue Mountains are from protected areas. Two populations are protected elsewhere in Washington, but the species is considered inadequately protected statewide. Several occurrences are known from within 5 km of protected areas, including the Dishman Hills Natural Resources Conservation Area, Rainbow Creek Research Natural Area, Rose Creek Preserve, Steamboat Rock State Park, and Wenaha-Tucannon Wilderness Area (Fertig and Kleinknecht 2022). A previous report from the Columbia River Gorge National Scenic Area was apparently mismapped.
Potential Inventory or Conservation Areas: Godman Spring.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020.



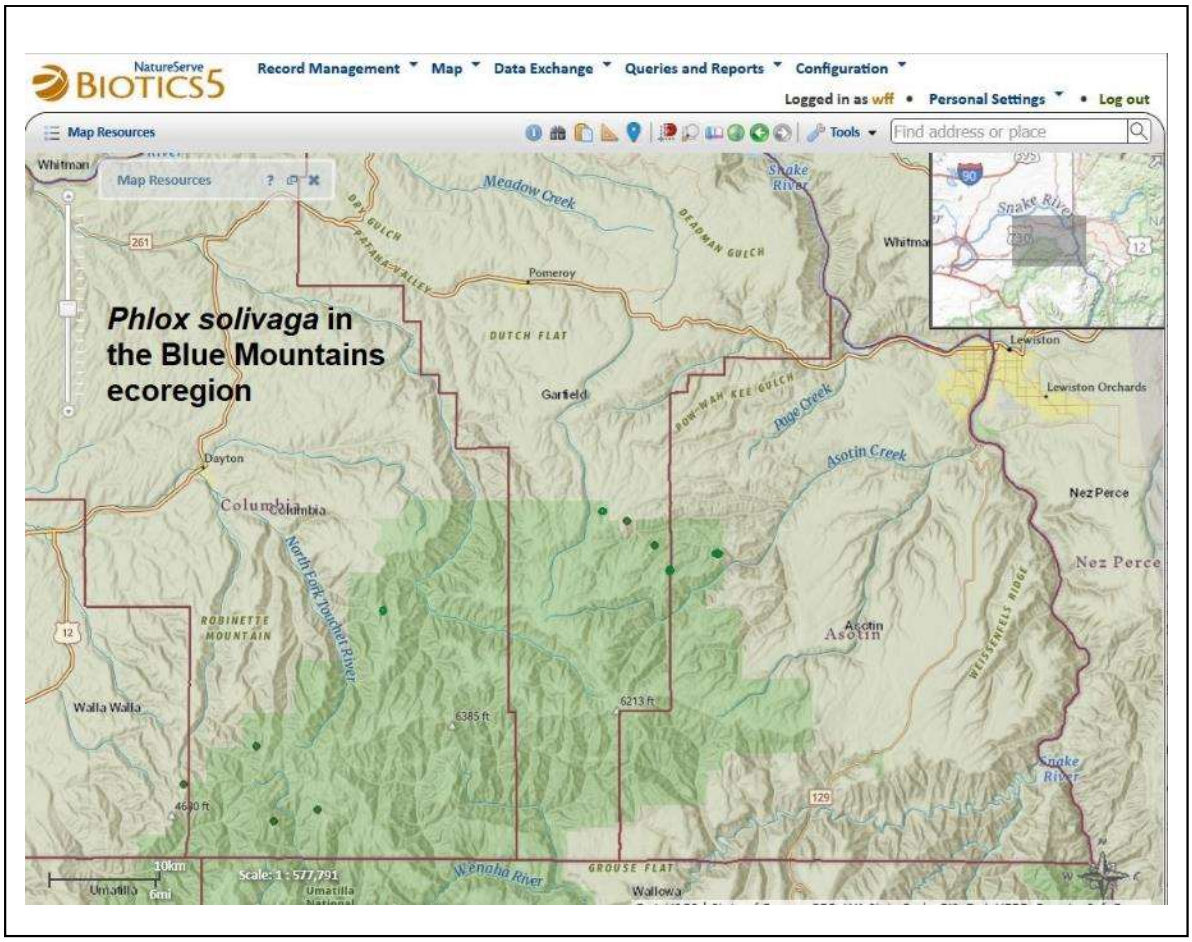
Petrophytum caespitosum ssp. caespitosum (Rocky Mountain rockmat)

Legal Status: BLM Sensitive
Conservation Status Rank: G5T3T5/S1, WA Sensitive
Range: ssp. *caespitosum* occurs from southeastern Washington and central Idaho to western Montana south to California, Texas, and northern Mexico. In Washington, this taxon is known only from the Lime Hill area of Asotin County.
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from one occurrence in the state, first discovered in 1999 and last surveyed in 2003. The population was not relocated in site visits to Lime Hill in 2019 and 2021, although some of the known habitat was not revisited.
Abundance: Approximately 100 plants were observed in 2003.
Habitat: Dry limestone cliffs and ledges of the Martin Bridge Limestone or Doyle Creek Formation.
Threats: Ranked as Highly Vulnerable to climate change using the NatureServe Climate Change Vulnerability Index protocol (Fertig 2022).
Trends: Probably downward.
Managed Areas in WA: Grande Ronde Area of Critical Environmental Concern, Vale BLM.
Protection Status in Blue Mountains: Completely protected in Washington, with the single occurrence contained within the BLM Grande Ronde ACEC. Fertig and Kleinknecht (2022) scored this species as inadequately protected statewide for not meeting the minimum criterion of 5 protected occurrences. Additional populations should be sought in the adjacent Chief Joseph Wildlife Area.
Potential Inventory or Conservation Areas: Lime Hill.
Additional References: Camp and Gamon 2011



Phlox solivaga (Yeti phlox)

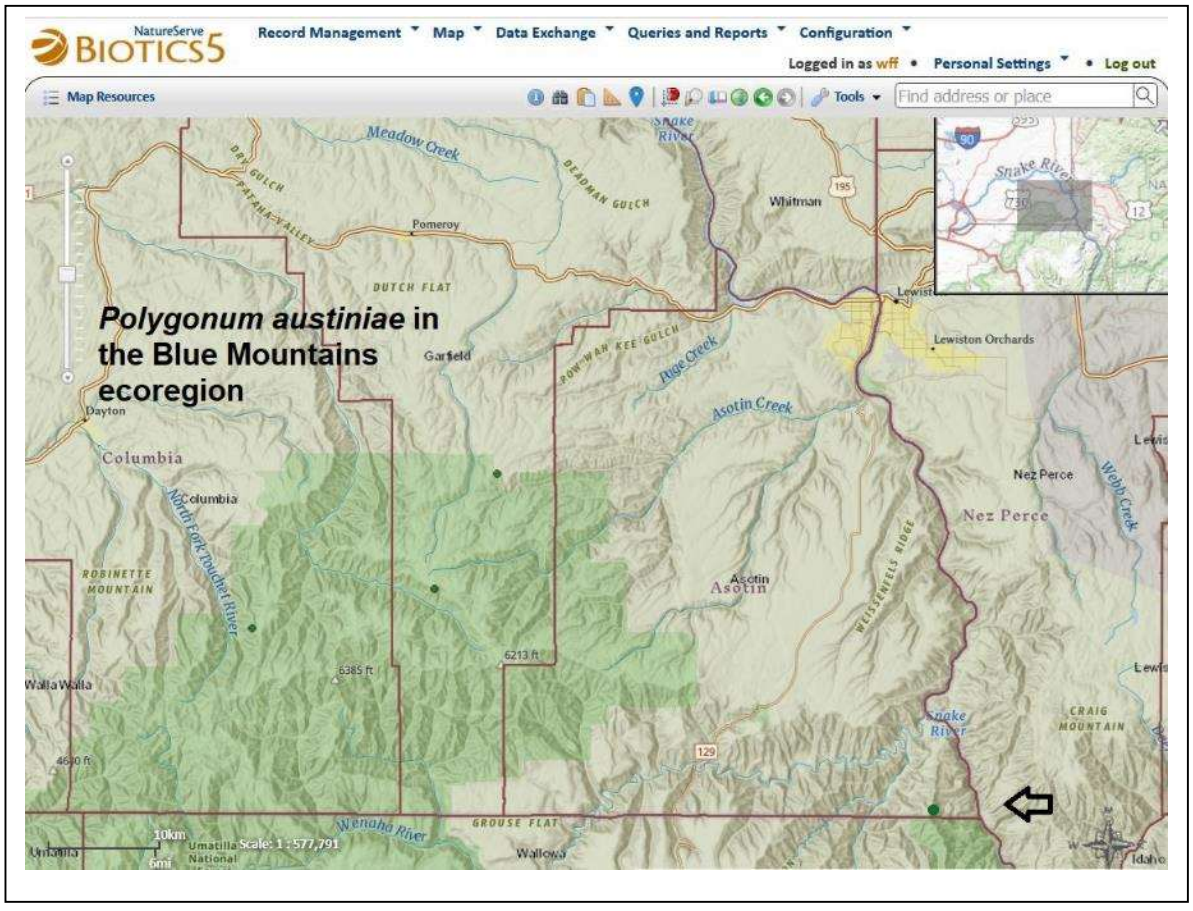
Legal Status: USFS Sensitive
Conservation Status Rank: G1/S1; WA Endangered
Range: Endemic to the Blue Mountains of southeastern Washington (Asotin, Columbia, Garfield, and Walla Walla counties). This species is likely to occur in extreme northeastern Oregon, but has not been documented yet (Fertig 2020a).
WA Ecoregions: Blue Mountains
Number of Occurrences: Known from 9 extant and 1 historical occurrence. Six populations have been newly documented since 2018, most recently in 2021.
Abundance: Population estimated at approximately 14,350 plants in 2018 (Fertig 2020a). Some additional populations have been discovered more recently. This species is probably more common than currently known and its G and S rank may need to be revised to G2/S2.
Habitat: Ferguson et al. (2015) reported that *Phlox solivaga* is restricted to flat paleo-surfaces of basalt lithosols. Since 2018, several new occurrences have been found on upper west and southwest-facing rims of volcanic bedrock and in roadbeds of exposed flat, reddish, bedrock and rubble. It is largely restricted to cushion plant communities with low cover of taller bunchgrasses.
Threats: Competition from invasive annual grasses and increased fire frequency.
Trends: Probably stable at present.
Managed Areas in WA: Asotin Wildlife Area, Pataha Bunchgrass Research Natural Area, Spokane BLM, Umatilla National Forest, Wenaha-Tucannon Wilderness Area.



Protection Status in Blue Mountains: Inadequately protected at present, with just 3 occurrences known from special management areas. Additional habitat may be present in the Rainbow Creek Research Natural Area on Umatilla National Forest (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Alder Gulch/West Tam Tam Ridge, Cape Horn/Cabin Ridge, Griffin Peak, Sawtooth Ridge, Sourdough Ridge/Lick Creek, Table Rock/Skyline, Warner Gulch/Smoothing Iron Ridge

Polygonum austiniae (Austin's knotweed)

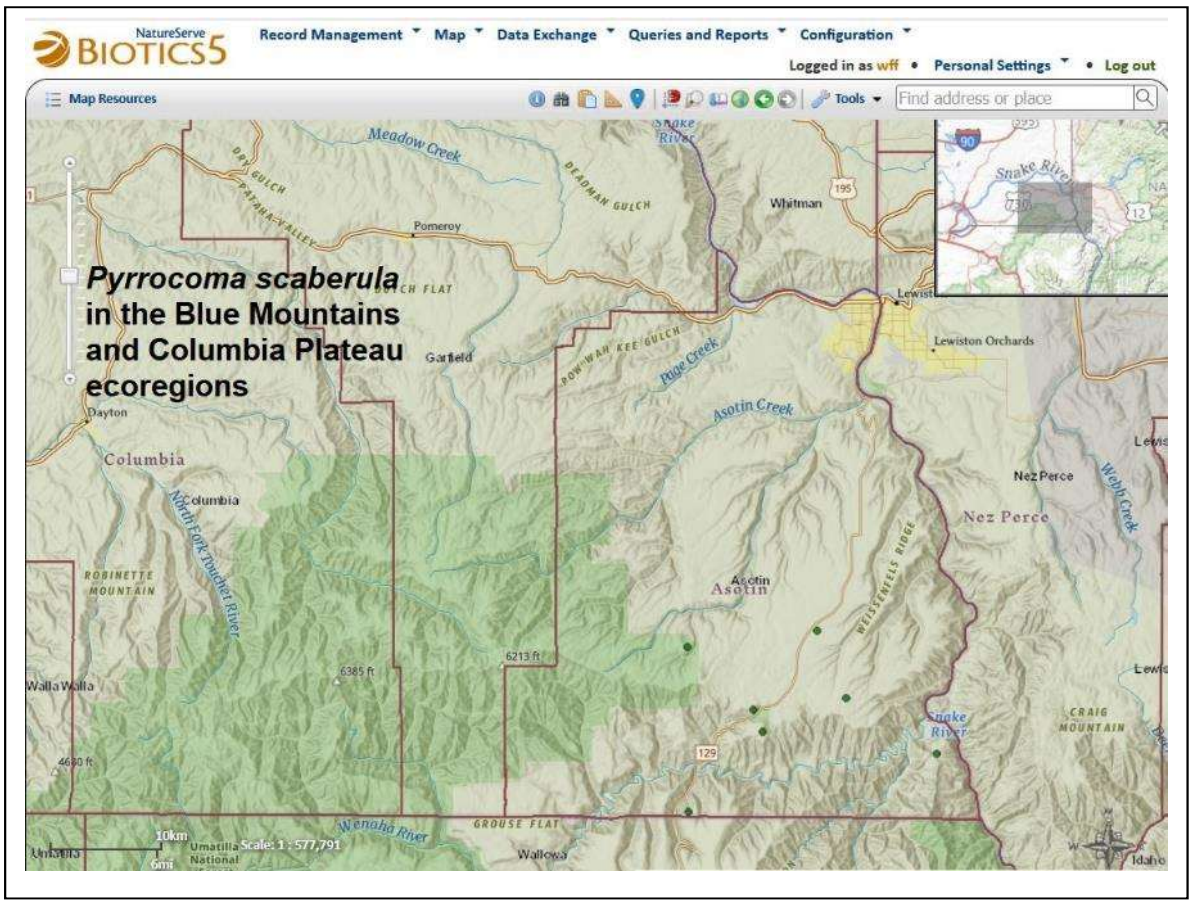
Synonym: *Polygonum douglasii* var. *austiniae*
Legal Status: USFS Sensitive.
Conservation Status Rank: G4/S1; WA Sensitive
Range: British Columbia to Alberta, south to California, Nevada, Montana, and Wyoming. In Washington, found in Asotin, Columbia, Garfield, Grant, Spokane, and Yakima counties.
WA Ecoregions: Blue Mountains, Columbia Plateau, East Cascades.
Number of Occurrences: Known from seven extant occurrences, all discovered or relocated since 2002. Three new occurrences were documented in the Blue Mountains in 2018-2019.
Abundance: Washington populations contain at least 100-200 plants apiece. This species is small, easily overlooked and probably more common than the few records suggest.
Habitat: Dry lithosols and fine basalt gravel in stiff sagebrush and barren basalt outcrops in cushion plant/bunchgrass communities.
Threats: Competition from invasive weeds, wildfire, and conversion of habitat to agriculture.
Trends: Stable in short term. Being an annual, population numbers are likely to fluctuate depending on drought conditions.



Managed Areas in WA: Okanogan-Wenatchee National Forest, Sun Lakes State Park, Umatilla National Forest, WA DNR.
Protection Status in Blue Mountains: Unprotected, with all known occurrences from the Blue Mountains found on multiple use lands managed by the US Forest Service. Statewide, the species is considered inadequately protected with just one occurrence protected in Sun Lakes SP. Several known occurrences are within 5 km of other protected areas, including Asotin Creek Wildlife Area, Sun Lakes Wildlife Area, Wenaha-Tucannon Wilderness Area, and W.T. Wooten Wildlife Area (Fertig and Kleinknecht 2022). This species is easily overlooked due to its low stature and may be more common than presently known.
Potential Inventory or Conservation Areas: Alder Gulch/West Tam Tam Ridge, Hard-to-Get-to Ridge, Mount Wilson.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020.

Pyrrocoma scaberula (Palouse goldenweed)

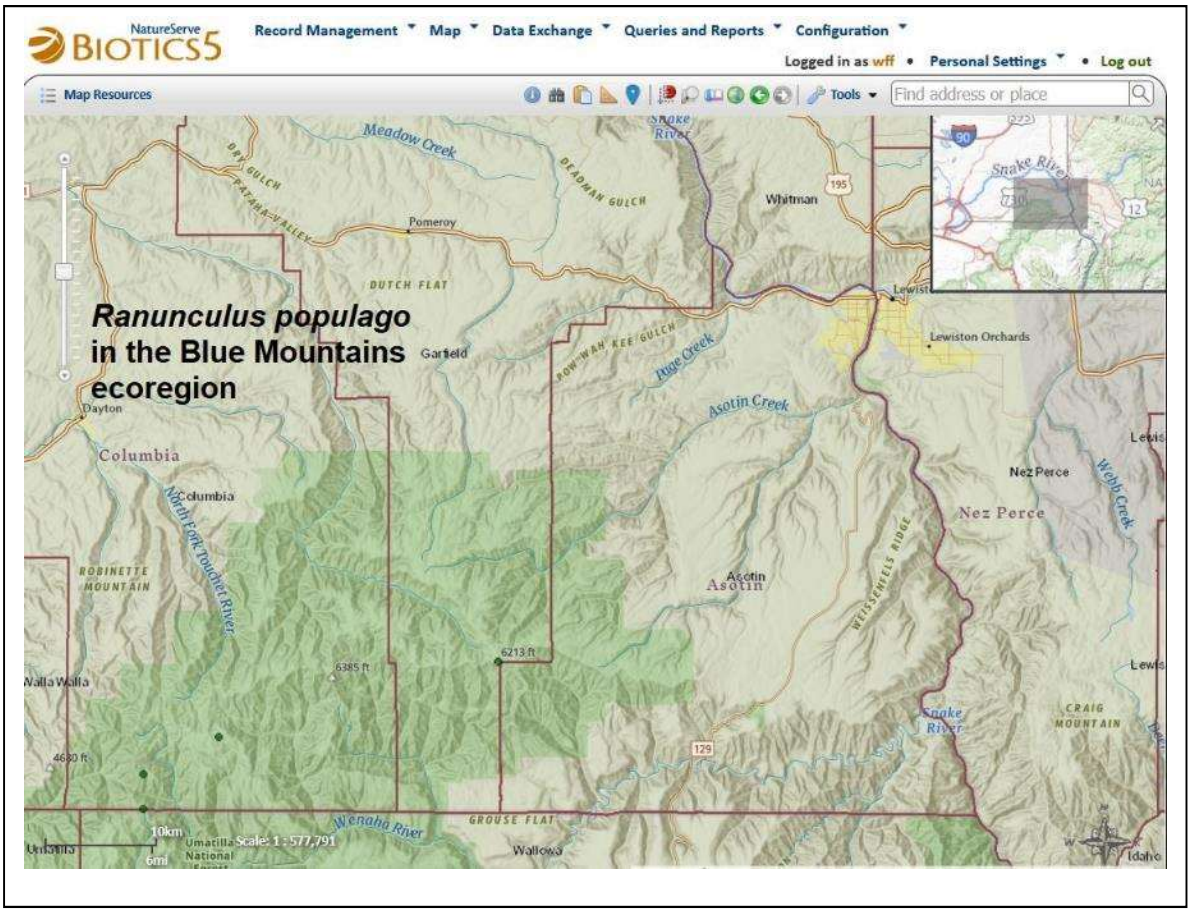
Synonym: Formerly included in *Haplopappus liatriformis* (Cronquist 1955).
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G2/S1; WA Endangered
Range: Regional endemic of the Snake River drainage of southeast Washington (Asotin County), northeastern Oregon, and west-central Idaho.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from seven extant occurrences, all documented since 2003 (most recently in 2020).



Abundance: About 1,300 plants have been observed in Washington (Fertig 2020a). Individual populations are small, numbering between 12-150 individuals.
Habitat: *Festuca idahoensis-Elymus spicatus* prairies and mosaic of prairie and Douglas-fir or Ponderosa pine woodlands in canyons and ridgetops on loess soil over basalt or limestone at 730-1,300m (2,400-4,300 ft).
Threats: Grazing, competition from invasive plants, conversion of habitat to agriculture, and wildfire.
Trends: Appear stable at present, but long-term trends are probably downward.
Managed Areas in WA: Chief Joseph SWA, Fields Spring SP, Grande Ronde ACEC, Umatilla NF, Vale BLM.
Protection Status in Blue Mountains: Inadequately protected, with just 3 protected occurrences.
Potential Inventory or Conservation Areas: Lime Hill, Puffer Butte.
Additional References: Björk and Darrach 2009, Fertig & Kleinknecht 2020, Smith et al. 2010.

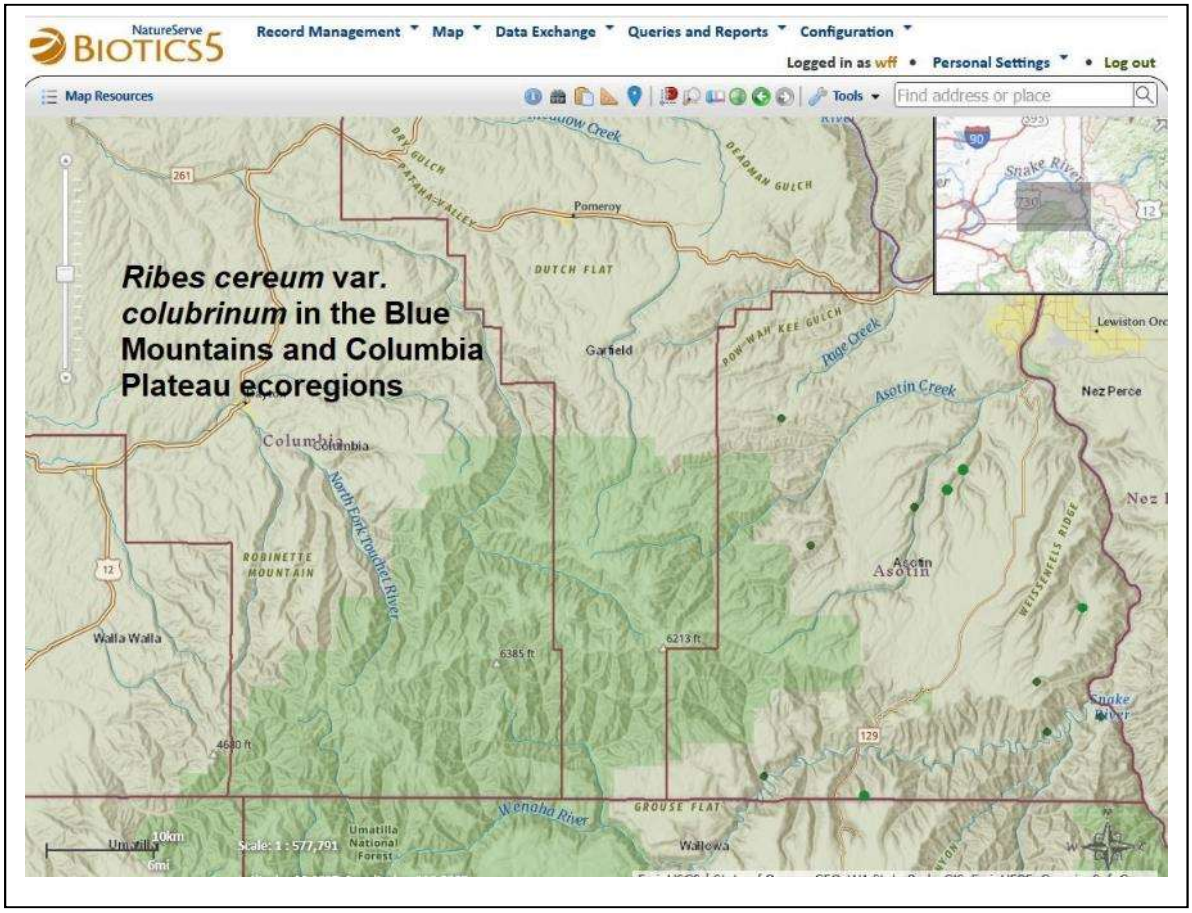
Ranunculus populago (Mountain buttercup)

Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G4/S2; WA Sensitive
Range: Cascades from west-central Washington to northern California and southeastern Washington, northeastern Oregon, central Idaho, and western Montana. In Washington, known from Columbia, Garfield, and Pierce counties.
WA Ecoregions: Blue Mountains, West Cascades.
Number of Occurrences: Known from 5 extant occurrences in Washington, all discovered since 1989 and most recently observed in 2008.
Abundance: Populations vary from 10 to over 1,500 individuals.
Habitat: Moist meadows, stream terraces, shrub thickets, and swamps.
Threats: Ranked as Moderately Vulnerable to climate change (Fertig 2020b).
Trends: Not known.
Managed Areas in WA: Gifford Pinchot National Forest, Glacier View Wilderness Area, Umatilla National Forest, Wenaha-Tucannon Wilderness Area.
Protection Status in Blue Mountains: Adequately protected, with 2 of the 4 occurrences from the Blue Mountains protected in the Wenaha-Tucannon Wilderness Area. Statewide, the species is protected at three sites and is considered inadequately protected based on criteria of Fertig and Kleinknecht (2022).
Potential Inventory or Conservation Areas: Godman Spring, Hard-to-Get-to Ridge, Sawtooth Ridge, Table Rock/Skyline
Additional References: WNHP 2022



Ribes cereum var. colubrinum (Wax currant)

Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G5T3/S1; WA Endangered
Range: Endemic to the Snake River Canyon area of southeastern Washington (Asotin County), northeastern Oregon, and western Idaho.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from eight extant and three historical occurrences in Washington. Three populations have been discovered or relocated since 2002 (most recently in 2007).
Abundance: Surveyed occurrences contain between 1 to 20 plants.
Habitat: Dry, rocky canyon bottoms or flats bordering streams in tall shrub communities at 300-1,000 m (1000-3300 ft).
Threats: Conversion of habitat to agriculture or development. Scored as Highly Vulnerable to climate changed based on the NatureServe Climate Change Vulnerability Index (Fertig 2022).
Trends: Not known.
Managed Areas in WA: Asotin SWA, Grande Ronde ACEC, Precious Lands Wildlife Management Area, and Vale BLM
Protection Status in Blue Mountains: Two of five occurrences in the Blue Mountains ecoregion are protected in the Asotin Creek SWA and Grande Ronde ACEC. Potential habitat may also occur in the Chief Joseph Wildlife Area (Fertig and Kleinknecht 2022). Statewide, just four occurrences are protected and the species is also considered inadequately protected.

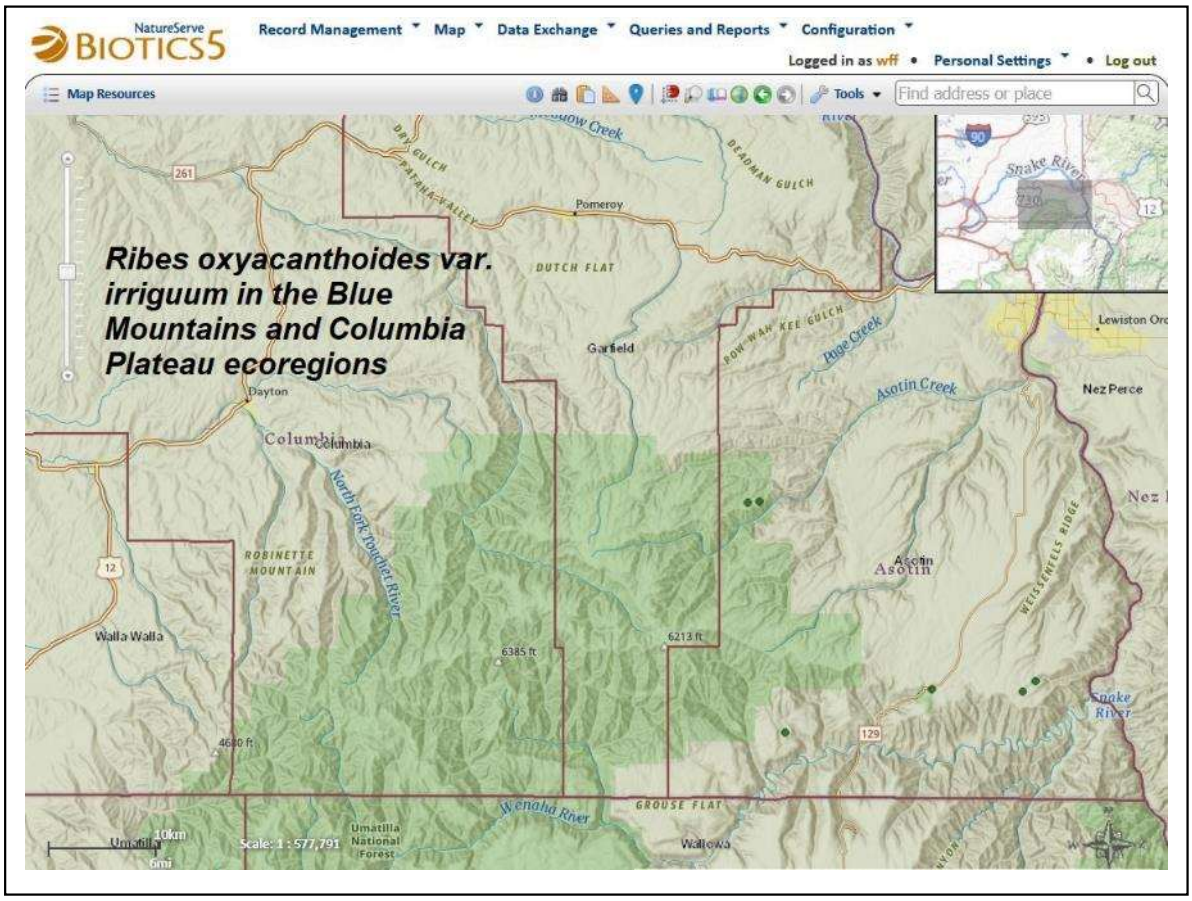


Potential Inventory or Conservation Areas: Grande Ronde Canyon, Lime Hill, Warner Gulch/Smoothing Iron Ridge.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020.

Ribes oxyacanthoides var. irriguum (Idaho gooseberry)

Synonym: *Ribes irriguum*
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G5T4/S2; WA Threatened
Range: Southeastern British Columbia to western Montana, south to Oregon and north-central Idaho. In Washington, known from Asotin, Spokane, and Whitman counties. Historical reports from Clark, Ferry and Stevens counties are based on misidentified specimens.
WA Ecoregions: Blue Mountains, Columbia Plateau, Okanogan. Report from Puget Trough ecoregion is erroneous.
Number of Occurrences: Known from 12 occurrences in Washington, of which only five are extant (last observed in 2020) and seven historical.
Abundance: Data lacking for most occurrences. Two of the extant populations consist of a single clump of plants and another has eight individuals. Sinnott (1985) reported this species as "not in imminent danger of becoming extinct" and "relatively frequent" and "the most common gooseberry in the Blue Mountains of Oregon and Washington", but cited only three collections from Washington.
Habitat: Small meadows, openings, and canyon bottoms along streams. Usually associated with conifers or deciduous shrubs.
Threats: Conversion of habitat to agriculture or human development.
Trends: Probably downward.

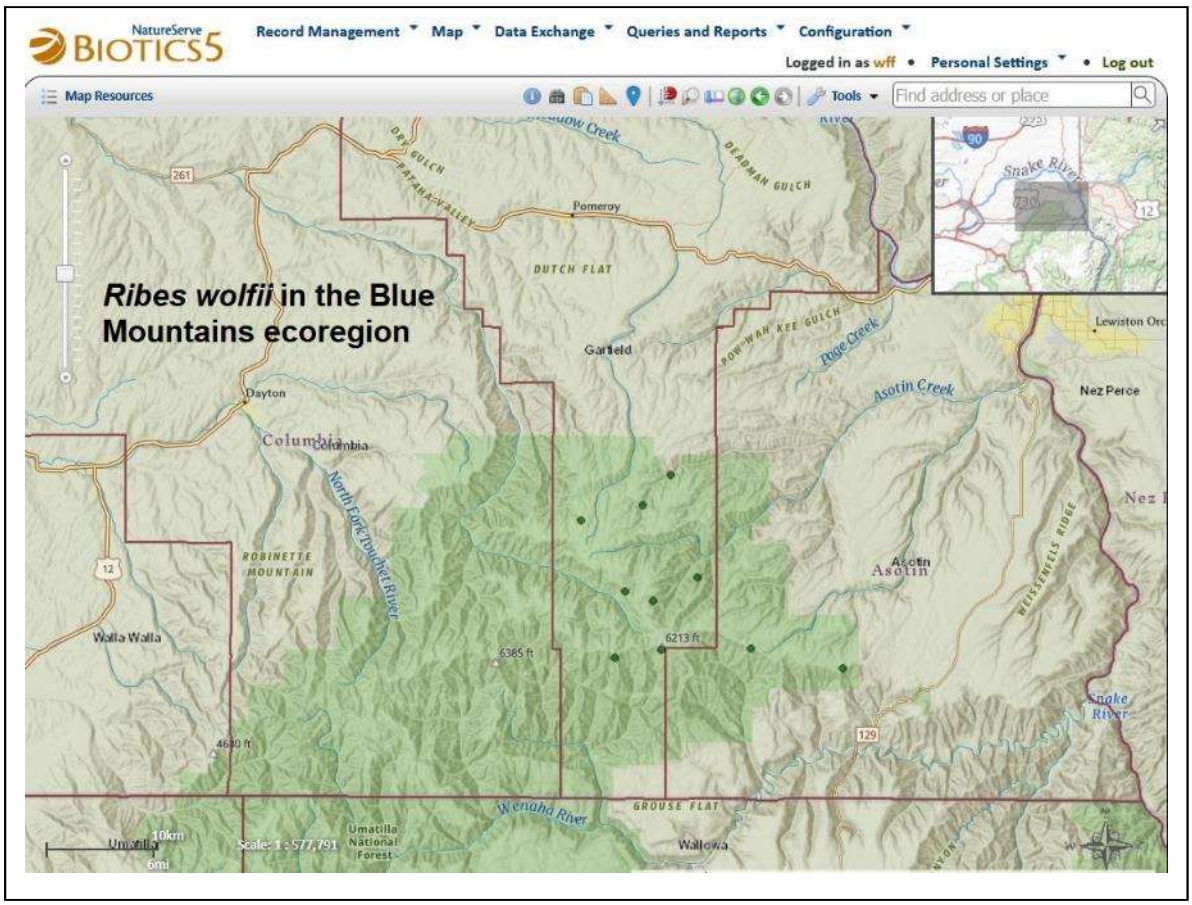
Managed Areas in WA: Chief Joseph SWA, Fields Spring SP, Umatilla NF.
Protection Status in Blue Mountains: Adequately protected, with two of the four known occurrences in the Blue Mountains found in protected areas. Statewide, the species is ranked as inadequately protected. Additional populations may occur in Asotin Creek Wildlife Area and private conservation easements managed by the Dishman Hills Conservancy and Inland Northwest Land Conservancy (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Puffer Butte, Sourdough Ridge/Lick Creek.
Comments: S rank needs to be changed to S1S2 to reflect the updated number of verified and extant occurrences.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020.



Ribes wolfii (Wolf's currant)

Legal Status: USFS Sensitive
Conservation Status Rank: G4/S2; WA Sensitive
Range: Northern Utah to western Colorado, northern Arizona, and New Mexico, with disjunct populations in southeastern Washington, northeastern Oregon, and west-central Idaho. In Washington, known only from Asotin and Garfield counties. A report from Chelan County was based on an historical collection from the Wenatchee Guard Station on Umatilla National Forest (not the Wenatchee Mountains). Additional reports from Columbia and Klickitat counties need confirmation.
WA Ecoregions: Blue Mountains

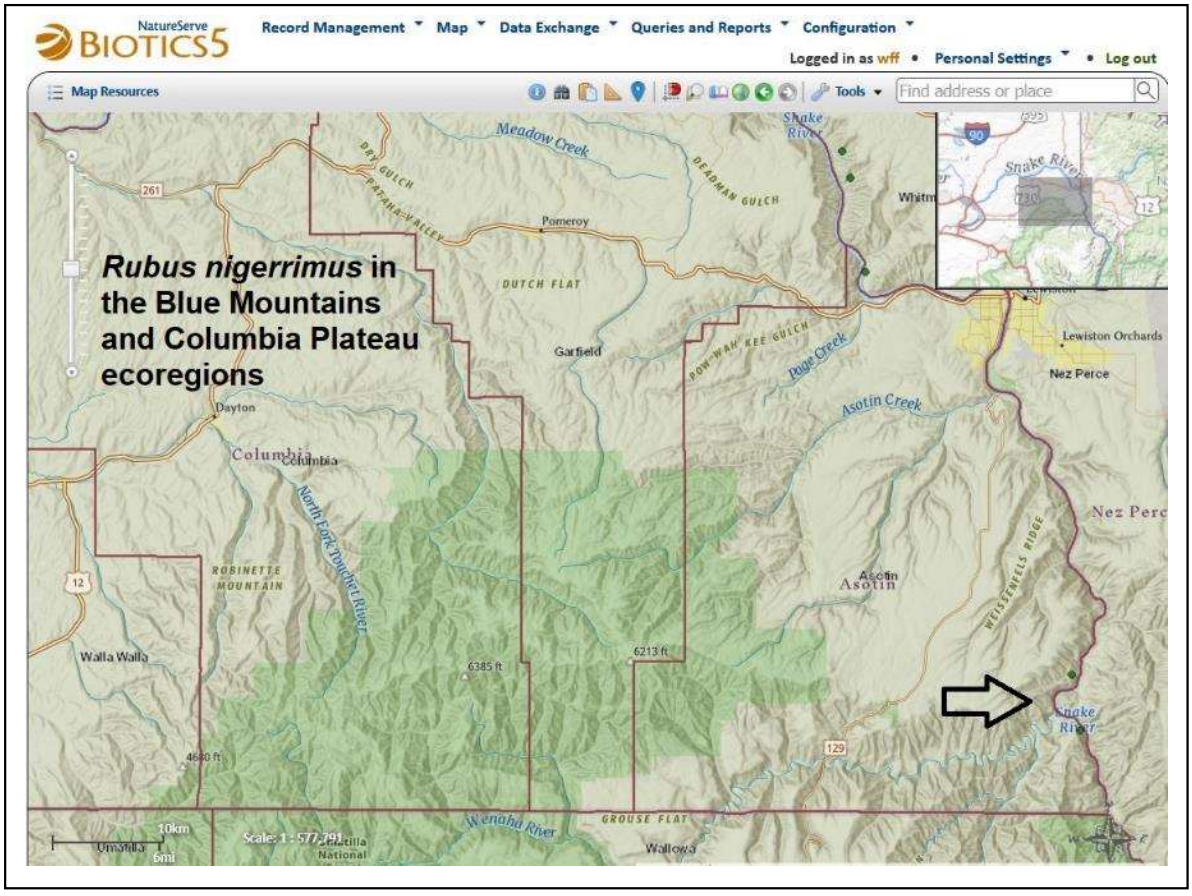
Number of Occurrences: Known from at least 9 extant and 1 historical occurrence in the Blue Mountains of Washington. The species was last documented in 1997.
Abundance: Populations range in size from 5-240 individuals.
Habitat: Clearings and meadows at the edge of Grand fir- Subalpine fir-Engelmann spruce forests and grassy slopes over basalt.
Threats: Impacts from timber harvest, grazing, and wildfire.
Trends: Not known.
Managed Areas in WA: Umatilla National Forest.
Protection Status in Blue Mountains: Unprotected. Two occurrences are found within 5 km of protected lands in the Asotin Creek Wildlife Area and Wenaha-Tucannon Wilderness Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Alder Gulch/West Tam Tam Ridge, Hard-to-Get-to Ridge.
Additional References: Morin 1999



Rubus nigerrimus (Northwest raspberry)

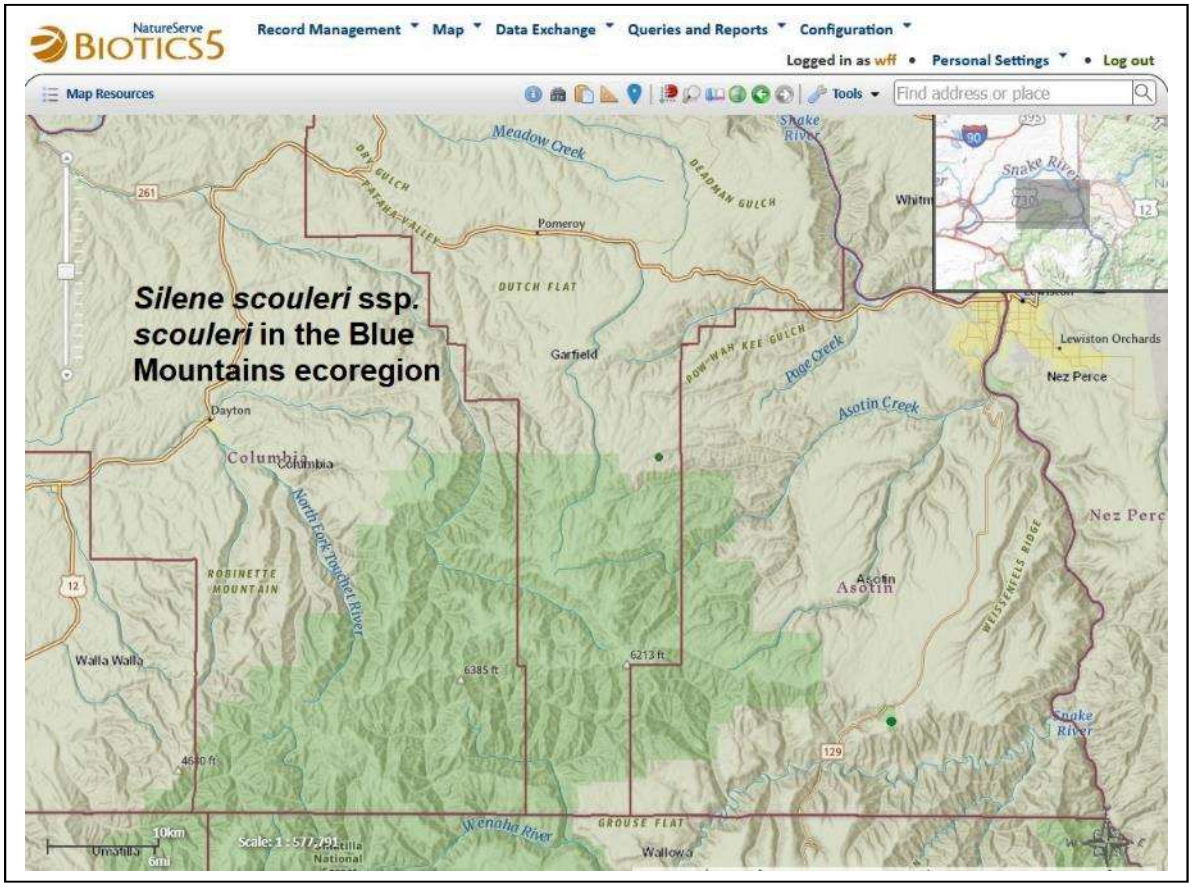
Synonym: *Rubus leucodermis* var. *nigerrimus*
Legal Status: BLM Sensitive
Conservation Status Rank: G2/S2; WA Threatened
Range: Endemic to southeastern Washington in Asotin, Garfield and Whitman counties. Reports from northeast Oregon and Idaho have not been corroborated (Alice et al. 2015).

WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from 16 extant and two historical occurrences in Washington. Ten populations have been discovered or relocated since 2000 (most recently in 2019), but at least five sites could not be relocated in 2019 (Fertig 2020a).
Abundance: Populations range from one to 130 plants. Due to the plant's clonal growth habit, abundance is difficult to estimate (Fertig 2020a). Kemper (2005) estimated the total population at 700 genets in 2005.
Habitat: Bottoms and slopes of steep, narrow canyons in shrubby thickets and open woods along streams or cut banks, often in more xeric sites than other *Rubus* species (Kemper 2005).
Threats: Livestock grazing, competition from invasive weeds (including *Rubus bifrons*), inbreeding depression resulting from population fragmentation, and road construction and widening (Kemper 2005d).
Trends: Apparently downward; most populations have not been monitored systematically. Surveys in 2019 found that many populations appeared to have been displaced by *Rubus bifrons* (Fertig 2020a)
Managed Areas in WA: Army Corps of Engineers, Grande Ronde ACEC, Vale BLM, WA DNR, private.
Protection Status in Blue Mountains: Inadequately protected, with just one occurrence thought to occur within the Grande Ronde ACEC. Additional habitat may be protected at the Canyon Ranch Preserve (managed by Washington State University) and Chief Joseph Wildlife Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Grande Ronde Canyon, Lime Hill, Snake River.
Additional References: Camp and Gamon 2011, Fertig & Kleinknecht 2020, Rush 1999b.



Silene scouleri ssp. scouleri (Scouler's catchfly)

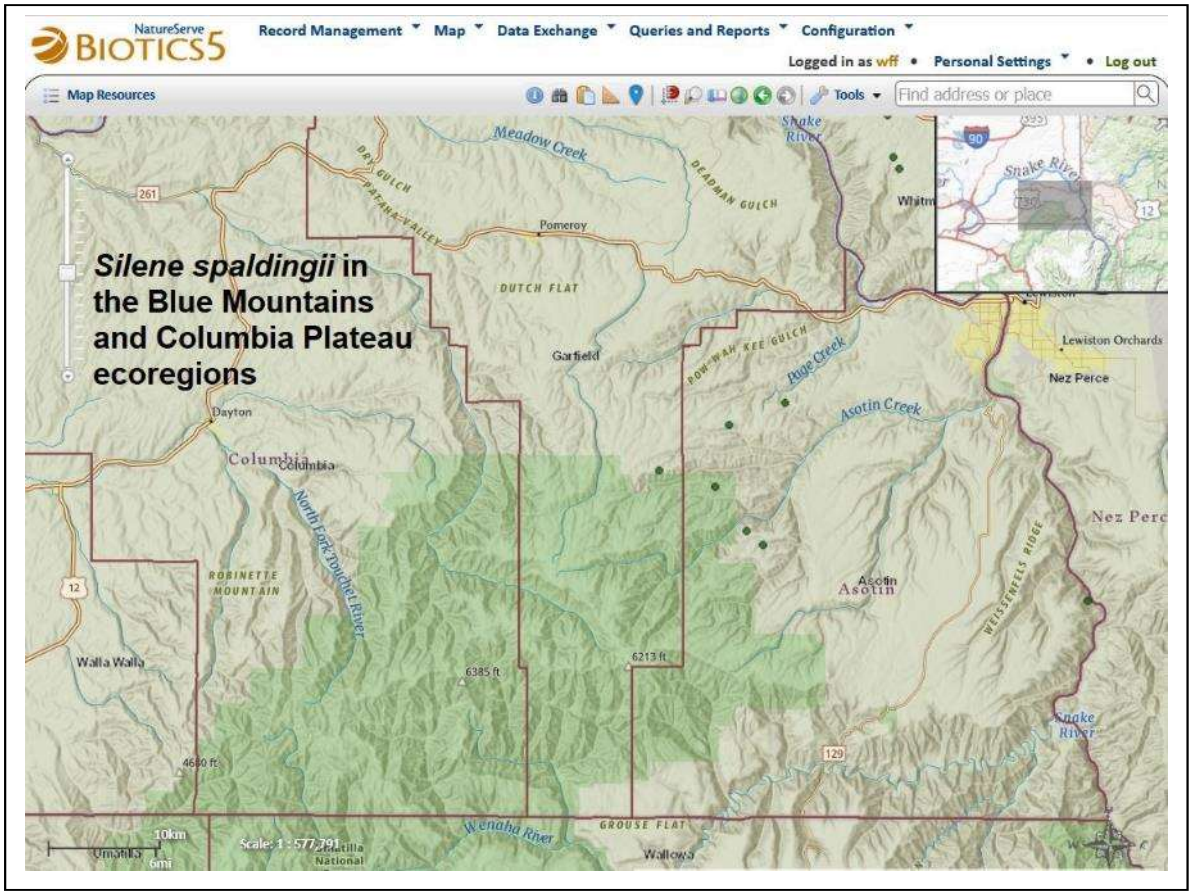
Legal Status: BLM Sensitive, USFS Sensitive
Conservation Status Rank: G5T3T5/S1; WA Sensitive
Range: British Columbia to northern Idaho, south to northern California. In Washington, found in Chelan, Clallam, Ferry, Garfield, Island, Pierce, Spokane, Stevens, Thurston, Whitman, and Yakima counties.
WA Ecoregions: Blue Mountains, Canadian Rockies, Columbia Plateau, East Cascades, Okanogan, Puget Trough
Number of Occurrences: Known from eight extant and 15 historical occurrences in Washington. Four populations have been relocated or discovered since 2004. A new population was discovered at Fields Spring State Park in 2020 as part of this study.
Abundance: Data lacking for nearly all populations (many historical sites may be extirpated). Reported as uncommon at Joint Base Lewis-McChord in 1993.
Habitat: Dry prairies, grassy bluffs, rocky ridges, timbered slopes, and upland meadows with scattered Douglas-fir and Subalpine fir from 60-2,100 m (190-6,900 ft).
Threats: Conversion of prairie habitat to agriculture or human development, fire suppression, competition from invasive plants, and grazing.
Trends: Downward historically, especially in prairie habitats of the Puget Trough ecoregion in western Washington.
Managed Areas in WA: Asotin Creek SWA, Colville National Forest, Ebey's Landing Preserve (TNC), Fields Spring SP, JB Lewis-McChord, Okanogan-Wenatchee NF, Steptoe Butte SP, William O. Douglas WA.



Protection Status in Blue Mountains: Both of the known occurrences in the Blue Mountains are in protected areas. Statewide, 5 occurrences are found in special management areas and the species is considered adequately protected (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Puffer Butte.
Additional References: Fertig & Kleinknecht 2020, Hitchcock et al. 1964, Hitchcock and Cronquist 2018.

Silene spaldingii (Spalding's catchfly)

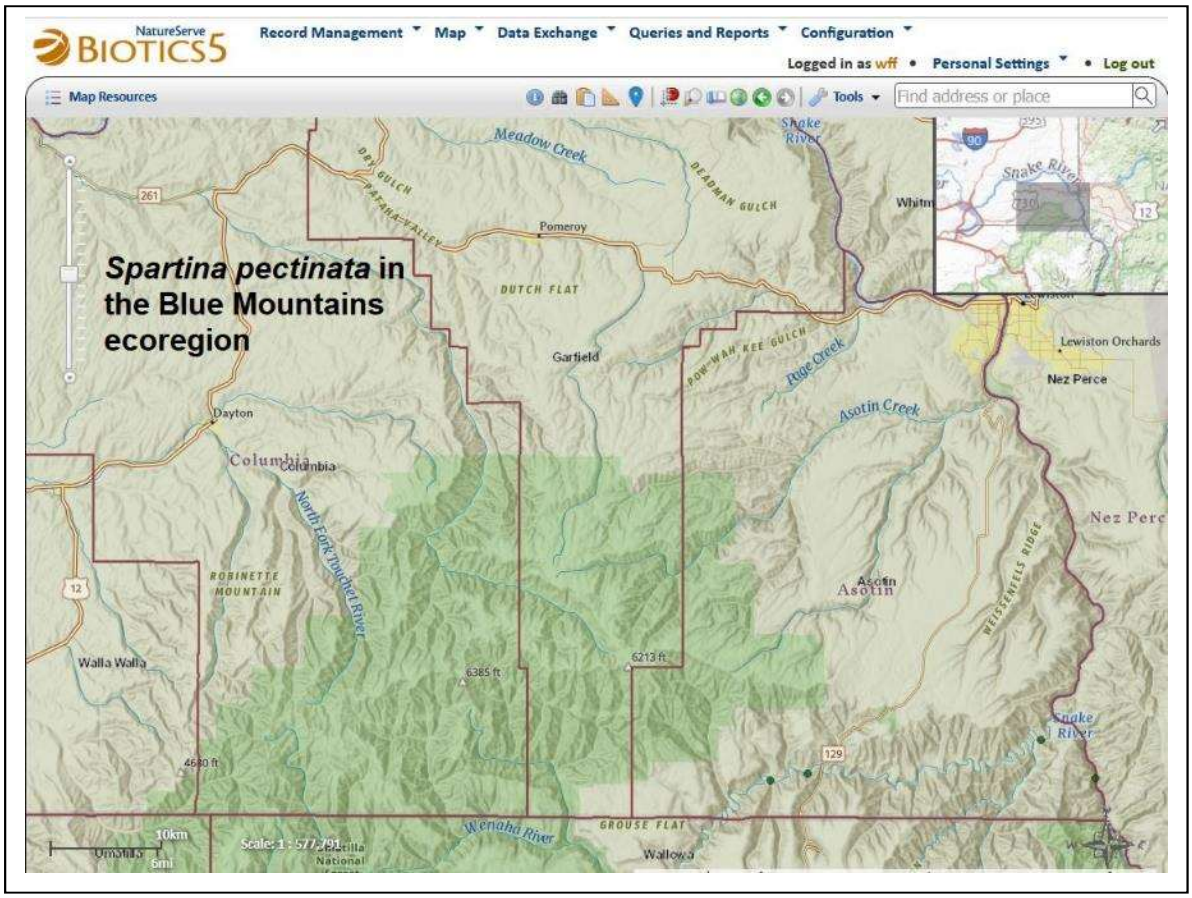
Legal Status: USFWS Threatened
Conservation Status Rank: G2/S2; WA Threatened
Range: Southern British Columbia to western Montana, south to eastern Washington, northeastern Oregon, and north-central Idaho. In Washington, known from Adams, Asotin, Lincoln, Spokane, and Whitman counties.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from 46 extant occurrences and eight historical or extirpated populations in Washington. Thirty-six occurrences have been relocated or discovered since 2000, with 21 documented since 2018 (Fertig 2021). The 54 occurrences in Washington are composed of over 500 discrete subpopulations (Niggemann and Fertig 2018). These can be aggregated into 9 "Key Conservation Areas" (KCA) divided among three main physiographic provinces: Canyon Grasslands, Channeled Scablands, and Palouse Grasslands (Arnett and Goldner 2017). KCAs are the main focus of recovery efforts for the species across its range (USFWS 2020).
Abundance: Hill and Gray (2004) estimated the entire Washington population to be 5,264 plants (out of a total of 24,365 individuals across its full range). A population discovered in 2008 at Asotin Creek Wildlife Area contained at least 6,000 plants. Current estimates suggest the state population is about 25,000 plants (USFWS 2020). Individual occurrences in Washington mostly range from 1 to 2,000.
Habitat: Idaho fescue grasslands with sparse shrub cover or patchy grassland and Ponderosa pine. Sites typically have deep loamy soils. Washington populations occur at elevations of 470-1,160 m (1,550-3,800 ft). Populations are often restricted to small "eyebrows" of undisturbed habitat embedded within a matrix of agricultural fields.
Threats: Loss of habitat to agriculture or human settlements, competition with invasive exotic plants, wildfire, population and habitat fragmentation, grazing and trampling, herbicides, and off-road vehicle recreation (USFWS 2007). A large wildfire destroyed native habitat over an extensive part of the Asotin Wildlife Area and Umatilla NF in 2021.
Trends: Declining over the past century as habitat has been lost to agriculture and development. Numbers may vary each year within a population due to prolonged dormancy of some mature individuals (not all plants produce above-ground stems each year, but persist below ground).
Managed Areas in WA: Asotin Creek Wildlife Area, Campus Prairie Biological Study Area, Coal Creek ACEC, Fairchild AFB, Kramer Palouse Biological Study Area, Nez Perce National Historic Park, Smoot Hill Biological Study Area, Spokane BLM, Steptoe Butte State Park, Swanson Lakes Wildlife Area, Turnbull National Wildlife Refuge, and Umatilla National Forest. A population has been introduced at the Steptoe Butte Natural Area Preserve.
Protection Status in Blue Mountains: Completely protected, with all 3 of the known occurrences found in Asotin Creek Wildlife Area. Statewide, 15 occurrences are in protected areas and the species is considered adequately protected (Fertig and Kleinknecht 2022). Additional populations might occur in the Rose Creek Preserve and on private lands with easements held by the Inland Northwest and Palouse land trusts.
Potential Inventory or Conservation Areas: Cape Horn/Cabin Ridge, Snake River, Sourdough Ridge/Lick Creek, Warner Gulch/Smoothing Iron Ridge.
Additional References: Arnett and Goldner 2017, Caplow 2002, Fertig & Kleinknecht 2020, Gamon 1991, Hill and Gray 2004, Lesica 1997.



Spartina pectinata (Prairie cordgrass)

Synonym: *Sporobolus michauxianus*
Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G5/S2; WA Sensitive
Range: Alberta to Newfoundland, south to Oregon, Utah, Texas, and Georgia. In Washington, found in Asotin, Douglas, Franklin, Garfield, Grant, Pend Oreille, Spokane, Walla Walla, and Whitman counties (WNHP 2022).
WA Ecoregions: Blue Mountains, Canadian Rockies, Columbia Plateau, Okanogan
Number of Occurrences: Known from 10 extant occurrences (most recently documented in 2019) and three historical populations (WNHP 2022).
Abundance: Data lacking for most occurrences in Washington. One population had approximately 200 ramets in 2003 (Fertig and Kleinknecht 2020).
Habitat: In Washington, found primarily along river banks, often on alkaline soils.
Threats: Grazing, conversion of habitat to agriculture, competition from invasive weeds, changes in hydrology from dam or reservoir construction. Ranked as Moderately Vulnerable to climate change (Fertig 2022).
Trends: Not known.

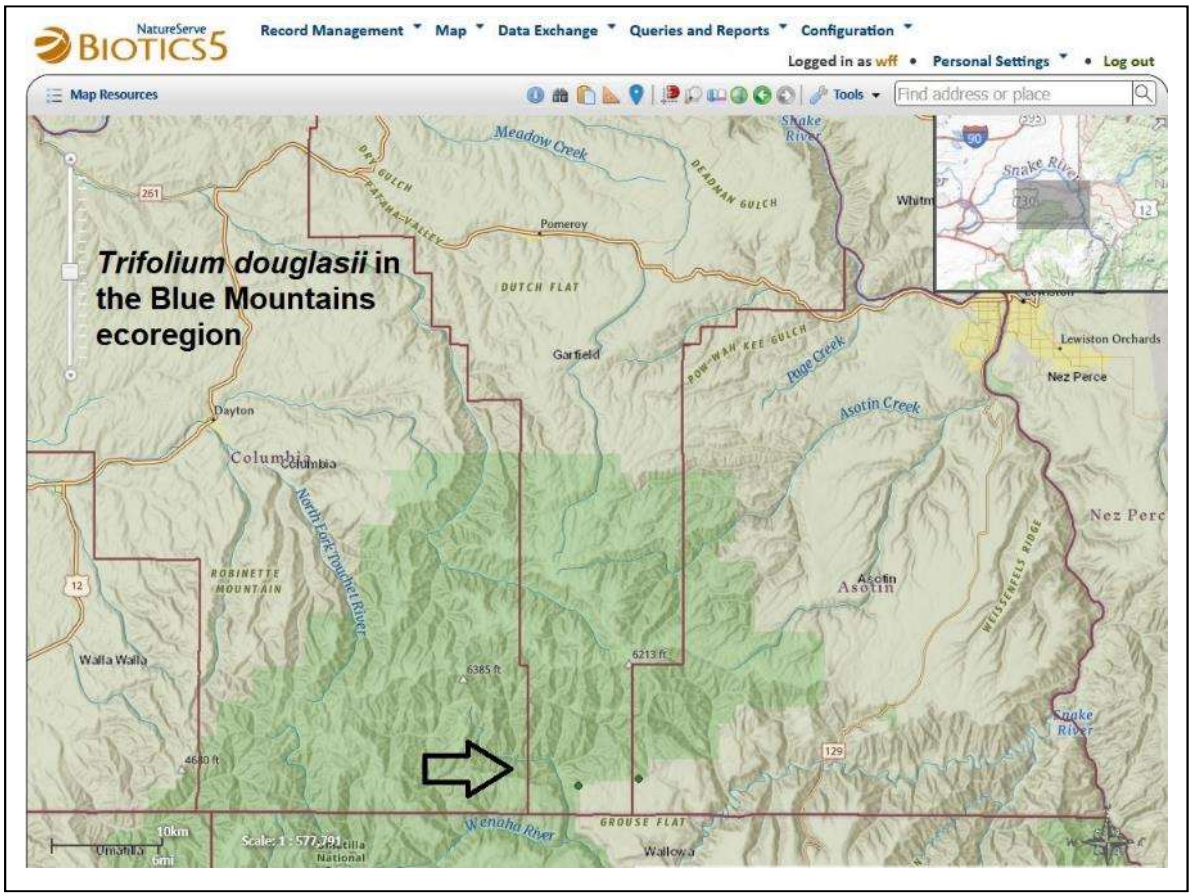
Managed Areas in WA: Chief Joseph Wildlife Area, Colville National Forest, Grande Ronde Area of Critical Environmental Concern, Little Pend Oreille Wildlife Area, McNary National Wildlife Refuge, Palouse Falls State Park, Riverside State Park, Vale BLM, Wells Wildlife Area.
Protection Status in Blue Mountains: All four occurrences in the Blue Mountains ecoregion are protected within the Chief Joseph Wildlife Area and Grande Ronde ACEC. Statewide, 9 occurrences are found in protected areas and the species is considered adequately protected (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Grande Ronde Canyon, Lime Hill.
Additional References: Camp and Gamon 2011, Roché et al. 2019.



Trifolium douglasii (Douglas' clover)

Legal Status: BLM Sensitive; USFS Sensitive
Conservation Status Rank: G3/S1; WA Endangered
Range: Regional endemic of eastern Washington, northeastern Oregon, and western Idaho. In Washington, currently known from Asotin and Garfield counties and historical reports from Spokane and Whitman counties.
WA Ecoregions: Blue Mountains, Columbia Plateau
Number of Occurrences: Known from two extant populations from the Blue Mountains (both documented since 2012 and most recently surveyed in 2021) and three historical reports from the Columbia Plateau (last observed in 1952).

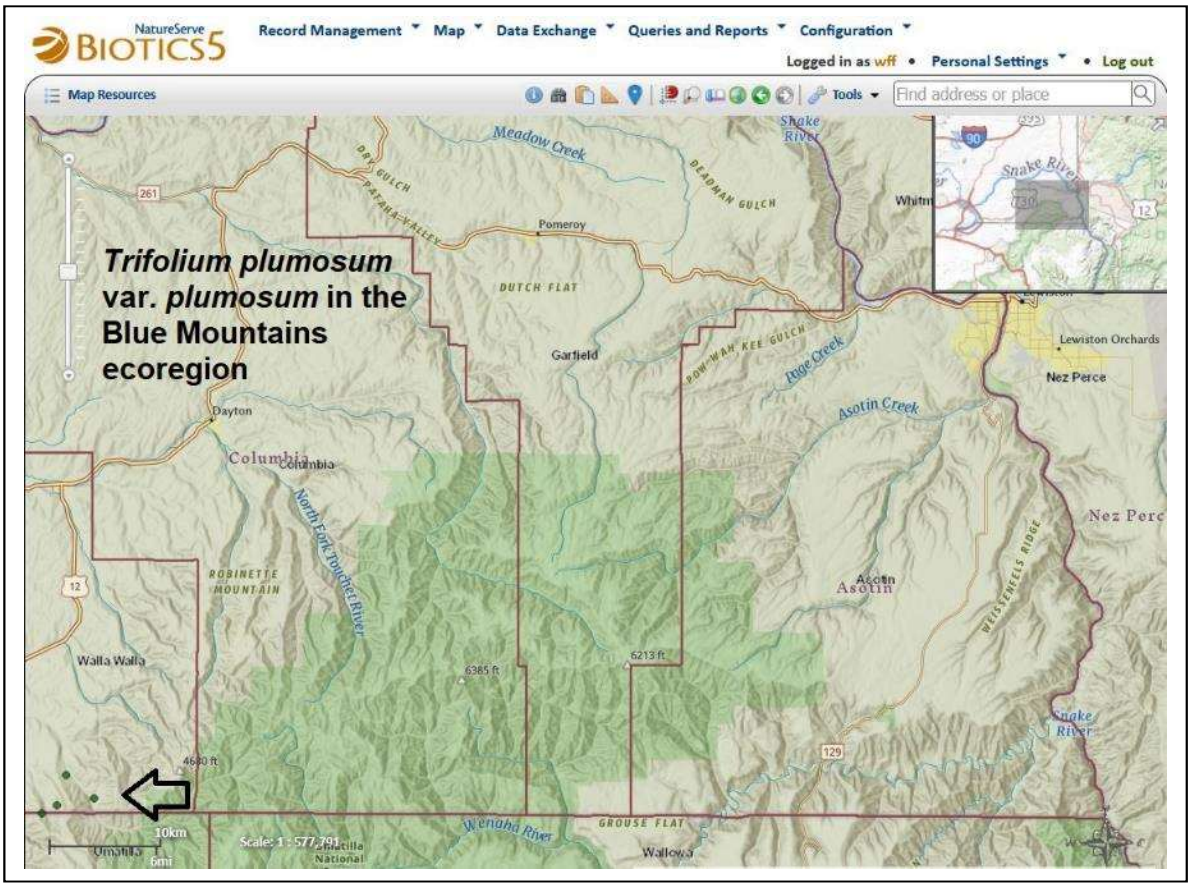
Abundance: One population on Umatilla NF contained 1,000-1,300 plants in 1993 and 2012, but only 8 were observed in 2021.
Habitat: Streambanks, forested wetlands, and wet meadows.
Threats: Conversion of wetland habitat to agriculture, competition from invasive weeds and native wetland species, grazing.
Trends: Probably downward, since 60% of known occurrences are considered historical. One extant occurrence declined significantly from 2012 to 2021, despite being largely within an exclosure.
Managed Areas in WA: Umatilla National Forest.
Protection Status in Blue Mountains: Unprotected. No occurrences in the state of Washington are currently on protected lands, although populations are known from within 5 km of several protected sites, including Chief Joseph Wildlife Area, Rose Creek Preserve, and Wenaha-Tucannon Wilderness Area (Fertig and Kleinknecht 2022).
Potential Inventory or Conservation Areas: Crooked Creek.
Additional References: Camp and Gamon 2011, Fertig 2020a, Fertig & Kleinknecht 2020.



Trifolium plumosum var. plumosum (Plumed clover)

Legal Status: none
Conservation Status Rank: G4T4/SH; WA Extirpated
Range: Regional endemic of the Blue Mountains of southeastern Washington (Walla Walla County) and Wallowa Mountains of northeastern Oregon.
WA Ecoregions: Blue Mountains

Number of Occurrences: Known from 4 historical occurrences in Washington, most recently observed in 1980.
Abundance: Not known, may be extirpated in Washington.
Habitat: Dry hillsides and meadows associated with Ponderosa pine (*Pinus ponderosa*) and Idaho fescue (*Festuca idahoensis*).
Threats: Agricultural development and livestock grazing.
Trends: Probably downward.
Managed Areas in WA: private.
Protection Status in Blue Mountains: Unprotected. No occurrences in the Blue Mountains ecoregion of Washington or Washington State are found in protected lands.
Potential Inventory or Conservation Areas: Kooskooskie.
Additional References: Camp and Gamon 2011.



Appendix B. Ecological Integrity Assessment of Selected Rare Plant Occurrences in the Blue Mountains Ecoregion

Lime Hill

Three assessment areas were surveyed at Lime Hill: two rare ecosystems and one ecosystem associated with the *Astragalus asotinensis* and *Astragalus arthurii* rare plant populations (Table B - 1, Figure B - 1).

Table B - 1. EIA Assessment Areas at Lime Hill

Assessment Area Name	Plant Association	Conservation Status Rank	Reason Assessed
Riparian Draw	*Philadelphus lewisii / Symphoricarpos albu*s Wet Shrubland	G1G2/S1S2	Rare plant association
Lime Hill Grasslands	Upper slopes: *Festuca idahoensis - Symphoricarpos albus* Grassland Lower slopes: *Pseudoroegneria spicata - Festuca idahoensis* Canyon Grassland	G1/S1; G3/S2	Rare plant association and populations of *Astragalus asotinensis* and *Astragalus arthurii* occur within this assessment area
Glossopetalon spinescens var. aridum / Pseudoroegneria spicata Shrubland	*Glossopetalon spinescens* var. *aridum / Pseudoroegneria spicata* Shrubland	G4/SNR	Plant association not yet recorded in WA

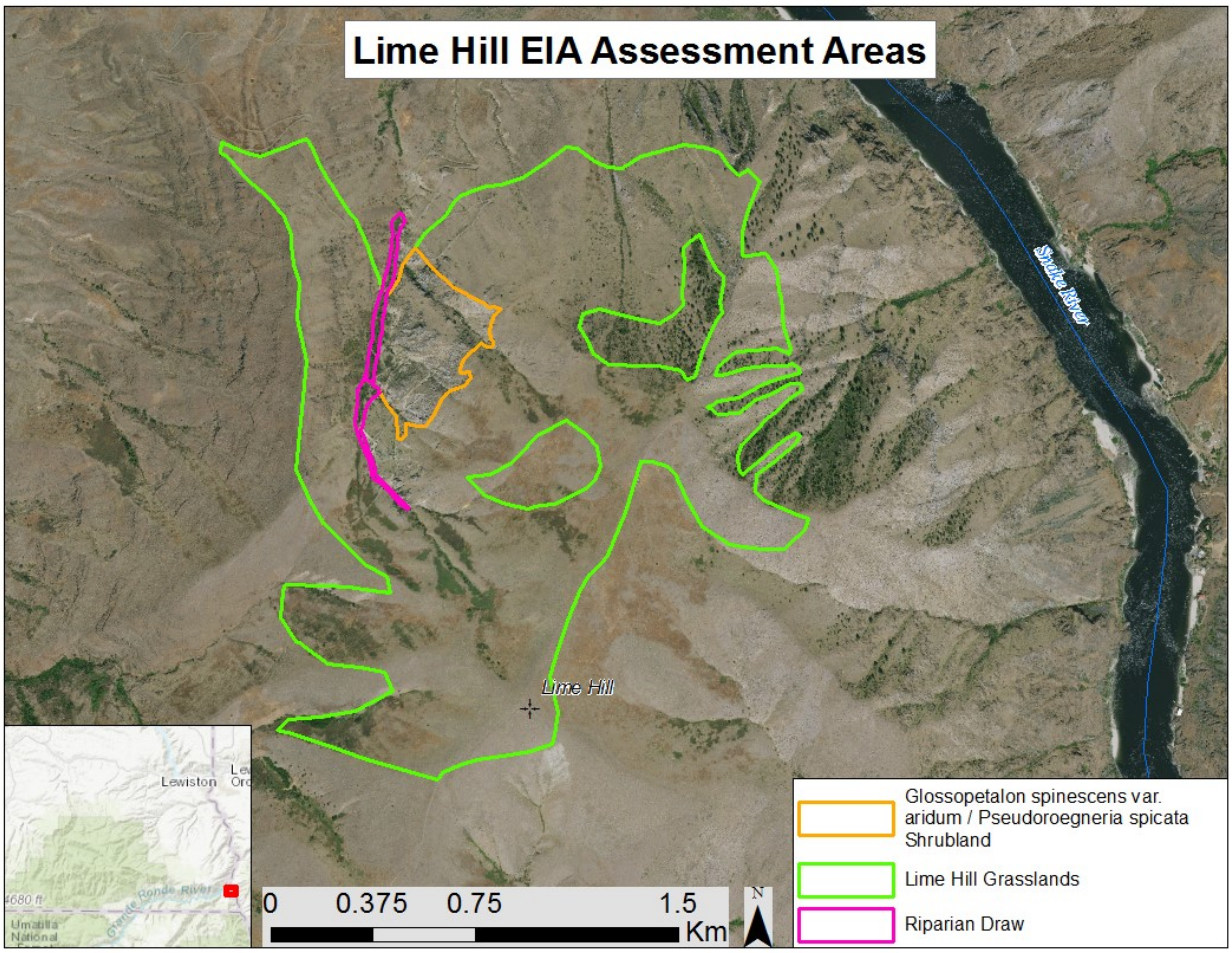


Figure B - 1. Map of EIA Assessment Areas at Lime Hill

Riparian Draw

Landscape context: B, Condition: A, EIA Rank A-, EO Rank B+
Classification:

Ecological System: Columbia Basin Foothill Riparian Woodland and Shrubland
WNHP Subgroup: Columbia Plateau Intermittent Riparian Shrubland
Association: Philadelphus lewisii / *Symphoricarpos albus* Wet Shrubland
G1G2/S1S2

Description:
This area is a 2.09 acre intermittent dry riparian drainage located in a draw between two ridges with inputs likely from precipitation and some groundwater seepage. The vegetation community is dominated by *Philadelphus lewisii*, *Holodiscus discolor*, *Amelanchier alnifolia*, and *Symphoricarpos albus*. The draw is more densely shrubby towards base of drainage and is surrounded by *Festuca idahoensis* - *Pseudoroegneria spicata* grassland outside of the assessment area. The drainage is crisscrossed by revegetated old roads that sees little foot traffic. Within the waterway, there is no obvious scour or channel. The immediately surrounding grasslands are in good condition but become more invaded downslope. Based on the G/S ranks for this association and the EIA score for this area, it would be considered an EO (Table B - 2).

Landscape Context Rank: B

Within the 500 m of the assessment area, contiguous natural land cover is greater than 99%. There are dirt roads in and around the assessment area, but they have been decommissioned and revegetated. Much of the surrounding landscape are areas used for grazing in natural pastures, and some light recreation. The land directly surrounding the assessment area (the edge) are 100% natural land cover, although flanked by decommissioned roads. On average, the natural edge is greater than 100 m wide. The condition of the edge has a higher proportion of invasive plants than within the assessment area, especially on the lowest slopes.

Condition Rank: A

Within the assessment area there is >99% relative cover of native vegetation. Non-native species observed within the assessment area included *Cynoglossum officinale* and *Hypericum perforatum*. No invasive species were observed within the assessment area. The dominant species expected for this plant association are present. There is a slight reduction in shrub cover in the areas the decommissioned road crosses, as well as some increased erosion and soil disturbance; however, this is a small percentage of the total area. There were no observed impacts to woody regeneration or litter. There were also no stressors observed that impact the hydrology of the site.

Table B - 2. EIA Metric Ranking for the Lime Hill Riparian Draw Assessment Area

Metric	Rank
LAN1. Contiguous Natural Land Cover	A
LAN2. Land Use Index	A
LAN MEF	A
BUF1. Perimeter with Natural Buffer	A
BUF2. Width of Natural Buffer	A
BUF3. Condition of Natural Buffer	C
BUF MEF	B-
Landscape PFS	B
VEG1. Native Plant Species Cover	A
VEG2. Invasive Nonnative Plant Species Cover	A
VEG3. Native Plant Species Composition	A
VEG4. Vegetation Structure	A
VEG5. Woody Regeneration	A
VEG6. Coarse Woody Debris	A
VEG MEF	A
HYD1. Water Source	A
HYD2. Hydroperiod	A
HYD3. Hydrological Connectivity	A
HYD MEF	A
SOI1. Soil Condition	B
SOIL MEF	B
Condition PFS	A
SIZ1. Comparative Size	C
SIZ2. Change in Size (optional)	NR
EIA Score	A-
EO Score	B+

Lime Hill Grasslands

Landscape context: B, Condition: C, EIA Rank B-, EO Rank B+
Classification:

Ecological System: Northern Rocky Mountain Lower Montane Foothill and Valley Grassland
Associations:

- Upper slopes: *Festuca idahoensis* - *Symphoricarpos albus* Grassland G1/S1
- Lower slopes: *Pseudoroegneria spicata* - *Festuca idahoensis* Canyon Grassland G3/S2

Very large area assessed. Lower slopes generally canyon grassland, shifts to more deep soiled lower montane grassland on the upper slopes and near the top of the ridge.

Description:
This assessment encompasses a very large area (121.98 acres) spanning all the grassland areas on Lime Hill. The primary community throughout the assessment area is *Pseudoroegneria spicata – Festuca idahoensis* Canyon Grassland. The upper slopes near the top of the ridge have deeper soils and shifts to a *Festuca idahoensis – Symphoricarpos albus* montane grassland that feature patches of *Symphoricarpos* spp. and *Rosa* spp. similar to those found in Palouse grasslands. There are two primary rare plants located within this grassland, *Astragalus asotinensis*, primarily found on limestone soils, and Astragalus arthurii, found on all other soils. Forb diversity is high across all plant communities. There is a presumed greater grazing history at top of ridge as old grazing infrastructure was observed there. The north and east slopes are in best condition overall. Both lime and basalt outcrops are present. Based on the G/S ranks for this association and the EIA score for this area, it would be considered an EO (Table B - 3).

Landscape Context Rank: B
Within the 500 m area surrounding the assessment area there is 100% contiguous natural land cover. The dirt roads in and around the assessment area have been decommissioned and revegetated. Within the natural land cover there are areas used for grazing in natural pastures, and some light recreation. The land directly surrounding the assessment area (the edge), is entirely natural land cover although flanked by decommissioned roads. On average, the natural edge is greater than 100 m wide. The condition of the buffer has a higher proportion of invasive plants than within the assessment area, especially on the lowest slopes, in particular the southwestern slope, and along the river.

Condition Rank: C
Relative native vegetation cover was not assessed in this area, however the lower canyon grasslands were in better condition (B condition) than the grasslands on and near the top of the ridges, which were much weedier (C condition). The toe slopes had the highest proportion of invasive plants, low-mid slopes had the lowest proportion of invasive plants, and the tops of the ridges has a moderate amount. Invasive species observed in the assessment area included *Anthriscus* spp., various non-native bromes (*Bromus tectorum* was particularly abundant)), *Centaurea* spp., *Dipsacus fullonum*, *Sisymbrium altissimum*, various invasive thistles, *Aegilops cylindrica*, *Ventenata dubia*, and *Taeniatherum caput-medusae*. As expected, *Festuca idahoensis* and *Pseudoroegneria spicata* trade dominance throughout the site and are only both reduced in patches of stressor impact. Overall, the site had high forb diversity, although forbs were slightly

decreased in weedier patches. Increasers (native species whose dominance is indicative of degraded ecological conditions, such as heavy grazed or browsed occurrences) in areas of grazing or erosion impact included *Achillea millefolium* and *Gutierrezia* spp. Shrub cover was as expected and bunchgrass cover was only slightly reduced in weedier areas. Litter accumulation is within the natural range of variation but is composed of nonnative plant material in weedier areas. Biological soil crust was observed on some steeper areas, although the site potential for soil crust is unknown. The primary soil stressor is the old road cut cutting up Lime Hill from the north; however, it appears to have revegetated fairly well and will reduce in impact over time. There is a faint 2-track road at the very top of the hill that is only causing minor disruption to soils.

Table B - 3. EIA Metric Ranking for the Lime Hill Grasslands Assessment Area

Metric	Rank
LAN1. Contiguous Natural Land Cover	A
LAN2. Land Use Index	A
LAN MEF	A
EDG1. Perimeter with Natural Edge	A
EDG2. Width of Natural Edge	A
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	C
EDG MEF	B-
Landscape PFS	B
VEG1. Native Plant Species Cover	C
VEG2. Invasive Nonnative Plant Species Cover	C-
VEG3. Native Plant Species Composition	B
VEG4. Vegetation Structure	B
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	B
VEG MEF	C+
SOI1. Soil Condition	B
SOIL MEF	B
Condition PFS	C
SIZ1. Comparative Size	B
SIZ2. Change in Size (optional)	NR
EIA Score	B-
EO Score	B+

Glossopetalon spinescens var. aridum / Pseudoroegneria spicata Shrubland

Landscape context: A, Condition: A. EIA Rank A-, EO Rank A+
Classification:

Ecological System: Inter-Mountain Basins Semi-Desert Shrub-Steppe
Plant Association: Glossopetalon spinescens var. aridum / *Pseudoroegneria spicata* Shrubland
G4/SNR

Description:
This is the first documented occurrence of this plant association in Washington, although it is known to occur nearby in Idaho. This 20.96 acre association was found in a step in slope on a steep northwest-facing aspect with limestone outcroppings. *Glossopetalon spinescens var. aridum* dominates the patchy, short shrub layer with *Pseudoroegneria spicata* establishing on areas of soil

development. An old road bisects the stand, but it has been decommissioned and revegetated. Relatively few non-native or invasive plants were observed aside from scattered bromes. Based on the G/S ranks for this association and the EIA score for this area, it would be considered an EO. More information on this ecosystem is available in Appendix B.

Landscape Context Rank: A

Within the 500 m area surrounding the assessment areas there is >99% contiguous natural land cover with little contemporary land use. The dirt roads in and around the assessment area have been decommissioned and revegetated. Within the natural land cover there are areas used for grazing in natural pastures, and some light recreation. The land directly surrounding the assessment area (the edge), is entirely natural land cover although flanked by decommissioned roads. On average, the natural edge is greater than 100 m wide. The condition of the edge has a higher proportion of invasive plants than within the assessment area, especially on the lowest slopes.

Condition Rank: A

Within the assessment area there is >99% relative cover of native plants. The only non-native plants observed were *Bromus* spp. at slightly greater than 1% absolute cover. There was no observed degradation to neither the diagnostic native plants nor overall diversity. There was some *Gutierrezia sarothrae* present but it wasn't linked to any apparent anthropogenic stressor. No degradation to the vegetation structure was observed and excellent biotic crust had formed where the slope was stable. This plant community has naturally low litter cover due to the slope and there was no apparent reduction in shrub regeneration. The bisecting decommissioned road introduces some minimal excess erosion.

Table B - 4. EIA Metric Ranking for the Lime Hill Glossopetalon spinescens var. aridum / Pseudoroegneria spicata Shrubland Assessment Area

Metric	Rate
LAN1. Contiguous Natural Land Cover	A
LAN2. Land Use Index	A
LAN MEF	A
EDG1. Perimeter with Natural Edge	A
EDG2. Width of Natural Edge	A
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	B
EDG MEF	B+
Landscape PFS	A
VEG1. Native Plant Species Cover	A-
VEG2. Invasive Nonnative Plant Species Cover	B
VEG3. Native Plant Species Composition	A
VEG4. Vegetation Structure	A
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	NR
VEG MEF	A-
SOI1. Soil Condition	B
SOIL MEF	B
Condition PFS	A
SIZ1. Comparative Size	A
SIZ2. Change in Size (optional)	NR
EIA Score	A-
EO Score	A+

Pataha

Two ecological integrity assessments were performed at Pataha RNA. One encompassing the entire grassland and one restricted to the area occupied by the *Phlox solivaga* population (Table B - 5, Figure B - 2).

Table B - 5. EIA Assessment Areas at Pataha RNA

Assessment Area	Plant Association	Global and State Rank	Reason Assessed
Larger Ecosystem EIA	CEGL001624 *Festuca idahoensis* - *Pseudoroegneria spicata* Grassland	G4/S2	Grassland ecosystem encompassing majority of Pataha RNA
Rare Plant EIA	CEGL001624 *Festuca idahoensis* - *Pseudoroegneria spicata* Grassland	G4/S2	Phlox solivaga population

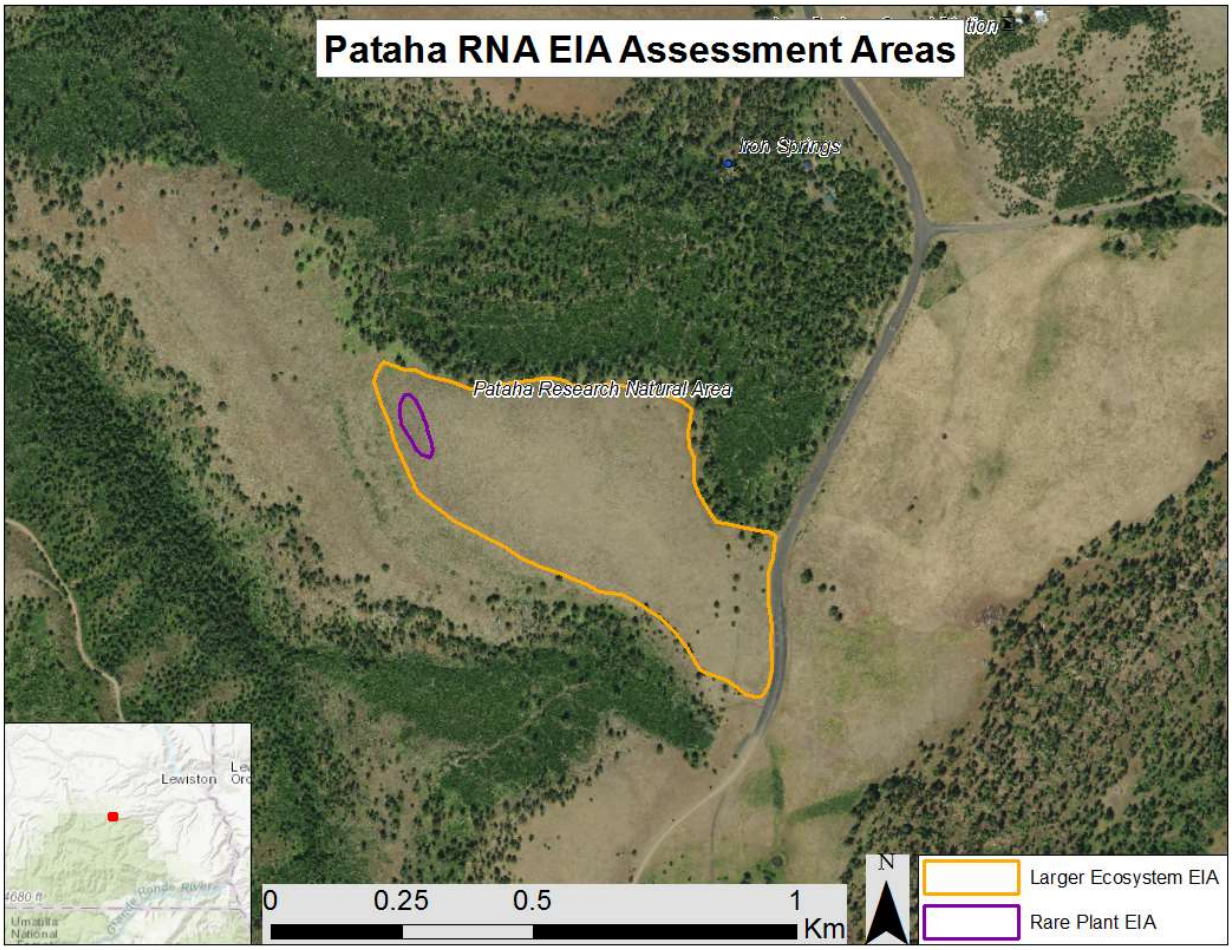


Figure B - 2. Map of EIA Assessment Areas at Pataha RNA

Larger Ecosystem EIA

Landscape context: B, Condition: B, EIA Rank B+, EO Rank B-
Classification

Ecological System: Northern Rocky Mountain Lower Montane Foothill and Valley Grassland
Association: CEGL001624 *Festuca idahoensis* - *Pseudoroegneria spicata* Grassland, G4/S2

Description
This 28.51 acre grassland is a part of the Pataha RNA within the Umatilla National Forest. *Festuca idahoensis* and *Pseudoroegneria spicata* share patchy dominance of the grassland with abundant forbs. There are fewer fobs in in the southwestern *Pseudoroegneria spicata* dominated areas. Overall, little shrub encroachment was observed. Some annual weeds are becoming prevalent in spaces between bunchgrasses, particularly on southern and western slopes. There is minimal human impact at the site but some disturbance is visible via ruts/escaped cow impacts. Soil crust somewhat patchy but possibly within NRV. Area appears to have burned approx. 10 years ago. Extent same as previously mapped in EO ID 4088 (Table B - 6).

Landscape Context Rank: B
Within 500 m of the assessment area, there is approximately 90% contiguous natural land cover. Natural landcover is broken by the NF-42 road. Tilled agriculture makes up approximately 8% of the surrounding landscape. The remainder is lightly grazed. The edge of the assessment area is approximately 85% natural land cover and is an average of >100 m wide. There was evidence of some weeds and fire within the natural edge.

Condition Rank: B
Within the assessment area we observed approximately 88% cover of native plant species. The non-native species observed were most prevalent on breaks in the southern and western slopes as well as along the roadway. *Ventenata dubia* and *Bromus tectorum* are abundant in patches. *Poa pratensis* and *Phleum pratense* were also observed. The diagnostic species for this association, primarily *Festuca idahoensis* and *Pseudoroegneria spicata*, were present and in the expected amounts. Species diversity did not seem reduced based on the information available. *Festuca idahoensis* is also a decreaser species (a species that decline rapidly due to stressors) indicating that this ecosystem has a low level of anthropogenic stressors. *Potentilla gracilis* was observed near the road, but did not appear to be acting as an increaser throughout the site. Some soil crust was observed but at lower cover than expected due to herbaceous litter accumulation, however, this coverage of soil crust is still likely within the natural range of variation. Within the assessment area there is some shallow rutting from vehicles in a few spots and some evidence of transient cattle. This area may have burned around ten years ago.

Table B - 6. EIA Metric Rankings for the Pataha Larger Ecosystem Assessment Area

Metric	Rank
LAN1. Contiguous Natural Land Cover	B
LAN2. Land Use Index	B
LAN MEF	B
EDG1. Perimeter with Natural Edge	B
EDG2. Width of Natural Edge	A
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	A
EDG MEF	A-
Landscape PFS	B
VEG1. Native Plant Species Cover	B
VEG2. Invasive Nonnative Plant Species Cover	C
VEG3. Native Plant Species Composition	A
VEG4. Vegetation Structure	A
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	A
VEG MEF	B+
SOI1. Soil Condition	B
SOIL MEF	B+
Condition PFS	B
SIZ1. Comparative Size	NR
SIZ2. Change in Size (optional)	NR
EIA Score	B+
EO Score	NR

Rare Plant EIA

Within the larger ecosystem assessment area is a small 0.5 acre population of *Phlox solivaga*. The area encompassing the rare plant population was assessed separately from the larger ecosystem assessment area described above.

Landscape context: A, Condition: A, EIA Rank A+, EO Rank B-
Classification

Ecological System: Northern Rocky Mountain Lower Montane Foothill and Valley Grassland
Association: CEGL001624 *Festuca idahoensis - Pseudoroegneria spicata* Grassland, G4/S2. This is the same classification as the larger landscape. The rare plant area is primarily differentiated by the thinner, rockier soils than the majority of the site.

Description:
This area was fairly discrete within the assessment area as the rare plant was only found on a rocky break in slope on the western end of the ecosystem assessment area. For more information about the larger ecosystem, see the description above. The slope is approximately 11 degrees and there is a 5% cover of rocks. This area is entirely within the previously mapped in ecosystem EO ID 4088 for the Festuca idahoensis - Pseudoroegneria spicata Grassland.

Landscape Context Rank: A
Within 500 meters of the rare plant population, 99% of the area is contiguous natural land cover broken only at the very edge by a road. The nearby forests have been logged, but have natural

composition. Roads comprise less than 1% of the buffer area, and the remaining land outside of the RNA is lightly to moderately grazed. The perimeter surrounding the rare plant population is entirely natural land cover at a width of greater than 100 meters. Within the natural edge surrounding the rare plant population, we observed transient grazing, a few 4x4 or truck ruts, and some Ventenata dubia and Bromus tectorum with a cover of around 5%.

Condition Rank: A

The area encompassing the rare plant population had a native vegetation cover of greater than 99%. Only trace amounts of *Ventenata dubia* were observed. The diagnostic species of the plant community were present and overall species diversity appears normal based on available information about the community. Bunchgrass cover is strong with little encroachment by woody species. This area may have burned around ten years ago and there is currently little herbaceous fuel accumulation.

Table B - 7. EIA Metric Rankings for the Pataha Rare Plant Assessment Area

Metric	Rank
LAN1. Contiguous Natural Land Cover	A
LAN2. Land Use Index	B
LAN MEF	A-
EDG1. Perimeter with Natural Edge	A
EDG2. Width of Natural Edge	A
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	A
EDG MEF	A
Landscape PFS	A
VEG1. Native Plant Species Cover	A-
VEG2. Invasive Nonnative Plant Species Cover	A
VEG3. Native Plant Species Composition	A
VEG4. Vegetation Structure	A
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	A
VEG MEF	A+
SOI1. Soil Condition	A
SOIL MEF	A
Condition PFS	A
SIZ1. Comparative Size	D
SIZ2. Change in Size (optional)	NR
EIA Score	A+
EO Score	B-

Sawtooth Ridge

In this area, we scored both the areas with *Phlox solivaga* plants and the larger ecosystem surrounding the rare plant populations. These two assessment areas were different sizes (Ecosystem 21.7 ac, rare plant pops 3.36 acres) but otherwise scored the same in all metrics (Figure B - 3).

Landscape context: A, Condition: A. EIA Rank A+, EO Rank A+

Classification:

Ecological System: Northern Rocky Mountain Subalpine-Upper Montane Grassland
Association: CTWA003382 *Festuca idahoensis* - *Pseudoroegneria spicata* - *Phlox* spp. Grassland GNR/SNR. Non-USNVC association from Johnson and Swanson 2005. A naturally discontiguous type that occurs on windblown ridges with rocky soil where woody plant species are unlikely to establish.

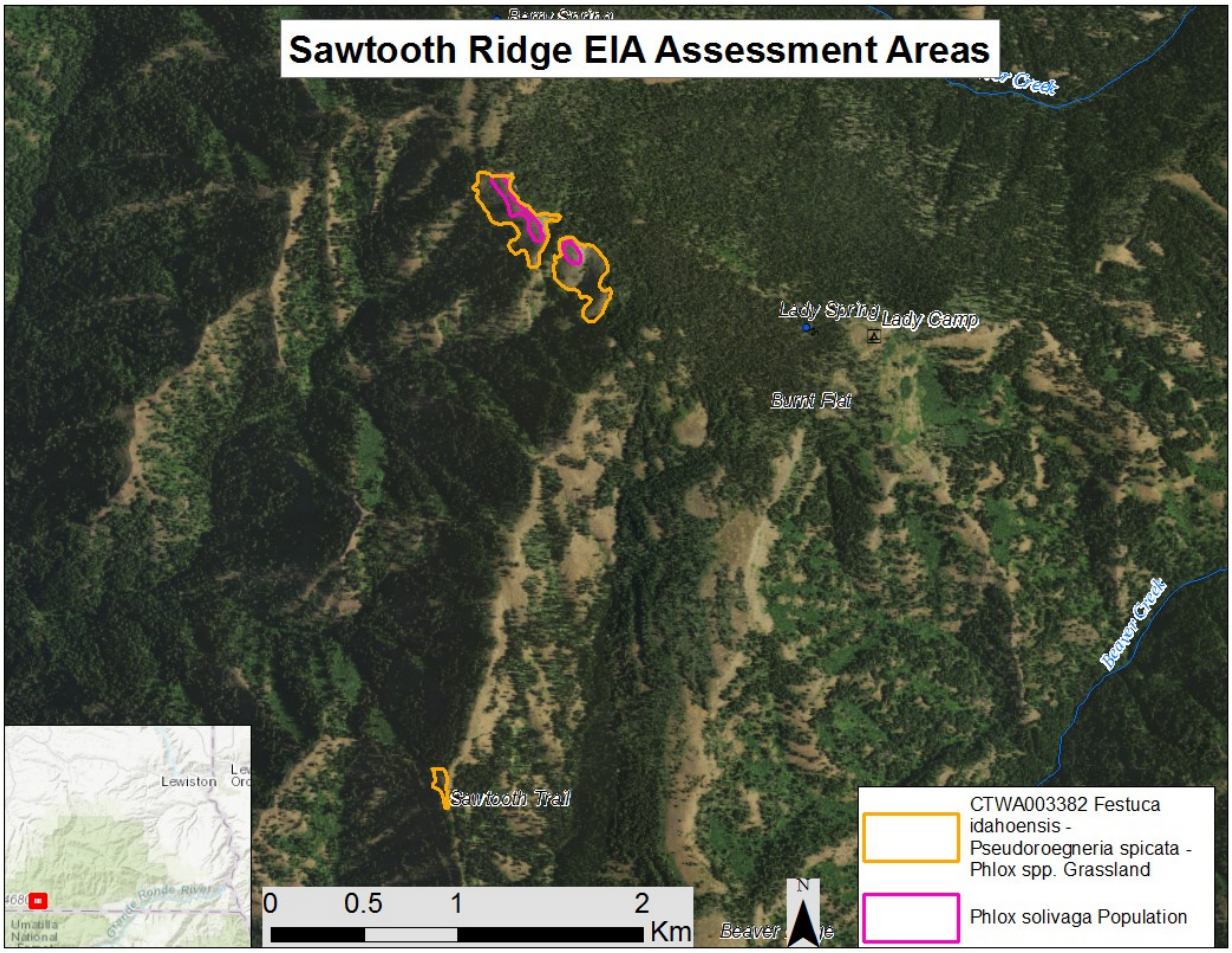


Figure B - 3. Map of EIA Assessment Areas on Sawtooth Ridge

Description

This is a windswept, southwest facing grassland located on interfluve/high slope ridges and outcroppings on a coarse, basalt substrate with copious cobbles. Snowdrifts form on the lee side and there is a trail on the upslope edge. Less Eriogonum douglasii was observed on north end. These grasslands transition from more open, rocky types, to more closed-canopy grasslands dominated by Festuca idahoensis as one proceeds downslope. Based on the G/S ranks and the EIA score for this area, it would be considered an EO (Table B - 8).

Landscape Context Rank: A

Within 500 m surrounding the assessment area, there is 100% contiguous natural land cover. The only observed stressors to this area is light recreation from trial on upslope edge, otherwise the

area is managed for natural vegetation. Within the buffer immediately surrounding the AAs, it is 100% natural cover in the perimeter and is an average of greater than 100 m. No invasive plants were observed in the buffer area.

Condition Rank: A

Within the assessment area, there is 100% relative cover of native plants. No invasive plants were observed in the assessment area. There are no known historical grazing impacts. No shrub encroachment into the naturally open grassland was observed. There was more bare soil observed at this site than at Griffin Peak. We observed ~5% moss cover, although little is known about the natural variability of crust in these environments.

Table B - 8. EIA Metric Rankings for the Sawtooth Ridge Assessment Areas

Metric	Rank
LAN1. Contiguous Natural Land Cover	A
LAN2. Land Use Index	A
LAN MEF	A
EDG1. Perimeter with Natural Edge	A
EDG2. Width of Natural Edge	A
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	A
EDG MEF	A
Landscape PFS	A
VEG1. Native Plant Species Cover	A
VEG2. Invasive Nonnative Plant Species Cover	A
VEG3. Native Plant Species Composition	A
VEG4. Vegetation Structure	A
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	A
VEG MEF	A
SOI1. Soil Condition	A
SOIL MEF	A
Condition PFS	A
SIZ1. Comparative Size	A
SIZ2. Change in Size (optional)	NR
EIA Score	A+
EO Score	A+

Griffin Peak

In this area, EIA metrics were scored within the extent of the *Phlox solivaga* population and contiguous habitat in similar condition (Figure B - 4).

Landscape context: A, Condition: A, EIA Rank A+, EO Rank A-

Classification:

Ecological System: Northern Rocky Mountain Subalpine-Upper Montane Grassland
Association: CTWA003382 *Festuca idahoensis* - *Pseudoroegneria spicata* - Phlox spp. GNR/SNR (Non-USNVC association from Johnson and Swanson 2005. A naturally discontiguous type that occurs on windblown ridges with rocky soil where woody plant species are unlikely to establish).

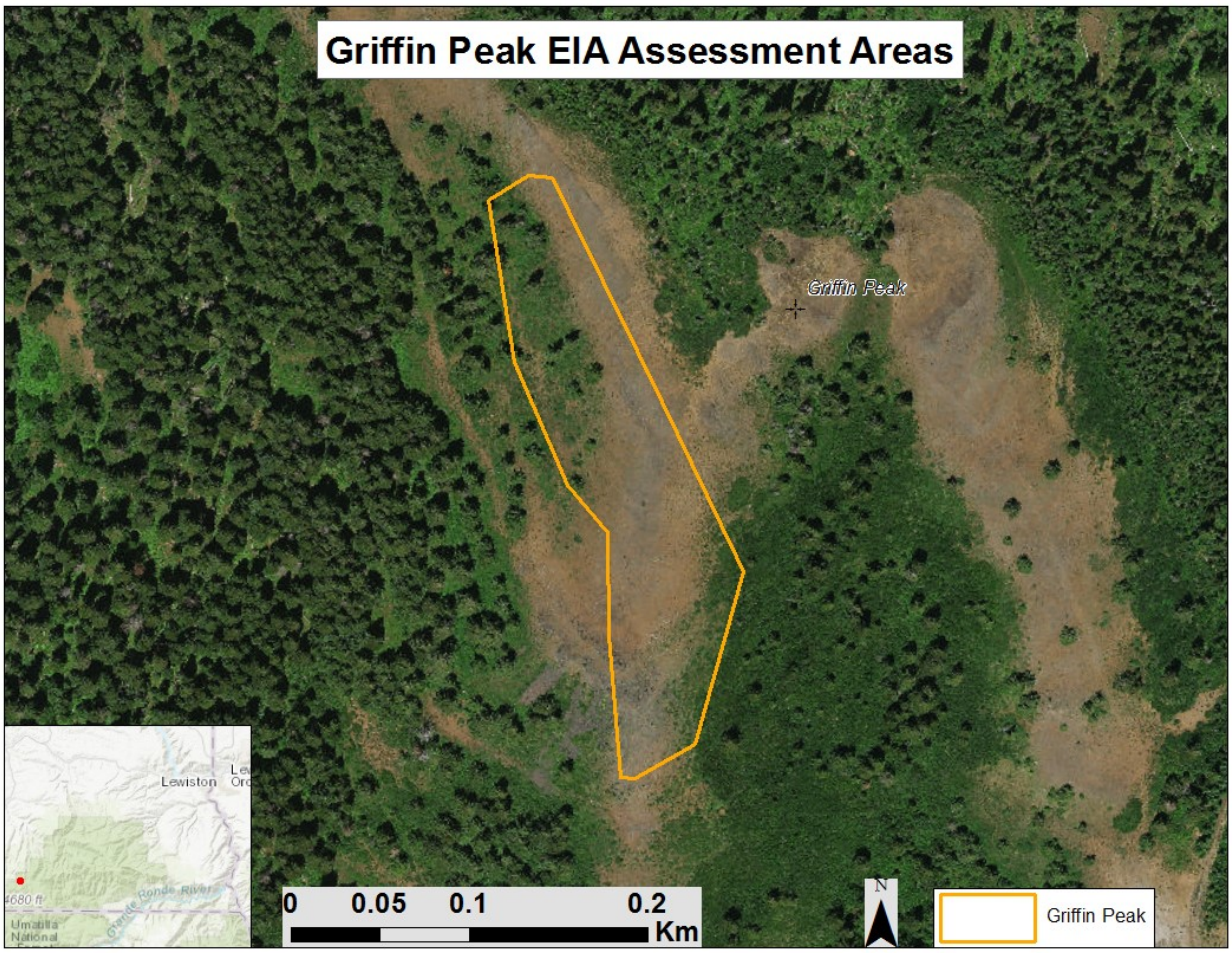


Figure B - 4. Map of EIA Assessment Area on Griffin Peak

Description

This is a small, 1 acre, rocky grassland on the summit of Griffin Peak, a windblown south facing slope with little snow accumulation. We assessed only the area of this ecosystem encompassing the *Phlox solivaga* plant community. There may be additional, similarly ranked, occurrences of this ecosystem on adjacent similar ridge tops. Based on the G/S ranks and the EIA score for this area, it would be considered an EO (Table B - 9. EIA Metric Rankings for the Griffin Peak Assessment AreaTable B - 9).

Landscape Context Rank: A

Within 500 m of the assessment area, there is 72% contiguous natural land cover. Natural cover is broken by forest roads. Nearby areas were clearcuts from the late 80s and salvage sale from the early 90s, but these are now mature old fields with natural composition. Remaining area that is not a forest road has some light grazing. Within the buffer immediately surrounding the AAs, it is 100% natural cover in the perimeter and is an average of greater than 100 m. The non-native grass *Poa bulbosa* was observed outside of the assessment area. Within the buffer is a 4x4 track to the summit of Griffin Peak, but it did not enter the assessment area.

Condition Rank: A

Within the assessment area, there is >99% relative cover of native vegetation. No invasive plants were observed within the assessment area. No reduction in bunchgrass cover or woody invasion was observed at this windswept site. Shrubs were observed on deeper soils nearby outside the assessment area. There was little litter accumulation as expected on a windblown site. An intact, fairly diverse biological crust was present throughout the assessment area. No anthropogenic disturbance to the soil was observed, however, there were some overturned rocks, likely flipped by bears.

Table B - 9. EIA Metric Rankings for the Griffin Peak Assessment Area

Metric	Rank
LAN1. Contiguous Natural Land Cover	B
LAN2. Land Use Index	B
LAN MEF	B
EDG1. Perimeter with Natural Edge	A
EDG2. Width of Natural Edge	A
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	A
EDG MEF	A
Landscape PFS	A
VEG1. Native Plant Species Cover	A
VEG2. Invasive Nonnative Plant Species Cover	A
VEG3. Native Plant Species Composition	A
VEG4. Vegetation Structure	A
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	A
VEG MEF	A
SOI1. Soil Condition	A
SOIL MEF	A
Condition PFS	A
SIZ1. Comparative Size	C
SIZ2. Change in Size (optional)	NR
EIA Score	A+
EO Score	A-

Tam Tam Ridge

In this area, EIA metrics were scored within the extent of the *Phlox solivaga* population (Figure B - 5).

Landscape context: B, Condition: C, EIA Rank B-, EO Rank C-
Classification:

Ecological System: Northern Rocky Mountain Lower Montane Foothill and Valley Grassland
Association: CEGL001624 *Festuca idahoensis* - *Pseudoroegneria spicata* Grassland G4/S2 This area is either a degraded *Festuca idahoensis* - *Pseudoroegneria spicata* grassland or perhaps *Pseudoroegneria spicata* - *Poa secunda* Grassland.

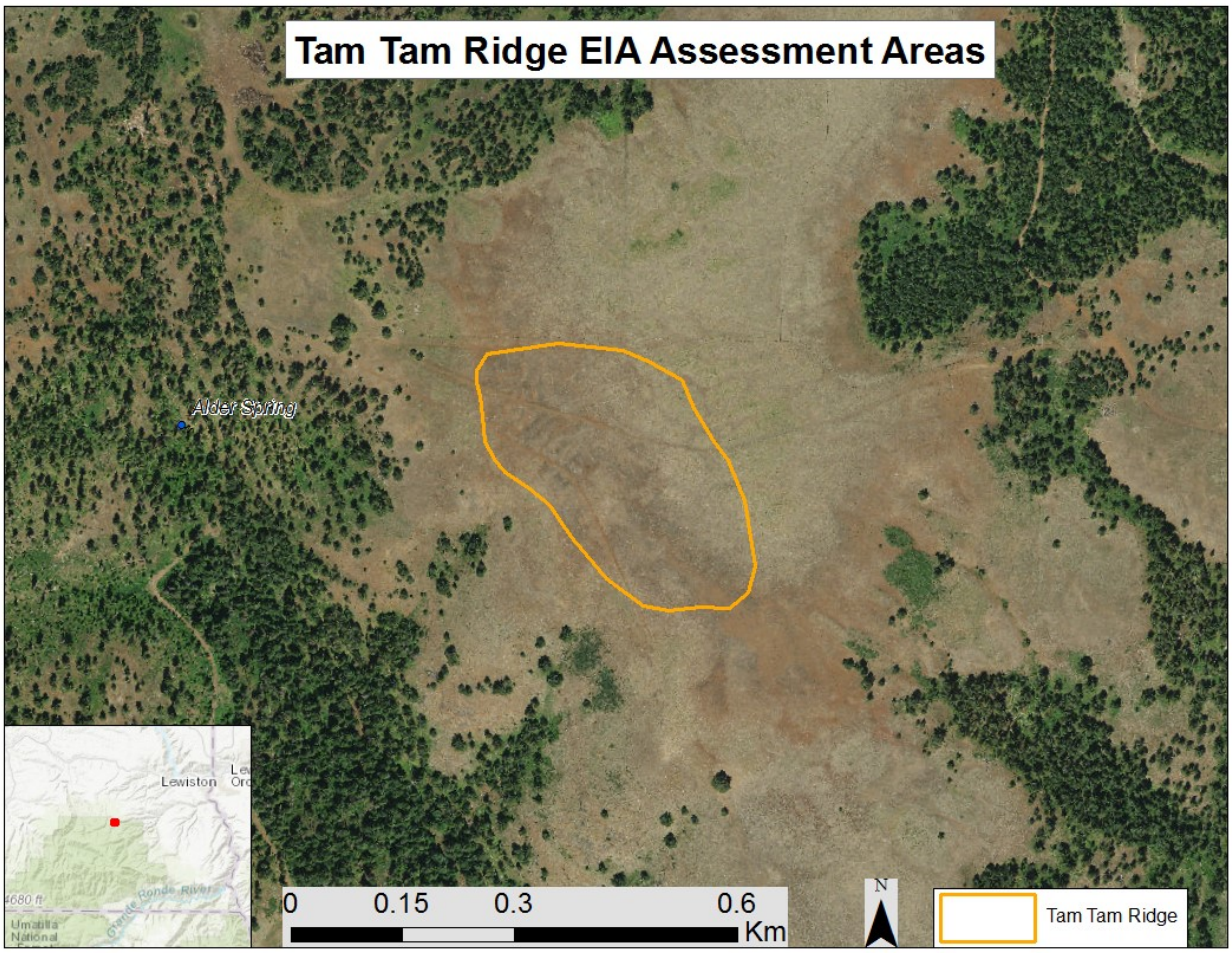


Figure B - 5. Map of EIA Assessment Area on Tam Tam Ridge

Description:
This is a 10.49 acre grassland area that contains abundant evidence of past and possibly current grazing use as well as abundant evidence of deer browse. Within the assessment are area are cattle trails and an old coral or cattle congregation area (water source, mineral lick?) where there is a higher level of trampling than elsewhere on site. There are 2 track roads through the assessment area although vehicle access appears to be intentionally blocked. We assessed only the area of this ecosystem encompassing the *Phlox solivaga* plant community. The full extent of this ecosystem likely extends further south. Based on the G/S ranks and the EIA score for this area, it would not be considered an EO (Table B - 10).

Landscape Context Rank: B
Within 500 m of the assessed area, contiguous natural land cover comprises 90% of the landscape. The 2-track road through the assessment area breaks natural land cover in a few areas but roads comprise less than 2% cover overall. Most of the nearby forest has been logged, but it retains natural species composition. The remainder of the assessed landscape is lightly to moderately grazed. The natural landscape directly abutting the assessment are (the edge), is on average 88m wide and only reduced by the two track road. Significant invasive plant species were observed downslope. The areas appear to be used by recreational trail riders.

Condition Rank: C

Within the assessment, area there is 90% relative cover of native plants. There is approximately 5% cover of non-native invasive species including *Ventenata dubia*, *Bromus horridus*, *Bromus tectorum*, and *Poa bulbosa*. Native species that are in greater abundance than expected due to stressors (increasers) include *Eriogonum heracleoides* and *Balsamorhiza serrata*. Native species that are in lower abundance due to stressors (decreasers) include the native bunch grasses *Pseudoroegneria spicata*, which persists intermittently throughout the site, and *Festuca idahoensis*, which has largely been eliminated. *Poa secunda* remains with fair cover. The biological soil crust has fair cover, particularly on the eastern portion and away from the potential corral area. The crust is comprised by primarily a moss that may be *Tortula* spp. The amount of litter is within the expected natural range of variation, however invasive species *B. tectorum* and *V. dubia* make up a significant proportion of litter.

Table B - 10. EIA Metric Ranking for the Tam Tam Ridge Assessment Area

Metric	Rank
LAN1. Contiguous Natural Land Cover	A
LAN2. Land Use Index	B
LAN MEF	A-
EDG1. Perimeter with Natural Edge	B
EDG2. Width of Natural Edge	B
EDG3. Condition of Natural Edge (do not include in calculation if not scored)	C
EDG MEF	C+
Landscape PFS	B
VEG1. Native Plant Species Cover	B
VEG2. Invasive Nonnative Plant Species Cover	C
VEG3. Native Plant Species Composition	C
VEG4. Vegetation Structure	C
VEG5. Woody Regeneration	NA
VEG6. Coarse Woody Debris	B
VEG MEF	C+
SOI1. Soil Condition	C+
SOIL MEF	C+
Condition PFS	C
SIZ1. Comparative Size	C
SIZ2. Change in Size (optional)	D
EIA Score	B-
EO Score	C-