

Rare Plants of the Salmon and Challis Field Offices of the BLM, in East Central Idaho

By: Caryl Elzinga Ph.D.
Alderspring Consulting



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Introduction

The area administered by the Salmon and Challis Field Offices of the Bureau of Land Management lies within Lemhi and Custer counties in east-central Idaho. Because of its remoteness, up until the early 1980s the area had received little botanical exploration except for occasional botanists. In the 1980s, the University of Idaho sponsored several graduate student efforts in exploring the east-central Idaho country. This work was built on by inventory effort by the Idaho Conservation Data Center (formerly Idaho Natural Heritage Program), the BLM, and the Forest Service. The area can still be considered relatively poorly explored, however. New populations of known sensitive species and even species new to the area continue to be found.

Four main types of rare plant groups are found on lower-elevation BLM lands in east-central Idaho:

- **Challis endemic species** are a group of species found only in the area around the town of Challis. These species are limited in their global distribution to this area, and are largely confined to substrate derived from the Challis Volcanics. The area around Challis is also very arid, the driest area in the state of Idaho, with an annual average precipitation of 10 inches or less. Many of these endemic species are not tracked as sensitive species because they are locally abundant and currently there are no known threats. *Leymus ambiguus* ssp. *salmonensis* (*Elymus ambiguus*), for example, is a common member of the Challis flora. These species are noted in Table 4 in the Summary Tables section.
- **Calcareous wetland species** are confined to alkaline rich fen systems produced by rainfall and snowmelt percolating through limestone substrates and upwelling in broad valley bottoms. These systems experience fairly constant flow, water temperature and chemistry throughout the year. One species endemic to east-central Idaho occurs in these fens (*Primula alcalina*). Several others are disjunct from their main range in the boreal regions of North America (e.g., *Kobresia simpliciuscula*, *Lomatogonium rotatum*).
- **Great Plains Species** are those found in east-central Idaho (primarily in the Lemhi Valley) that have their primary distribution to the east. These include *Astragalus gilviflorus*, *Coryphantha vivipara* and *Bouteloua gracilis*.
- **Regional endemics** are species with a limited distribution such as western Montana and eastern Idaho (*Penstemon lemhiensis*).

Organization

This document is intended to function as a working resource of the rare species within BLM lands of east-central Idaho. As such, pages are not paginated, with the expectation that they would be discarded, added to, or moved about as species status changed, and new species were added. Species lists were generated from existing BLM sensitive plant lists, literature, Montana sensitive plant lists, and Conservation Data Center information. My intent was to:

1. Summarize known ecological information about species known to occur on BLM lands, especially information not currently documented in any form but residing primarily with knowledgeable individuals.
2. Identify species not currently known from BLM lands, but which have good potential to occur there.
3. Document species that had been considered rare in the past, or that were of limited distribution but not considered rare. Some of these species may warrant inclusion on the sensitive plant list in the future if threatening human activity dramatically increases. Others have been dropped from consideration because of misidentifications, taxon changes, or because they were found to occur over a larger range than previously thought.

To meet these objectives, the information has been arranged as follows:

Volume 1

Summary tables

- Table 1. Sensitive plant species of the BLM, Salmon and Challis Field Offices
- Table 2. Species of interest (those with potential to occur on BLM lands in Custer and Lemhi counties, or those currently under review)
- Table 3. Sensitive plant species and species of interest arranged by habitat
- Table 4. Endemic, dropped, or unlikely species
- Table 5. Alpine species (those known or suspected to occur in Lemhi and Custer counties, but not expected on BLM lands)

Species of interest

Volume 2

Sensitive plant species

Volume 3

Topographic maps of the lands administered by the Salmon and Challis Field Offices illustrating rare plant locations.

Volume 4

Conservation Data Center records for species in Custer and Lemhi counties.

Explanation of Codes

Tables generally include the following fields:

Family

Species Name generally using the most recently accepted name

Common Name

NPS02 the Native Plant Society status code, based on the 2002 results; see below; in Table 4, this column also includes those species which have been listed in the past but dropped from the list (“dropped”) and those species which have never had any status (“ns”)

L, CU Lemhi or Custer county known occurrence in separate columns to facilitate sorting; in some tables the fields are combined into a single **County** column

Habitat

Habitat Code in some of the tables; codes given in the table header

Distribution and Notes

Status codes used by the Idaho Native Plant Society and Conservation Data Center are included in species summary lists. They are deliberately left out of the species profiles because status may change from year to year.

CDC Network Categories

G = Global rank indicator; denotes rank based on rangewide status.

T = Trinomial rank indicator; denotes range wide status of variety or subspecies.

S = State rank indicator; denotes rank based on status within Idaho.

1 = Critically imperiled because of extreme rarity or because of some factor of its biology making it especially vulnerable to extinction.

2 = Imperiled because of rarity or because of other factors demonstrably making it very vulnerable to extinction.

3 = Rare or uncommon, but not imperiled.

4 = Not rare and apparently secure, but with cause for long-term concern.

5 = Demonstrably widespread, abundant, and secure.

INPS Categories

State Priority 1 (S1) = Taxa in danger of becoming extinct or extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue to operate; these are taxa whose populations are present only at critically low levels or whose habitats have been degraded or depleted to a significant degree.

State Priority 2 (S2) = Taxa likely to be classified as Priority 1 within the foreseeable future in Idaho, if factors contributing to their population decline or habitat degradation or loss continue.

Sensitive (S) = Taxa with small populations or localized distributions within Idaho that presently do not meet the criteria for classifications as Priority 1 or 2 but whose populations and habitats might be jeopardized without active management or removal of threats.

Monitor (M) = Taxa common within a limited range as well as those taxa which are uncommon but have no identifiable threats.

Review (R) = Taxa which may be of conservation concern in Idaho, but lack sufficient data to base a recommendation regarding their appropriate classification.

Acknowledgements

Much of the information contained in this report is based on data that has been collected, stored and maintained by the Conservation Data Center. Many of the descriptions came from element occurrence records stored in the Conservation Data Center's database. Maps were generated by accessing this database. For some species, reports or online plant characterization abstracts were available that formed the basis (and sometimes the actual text) used in this document. The Conservation Data Center, and especially Michael Mancuso, also deserves credit for supplying a draft of their effort for a similar document for the BLM in southeast Idaho.

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Illustrations are primarily from Vascular Plants of the Pacific Northwest and are used with permission from the University of Washington. Robbin Jess gave permission to use illustrations originally published in the Intermountain Flora for *Cymopteris ibapensis*, *Ipomopsis polycladon*, and *Phacelia inconspicua*. The Montana Natural Heritage Program gave permission to use the illustration done by Walter Fertig for *Lesquerella paysonii*.

Table 1. Sensitive plant species of the BLM (Salmon and Challis Field Offices, Custer and Lemhi counties). NPS'02 status codes are those published by the Native Plant Society in 2002 (see introduction for status code meanings).

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Asteraceae	<i>Agoseris lackschewitzii</i> D. henderson & R. Moseley	Pink Agoseris	SS	L		Moist to wet subirrigated montane or subalpine meadows	Mountains of east central ID, extending to sw MT and British Columbia
Asteraceae	<i>Aster junciformis</i> Rydb.	Rush Aster	SS		c	Calcareous wetlands with <i>Carex aquatilis</i> , <i>C. nebrascensis</i> , <i>C. simulata</i> , <i>C. utriculata</i> .	Alaska to BC and Quebec south to several northern states; Bonner, Boundary, Custer, Fremont, Kootenai, Teton, Valley
Fabaceae	<i>Astragalus amblytropis</i> Barneby	Challis Milkvetch	G3	L	c	Unstable gravelly to ashy clay substrate derived from volcanic and metamorphic rock; often on road cuts and fills, these usually relatively short-lived expressions of a more stable nearby population on natural substrate	Endemic to east-central Idaho along the Salmon River and tributaries from Clayton north to Elk Bend.
Fabaceae	<i>Astragalus aquilonius</i> Barneby	Lemhi Milkvetch	G3	L	c	Washes and slopes, especially near and at the base; soils gravelly to sandy, usually from volcanic weatherings; also on open flats with relatively deep soils; sagebrush/bunchgrass and tall desert shrub zones	East-central Idaho endemic, occurring in Butte, Custer and Lemhi Counties. Populations are known from the Lemhi Valley, and up the Salmon River Corridor and tributaries. Most sites are in the Challis Volcanic area, with the largest population center of 1000's of plants in the Bradbury Flat and Round Valley area.
Fabaceae	<i>Astragalus bisulcatus</i> (Hook.) Gray var. <i>bisulcatus</i>	Two-grooved Milkvetch	SS	L		Prairies, plains, foothills, and also barren sites, often on selenium-rich soils	Prairie provinces of Canada, s to KS, NM, AZ, including Utah, WY, east-central ID; Clark, Fremont, Lemhi Cos.
Fabaceae	<i>Astragalus diversifolius</i> Gray	Meadow Milkvetch	G2	L	c	Moist alkaline meadows associated with spring-fed fen systems (e.g., Birch Creek, Summit Creek) and less commonly in other moist subirrigated meadows (not associated with fens); mesic, not wet, with alkaline clayey soils, often whitish in appearance; surface usually flat, sometimes with swale topography or hummocks	Rocky Mountains, Colorado, western Wyoming, east-central Idaho, western Montana and apparently in Alberta
Fabaceae	<i>Astragalus giviflorus</i> Sheldon	Plains orophaca	S1	L		Barren knolls, hilltops, gullied badlands; Railroad Canyon population on a gravelly calcareous slope adjacent to outcrops	East base of Rockies from s Canada to CO, east to the northern Plains and west into e ID. Clark, Fremont, Lemhi Cos.
Fabaceae	<i>Astragalus leptaleus</i> Gray	Park Milkvetch	SM	L	c	Moist meadows, swales, turfy hummocks near mountain streams; often where alkaline	Western MT to central ID, s in the Rocky Mts to CO; Custer and Lemhi Co.
Poaceae	<i>Bouteloua gracilis</i> (Willd. ex Kunth) Lag. ex Griffiths	Blue grama	S1	L	c	Open sagebrush communities, our populations usually on flat or gently sloping alluvial fans	Great Plains species with isolated stations in Idaho: Pahsimeroi (Taler Creek), Kriley Gulch area.
Cyperaceae	<i>Carex livida</i> (Wahlenb.) Willd.	Pale Sedge	SS	L	c	Saturated organic soils in peatlands and swampy woods.	Interruptedly circumboreal, south in NA to the Pacific NW and other northern states; Blaine, Bonner, Custer, Fremont, Lemhi
Cyperaceae	<i>Carex parryana</i> ssp. <i>Idahoa</i> (Bailey) D.F.Murr.	Idaho Sedge	G2	L		Calcareous fens in Idaho, but a few of the Montana populations occur in non-calcareous wetlands; subirrigated, moist at the surface	Southwest MT and adj east-central ID; Clark, Lemhi, Caribou Cos.
Cactaceae	<i>Coryphantha vivipara</i> (Nutt.) Britt. & Brown (<i>Escobaria vivipara</i> (Nutt.) Buxbaum)	Cushion Cactus	SS	L		Open sagebrush/grassland sites in valleys and foothills.	Alberta and Manitoba, south to OR, NM and TX. In Lemhi Co. Much less common than <i>C. missouriensis</i> .

Apiaceae	<i>Cymopterus ibapensis</i> M.E. Jones	Ibapah Wavewing	SR	L c	Gravelly open calcareous substrates from valley bottoms to above timberline.	Southeast OR, NV, UT, east-central ID; Butte, Custer and Lemhi Cos. Note from 2001: Discrepancy remains regarding the proper disposition of plants from the central Idaho mountains that were formally assigned to this name. <i>C. ibapensis</i> is now considered a variety of <i>C. longipes</i> .
Brassicaceae	<i>Draba globosa</i> Payson (<i>Draba apiculata</i> C.L. Hitchc.)	Pointed Draba	S2	L c	Alpine fellfields, ridgecrests and slopes on shallow rocky soils	Uinlas, western and scentral WY, Beartooth Plateau, White Clouds; Custer Co.
Brassicaceae	<i>Draba incerta</i> Payson	Yellowstone Draba	SS	L c	High mountain ridgecrests and tallus slopes; soils shallow to moderately deep but rocky	Alaska, s to the mountains of WA, ID, UT, WY. Boundary, Custer, Fremont, Lemhi
Asteraceae	<i>Eatonella nivica</i> (D.C.Eat.) Gray	White Eatonella	SS	L c	Dry sandy or volcanic, mid-elevation desert areas, often in sagebrush	CA and NV, to se OR, adj sw ID, disjunct near the Salmon River in east-central ID. Adams, Custer, Elmore, Owyhee, Lemhi
Polygonaceae	<i>Eriogonum capistratum</i> var. <i>welshii</i> Reveal	Welsh's Buckwheat	G2	L c	barren, windswept, gravelly clay slopes and ridges; often on broad alluvial fans with <i>Artemisia tridentata wyomingensis</i> , <i>A. arbuscula</i> , <i>A. frigida</i> , and <i>Atriplex</i>	Endemic to Custer CO. Chris Murphy surveyed in 2001.
Cyperaceae	<i>Kobresia simpliciuscula</i> (Wahlemb.) Mackenzie	Simple Kobresia	S2	L c	Fens, wet meadows, pond edges and other wet places at moderate to high elevations; in east-central ID in calcareous fens	Circumboreal, in NA extending s across Canada and irregularly to CO, the Wallowa Mts. In OR, east-central ID, and w MT.
Gentianaceae	<i>Lomatogonium rotatum</i> (L.) Fr. Ex Nyman	Marsh Felwort	S1	L c	Calcareous fens; often in dense graminoid vegetation	Circumpolar; in NA from Hudson Bay to Alaska, south in the Rocky to CO, to Maine in the eastern US; Custer and Lemhi Co.
Fabaceae	<i>Oxytropis besseyi</i> (Rydb.) Blank var. <i>salmonensis</i> Barneby	Challis Crazyweed	G3	c	Sandy washes or open slopes of rocky volcanic soil in Wyoming big sagebrush and sail desert shrub communities	Challis endemic; Custer County, ID
Scrophulariaceae	<i>Penstemon lemhiensis</i> (Keck) Cronq.	Lemhi Penstemon	G3	L	Sagebrush communities; just below or in openings in the doug-fir zone; road cuts and fills; on natural sites often where soils are shallow, with platy rock outcrops	Continental Divide from Leadore north to Lost Trail Pass, west to Horse Creek Pass in the Bitterroot Mountains and south along the Salmon River Range approximately to Williams Creek. It is absent from the Lemhi Mountains. In Montana from just south of Darby, east to Butte, and south to Dillon -- in the Bitterroot, Highland, and Pioneer Mountains.
Brassicaceae	<i>Physaria didymocarpa</i> var. <i>lyrata</i> C.L. Hitchcock	Salmon Twin Bladderpod	G1	L	Rocky, sparsely vegetated, generally south-facing slopes; substrate coarse-textured, often 3-7cm in diameter, loose to relatively stable, but probably periodically experiencing down-slope movement	Lemhi County, Idaho; in the lower Lemhi Valley and near Salmon
Primulaceae	<i>Primula alcalina</i> Cholewa & D. Henderson	Alkali Primrose	G2	L c	Fen obligate; usually where subirrigated and moist at the surface; often on "bouncy" turf	Endemic to Custer and Lemhi Counties, Idaho; historical sites in adjacent Montana
Salicaceae	<i>Salix candida</i> Fluegge ex Willd.	Hoary Willow	SS	L c	Fens, swamp; usually not right on the channel	Alaska to Labrador s to NJ, SD, Rocky Mts Boundary, Bonner, Caribou, Custer, Fremont, Lemhi, Teton Cos.
Salicaceae	<i>Salix pseudomonticola</i> Ball	False Mountain Willow	S2	L c	Moist to wet bottomlands; often where alkaline	Alaska east to w Quebec, s to ID, n WY, SD, Ontario; Clark, Fremont, Lemhi Cos
Cyperaceae	<i>Scirpus rollandii</i> Fern	Rolland Bullrush	G3	L c	High valley wetlands on saturated calcareous soils, sometimes hummocked	Circumboreal, disjunct in CO, WY, MT, ID and CA. Clark, Custer, Lemhi Cos.
Brassicaceae	<i>Treyipodium repandum</i> Rollins	Wavy Leaf Thelypod	G3	L c	Open slopes; asny to scree substrates in the Challis volcanic area	Challis endemic; Custer and Lemhi Counties, ID
Lichen	<i>Xanthoparmelia idahoensis</i> Hale	Idaho Range Lichen	G2	L	Bentonile slopes near Salmon and at a few spots up the Lemhi to about Lemhi, ID.	Lemhi County, Idaho; in the lower Lemhi Valley and near Salmon

Table 2. Species of interest (species not known, but with potential to occur) for Salmon and Challis Field Offices, Custer (Cu) and Lemhi (L) counties. NPS'02 status codes are those published by the Native Plant Society in 2002 (see Introduction for status code meanings).

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Labiatae	<i>Agastache cusickii</i> (Greenm.) Heller	Cusick's horse-mint; Cusick's giant hyssop	SR			Dry, open, limestone talus slopes, often with sagebrush or mountain mahogany in the montane zone	Sensitive in MT, known from Beaverhead County; not tracked in ID; BONAP shows as suspected but unconfirmed in ID.
Ericaceae	<i>Allotropa virgata</i> Torr. & Gray ex Gray	Candystick	SS			Lodgepole pine with an understory of grouse worlberry on gentle to moderate southeast and southwest facing slopes. Soils are coarse-textured, acidic, eroded granitics with a shallow duff layer.	Southeast British Columbia, south through Canada and the coastal ranges to the southern Sierra Nevada mountains; disjunct in Valley Co. Idaho and western Montana. Most populations are small. Plant is an obligate mycotroph.
Ranunculaceae	<i>Anemone cylindrica</i> Gray	Candle anemone	SR			Prairies to the lower level meadows in sagebrush steppe in the mountains; usually slopes or flats with additional moisture (north-facing or subirrigated).	British Columbia south in Rocky Mountains to MT, NM, AZ and east to SD, MO, and NJ. Reported for eastern Idaho by Davis (1952); note that Hitchcock et al (1964) says incorrectly reported for Idaho but that Hitchcock and Cronquist (1973) is less emphatic; occurs in southwest Montana and not unexpected in adjacent Idaho.
Fabaceae	<i>Astragalus amnis-amissi</i> Bameby ex CL Hitchc.	Lost River Milkvetch	G3		c	Limestone cliffs and steep talus, generally in moist shaded pockets and crevices	East-central ID endemic; Lost River Range, Hawley Mt, southern tip of the Lemhis; Butte and Custer Cos.
Fabaceae	<i>Astragalus paysonii</i> (Rydb.) Bameby	Payson's Milkvetch			c	Seral forest habitats, including burned over forests and older road and trail cuts	Regional endemic in Idaho and southwestern Wyoming; historical record in the Yankee Fork drainage.
Fabaceae	<i>Astragalus vexilliflexus</i> Sheldon var. <i>nubilus</i> Bameby	White Clouds Milkvetch	G2		c	Open ridgeline and slopes, sparsely vegetated; volcanic, granitic, and metamorphic substrates	White Cloud Peaks and Boulders; endemic to Custer Co.
Poaceae	<i>Calamagrostis tweedyi</i> (Scribn.) Scirbn. ex Vasey	Cascade Reedgrass	G3/S2			Disturbed or seral areas in subalpine fir forests, or in mature forests where usually vegetative	Wenatchee Mts., central ID, nw MT; Idaho Co.
Onagraceae	<i>Camassonia plerosperma</i> (S. Wats.) Raven	Wing-seed Evening Primrose	SS			Mixed sagebrush and juniper communities at low to moderate elevations; usually at the base of outcrops in rubble.	AZ, CA, NV, UT and east central ID. Butte and Clark Cos at end of Beaverhead and Lost River Ranges.
Cyperaceae	<i>Carex buxbaumii</i> Wahlenb.	Buxbaum's Sedge	SS		c	Peat fens, marshes, wet meadows and streamsides, usually in broad montane valleys along low-gradient streams or lakeshores.	Widespread, but uncommon throughout boreal regions of NA, in the western US as far south as CO, UT, central CA; Blaine, Bonner, Boundary, Custer, Fremont, Valley, Idaho cos.
Cyperaceae	<i>Carex crawei</i> Dewey	Crawe's Sedge	SR			Foot hills; gravelly calcareous soils on the shores of ponds and streams.	East-central ID, Clark CO; Quebec to BC, south to NJ, TN, MO, UT, MT, ID; sparse and rare

Cyperaceae	<i>Carex flava</i> L.	Yellow Sedge	SM	c	Boggy or swampy places and along the shores of lakes and streams; Stanley location is a fen.	Throughout Boreal regions of North America, reaching as far south as ne WA, central ID and MT. The similar <i>Carex viridula</i> occurs in Birch Creek; nearest location of <i>C. flava</i> is about 3 miles north of Stanley.
Cyperaceae	<i>Carex occidentalis</i> Bailey	Western sedge	S1		Open to lightly wooded slopes and dry meadows, generally at middle elevations, but extending to subalpine and alpine areas.	Southern Rockies, from s WY to NM and west to UT, NV, and s CA; Occurs in Beaverhead Co.; not unlikely in adjacent ID. Known from Bonneville Co.
Saxifragaceae	<i>Chryso-splenium tetrandrum</i> (Lund ex Malmgr.) Th. Fries	Northern golden saxifrage	S1	L	Seeps, wet rock ledges and streambanks in the montane zone.	Circumpolar, south in N. America to BC, WA, MT, CO. Known in Idaho from near Lost Trail Pass. Potential in wet montane riparian forested bottoms.
Cuscutaceae	<i>Cuscuta denticulata</i> Engelm.	Sepal-tooth Dodder	S1		Historic record says "on sagebrush" Community near Blue Dome includes both Wyoming and mountain big sagebrush	Historic site near Blue Dome. Clark, Idaho Cos; BONAP has records for much of the western US
Asteraceae	<i>Dimeresia howellii</i> Gray	Dimeresia	S2		Dry gravelly, rocky or cindery soils in the valleys or lower foothills.	Northeast CA and nw NV to Baker Co., OR and Owyhee Co., ID.
Onagraceae	<i>Epilobium palustre</i> L.	Swamp Willow-weed	SM	c	Wet soils, fens, bogs; often alkaline; mostly likely in our calcareous fens	Alaska to Cascades of central WA, east to the Atlantic, s in Rockies to CO; also in Eurasia; in Idaho known from Bonner, Boundary, Custer, Fremont Cos.
Orchidaceae	<i>Epipactis gigantea</i> Dougl. ex Hook.	Giant Helleborine	S2	L c	Moist areas along streambanks, seeps and springs; especially common around hot springs, but also occurs around cold springs	Cordilleran areas from central Mexico n to BC; many locations in ID; occurs in the Warm Springs drainage near Elk Bend (on FS, but parking area on BLM).
Polemoniaceae	<i>Ipomopsis polycladon</i> (Torr.) V. Grant (<i>Gilia polycladon</i>)	Spreading Gilia	S2		Dry, open substrates; foothills and valleys; sagebrush/grassland, or sometimes Atriplex communities	Throughout much of Great Basin: Nevada, Utah and adjacent Colorado and north to the Snake River Plain, and south to west Texas, southern California, southern Arizona and adjacent Mexico. In Idaho Owyhee, Powell, Butte Counties.
Juncaceae	<i>Juncus hallii</i> Engelm.	Hall's rush	SR		Sparsely wooded rocky slopes and moist meadows and streambanks in the mountains to alpine	sw MT to CO, UT and scattered stations in ID; Boneville, Clearwater, Fremont, Lemhi, Owyhee; most collections from the 1970s, none later than 1988.
Brassicaceae	<i>Lesquerella paysonii</i> Rollins	Payson's bladderpod	G3		Calcareous open gravelly slopes and ridgetops in the sagebrush/grass and lower coniferous forest montane zone	Western WY, e central ID, sw MT; Bonneville CO. Moseley 1996 suggested removal from sensitive list. Still tracked as G3, and still tracked by Montana and Wyoming.
Portulacaceae	<i>Lewisia kelloggii</i> Brandg.	Idaho Bitterroot	S1	L c	On gravelly soils, often fractured bedrock, usually near late snowbanks, upper ridges and slopes; with high elevation forbs and a sparse overstory of conifers	Central ID (Boise, Valley, Elmore, Lemhi, Custer), and in the Sierra Nevada, CA.

Poaceae	<i>Muhlenbergia racemosa</i> (Michx.) BSP	Green muhly	S1		Saturated soils in fens, on peat and mineral hummocks	British Columbia, s on the east side of the Cascades to ne OR, NV, AZ, n Mexico, east to Newfoundland, OK, TN, MD. Fremont Co Island Park area, Bannock, Bonner, Teton
Poaceae	<i>Nasella viridula</i> Trin. (Barkworth) (<i>Stipa viridula</i>)	Green Needlegrass	S2		Plains, prairies, foothills at lower elevations, to mountain meadows, open woodlands and hillsides at higher elevations.	Most common east of the Continental Divide; BC, Alberta, Saskatchewan, s through MT to NM and AZ and e to WI and IL. Clark, Elmore, Owyhee Cos
Apiaceae	<i>Orogenia fusiformis</i> Wats.	Tapered-root Orogenia	SR		Open slopes and ridges from the lower foothills to moderate elevations, usually with <i>Artemisia tridentata</i> . Often flowering at the edges of retreating snowbanks.	Southern Washington to Ravalli County, MT and south to Oregon, southern Idaho, Utah and western Colorado. Several occurrences in Montana along the Idaho border. In MT on Beaverhead, Lick Creek and Jennings Camp quad.
Hydrophyllaceae	<i>Phacelia inconspicua</i> E.L. Greene	Obscure scorpion-weed	G1		Loose sandy soils in open sagebrush grass communities, on open microsites; often on north-facing slopes where late-melting snowbanks provides late spring moisture; sometimes near the edges of aspen cloness	Northern Snake River Plain and nw Nevada; Bulte and Blaine Cos.
Hydrophyllaceae	<i>Phacelia minutissima</i> L.F. Henderson	Least Phacelia	G3		Meadows, along streambanks, on slopes, often in areas of late snowmelt or seeps in sagebrush and aspen; sometimes in disturbed areas. Foothills to midmontane. Collections in Owyhee Co have been in dense false helebore patches down-slope from aspen with an open understory and a diverse flora of annuals	Regional endemic, upper Intermountain, central ID, ne OR, central WA, Elko Co Nevada; Camas and Owyhee
Poaceae	<i>Piptatherum micrathum</i> (Trin. & Rupr.) Barkworth (<i>Oryzopsis micrantha</i>)	Small-flowered Ricegrass	S2		Cracks in a limestone cliff (opposite Blue Dome); also in open dry woods and rocky slopes at medium elevations.	Saskatchewan to ND, MT, s to NV, NM, AZ, CA. In Idaho, just on the border of Bulte CO east of campground below Birch Creek; disjunct from the east by several hundred miles.
Plantaginaceae	<i>Plantago eriopoda</i> Torr.	Alkaline Plainain	SR	L	Calcareous subirrigated meadows; highly alkaline; fairly low vegetative cover	CO and NE north in the plains states and west to c ID and through the Great Basin region to CO
Polypodiaceae	<i>Polystichum kruckebergii</i> W.H. Wagner	Kruckeberg's Swordfern	SS	c	Cliff crevices and talus slopes at middle to upper elevations.	Irregularly from s BC and nw WA to s CA, east to c ID w MT and n UT; Cassia, Custer, Idaho Cos.
Rosaceae	<i>Potentilla bipinnatifida</i> Dougl. Ex Hook.	Tansy Cinquefoil	SR	c	Lower foothill and valley sagebrush/grassland.	Idaho east to Minnesota, south to Utah, New Mexico, Nebraska; collections from near Chilly, near Clyde, and from south of Challis. Added to review in 2002
Primulaceae	<i>Primula incana</i> M.E. Jones	Jone's Primrose	S1	c	Moist alkaline meadows and streambanks, often on hummocks; in Yellowstone associated with thermal areas	Rocky Mts and w Canada south to CO, UT, n Cascades. In Idaho in Custer and Teton Cos., Bowers Hot Springs in East Fork above Guard Station; widespread but not common

Chenopodiaceae	Salicornia rubra A. Nels.	Red Glasswort	SS		Moist saline or alkaline bottoms	Southern BC and e WA to NV, KS, NM; Bear Lake, Bingham, Caribou, Cassia, Franklin and Oneida Cos.
Salicaceae	Salix farriae Ball	Farr's Willow	S2	c	Wet meadows, moist streambanks and lakeshores between 9000-9300'	Southern BC and AB, ne OR, east-central ID, w MT, nw WY. Custer Co (N of Leatherman Pass; White Cloud Peaks; Upper Meriam Lake Basin); quite a bit in Yellowstone
Crassulaceae	Sedum borschii R.T. Clausen	Borsch's Stonecrop	SM	L	Midmontane open to shaded cliffs and rocky slopes, west to nw exposures on a variety of parent material; often in Douglas-fir	Endemic to northern half of ID batholith, the 7 Devils Mts, Craigs, and sw MT. Idaho, Lemhi and Valley Cos..
Caryophyllaceae	Silene scaposa Robbins var. lobata Hitchc. & Maguire	Scapose Silene	SM		Slightly moist drainages, gravelly meadows and hillsides in sagebrush or PJ areas; often on limestone.	Southeast OR, n NV, Lost River and Lemhi ranges of east-central ID; Butte and Clark Cos.
Orchidaceae	Spiranthes diluvialis Sheviak	Ute Ladies tresses	G2		Meadows near springs, lakes and perennial streams on plains, in broad intermountain valleys, and in narrower mountain valleys at lower elevations.	Great Plains of western Nebraska and adjacent Wyoming, west about 600 miles across the Rocky Mountains and Intermountain Region to the Okanogan Valley in north central Washington, near the Canadian border; in Idaho, South Fork Snake River drainage between Palisades Dam and Heise.
Brassicaceae	Stanleya tomentosa Parry var runcinata (Rydb.) Rollins	Woolly Princess Plume	SR	c	Open slopes; ashy to scree substrates	Variety endemic to the Challis area. in the Challis volcanic area
Ranunculaceae	Thalictrum dasycarpum Fisch & Ave-Lall.	Purple meadowrue	S1		Deciduous riparian woods, damp thickets, moist woods, wet meadows; often within or adjacent to the floodplain	Eastern BC e to Ontario, s through the central US to the southeastern states, in the Rockies to NM, AZ, ID, ne WA. Bear Lake, Bonner, Boundary, Cassia, Fremont

Table 2. Species of interest (species not known, but with potential to occur) for Salmon and Challis Field Offices, Custer (Cu) and Lemhi (L) counties. NPS'02 status codes are those published by the Native Plant Society in 2002 (see Introduction for status code meanings).

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Labiatae	<i>Agastache cusickii</i> (Greenm.) Heller	Cusick's horse-mint; Cusick's giant hyssop	SR			Dry, open, limestone talus slopes, often with sagebrush or mountain mahogany in the montane zone	Sensitive in MT, known from Beaverhead County; not tracked in ID; BONAP shows as suspected but unconfirmed in ID.
Ericaceae	<i>Allotropa virgata</i> Torr. & Gray ex Gray	Candystick	SS			Lodgepole pine with an understory of grouse wortleberry on gentle to moderate southeast and southwest facing slopes. Soils are coarse-textured, acidic, eroded granitics with a shallow duff layer.	Southeast British Columbia, south through Canada and the coastal ranges to the southern Sierra Nevada mountains; disjunct in Valley Co. Idaho and western Montana. Most populations are small. Plant is an obligate mycotroph.
Ranunculaceae	<i>Anemone cylindrica</i> Gray	Candle anemone	SR			Prairies to the lower level meadows in sagebrush steppe in the mountains; usually slopes or flats with additional moisture (north-facing or subirrigated).	British Columbia south in Rocky Mountains to MT, NM, AZ and east to SD, MO, and NJ. Reported for eastern Idaho by Davis (1952); note that Hitchcock et al (1964) says incorrectly reported for Idaho but that Hitchcock and Cronquist (1973) is less emphatic; occurs in southwest Montana and not unexpected in adjacent Idaho.
Fabaceae	<i>Astragalus amnis-amissi</i> Barneby ex CL Hitchc.	Lost River Milkvetch	G3		c	Limestone cliffs and steep talus, generally in moist shaded pockets and crevices	East-central ID endemic; Lost River Range, Hawley Mt, southern tip of the Lemhis; Bulte and Custer Cos.
Fabaceae	<i>Astragalus paysonii</i> (Rydb.) Barneby	Payson's Milkvetch			c	Seral forest habitats, including burned over forests and older road and trail cuts	Regional endemic in Idaho and southwestern Wyoming; historical record in the Yankee Fork drainage.
Fabaceae	<i>Astragalus vexilliflexus</i> Sheldon var. <i>nubilus</i> Barneby	White Clouds Milkvetch	G2		c	Open ridgeline and slopes, sparsely vegetated; volcanic, granitic, and metamorphic substrates	White Cloud Peaks and Boulders; endemic to Custer Co.
Poaceae	<i>Calamagrostis tweedyi</i> (Scribn.) Scirbn. ex Vasey	Cascade Reedgrass	G3/S2			Disturbed or seral areas in subalpine fir forests, or in mature forests where usually vegalative	Wenatchee Mts., central ID, nw MT; Idaho Co.
Onagraceae	<i>Camassonia plerosperma</i> (S. Wats.) Raven	Wing-seed Evening Primrose	SS			Mixed sagebrush and juniper communities at low to moderate elevations; usually at the base of outcrops in rubble.	AZ, CA, NV, UT and east central ID. Bulte and Clark Cos at end of Beaverhead and Lost River Ranges.
Cyperaceae	<i>Carex buxbaumii</i> Wahlenb.	Buxbaum's Sedge	SS		c	Peat fens, marshes, wet meadows and streamsides, usually in broad montane valleys along low-gradient streams or lakeshores.	Widespread, but uncommon throughout boreal regions of NA, in the western US as far south as CO, UT, central CA; Blaine, Bonner, Boundary, Custer, Fremont, Valley, Idaho cos.
Cyperaceae	<i>Carex crawei</i> Dewey	Crawe's Sedge	SR			Foothills; gravelly calcareous soils on the shores of ponds and streams.	East-central ID, Clark CO; Quebec to BC, south to NJ, TN, MO, UT, MT, ID; sparse and rare

Cyperaceae	<i>Carex flava</i> L.	Yellow Sedge	SM	c	Boggy or swampy places and along the shores of lakes and streams; Stanley location is a fen.	Throughout Boreal regions of North America, reaching as far south as ne WA, central ID and MT. The similar <i>Carex viridula</i> occurs in Birch Creek; nearest location of <i>C. flava</i> is about 3 miles north of Stanley.	
Cyperaceae	<i>Carex occidentalis</i> Bailey	Western sedge	S1		Open to lightly wooded slopes and dry meadows, generally at middle elevations, but extending to subalpine and alpine areas.	Southern Rockies, from s WY to NM and west to UT, NV, and s CA; Occurs in Beaverhead Co.; not unlikely in adjacent ID. Known from Bonneville Co.	
Saxifragaceae	<i>Chrysosplenium tetrandrum</i> (Lund ex Malmgr.) Th. Fries	Northern golden saxifrage	S1	L	Seeps, wet rock ledges and streambanks in the montane zone.	Circumpolar, south in N. America to BC, WA, MT, CO. Known in Idaho from near Lost Trail Pass. Potential in wet montane riparian forested bottoms.	
Cuscutaceae	<i>Cuscuta denticulata</i> Engelm.	Sepal-tooth Dodder	S1		Historic record says "on sagebrush" Community near Blue Dome includes both Wyoming and mountain big sagebrush	Historic site near Blue Dome. Clark, Idaho Cos; BONAP has records for much of the western US	
Asteraceae	<i>Dimeresia howellii</i> Gray	Dimeresia	S2		Dry gravelly, rocky or cindery soils in the valleys or lower foothills.	Northeast CA and nw NV to Baker Co., OR and Owyhee Co., ID.	
Onagraceae	<i>Epilobium palustre</i> L.	Swamp Willow-weed	SM	c	Wet soils, fens, bogs; often alkaline; mostly likely in our calcareous fens	Alaska to Cascades of central WA, east to the Atlantic, s in Rockies to CO; also in Eurasia; in Idaho known from Bonner, Boundary, Custer, Fremont Cos.	
Orchidaceae	<i>Epipactis gigantea</i> Dougl. ex Hook.	Giant Helleborine	S2	L	c	Moist areas along streambanks, seeps and springs; especially common around hot springs, but also occurs around cold springs	Cordilleran areas from central Mexico n to BC; many locations in ID; occurs in the Warm Springs drainage near Elk Bend (on FS, but parking area on BLM).
Polemoniaceae	<i>Ipomopsis polycladon</i> (Torr.) V. Grant (<i>Gilia polycladon</i>)	Spreading Gilia	S2		Dry, open substrates; foothills and valleys; sagebrush/grassland, or sometimes Atriplex communities	Throughout much of Great Basin; Nevada, Utah and adjacent Colorado and north to the Snake River Plain, and south to west Texas, southern California, southern Arizona and adjacent Mexico. In Idaho Owyhee, Powell, Butte Counties.	
Juncaceae	<i>Juncus hallii</i> Engelm.	Hall's rush	SR		Sparsely wooded rocky slopes and moist meadows and streambanks in the mountains to alpine	sw MT to CO, UT and scattered stations in ID; Boneville, Clearwater, Fremont, Lemhi, Owyhee; most collections from the 1970s, none later than 1988.	
Brassicaceae	<i>Lesquerella paysonii</i> Rollins	Payson's bladderpod	G3		Calcareous open gravelly slopes and ridgetops in the sagebrush/grass and lower coniferous forest montane zone	Western WY, e central ID, sw MT; Bonneville CO. Moseley 1996 suggested removal from sensitive list. Still tracked as G3, and still tracked by Montana and Wyoming.	
Portulacaceae	<i>Lewisia kelloggii</i> Brandg.	Idaho Bitterroot	S1	L	c	On gravelly soils, often fractured bedrock, usually near late snowbanks, upper ridges and slopes; with high elevation forbs and a sparse overstory of conifers	Central ID (Boise, Valley, Elmore, Lemhi, Custer), and in the Sierra Nevada, CA.

Poaceae	Muhlenbergia racemosa (Michx.) BSP	Green muhly	S1		Saturated soils in fens, on peat and mineral hummocks	British Columbia, s on the east side of the Cascades to ne OR, NV, AZ, n Mexico, east to Newfoundland, OK, TN, MD. Fremont Co Island Park area, Bannock, Bonner, Teton
Poaceae	Nasella viridula Trin. (Barkworth) (Slipa viridula)	Green Needlegrass	S2		Plains, prairies, foothills at lower elevations, to mountain meadows, open woodlands and hillsides at higher elevations.	Most common east of the Continental Divide; BC, Alberta, Saskatchewan, s through MT to NM and AZ and e to WI and IL. Clark, Elmore, Owyhee Cos
Apiaceae	Orogenia fusiformis Wats.	Tapered-root Orogenia	SR		Open slopes and ridges from the lower foothills to moderate elevations, usually with <i>Artemisia tridentata</i> . Often flowering at the edges of retreating snowbanks.	Southern Washington to Ravalli County, MT and south to Oregon, southern Idaho, Utah and western Colorado. Several occurrences in Montana along the Idaho border. In MT on Beaverhead, Lick Creek and Jennings Camp quad.
Hydrophyllaceae	Phacelia inconspicua E.L. Greene	Obscure scorpion-weed	G1		Loose sandy soils in open sagebrush grass communities, on open microsites; often on north-facing slopes where late-melting snowbanks provides late spring moisture; sometimes near the edges of aspen clones	Northern Snake River Plain and nw Nevada; Butte and Blaine Cos.
Hydrophyllaceae	Phacelia minutissima L.F. Henderson	Least Phacelia	G3		Meadows, along streambanks, on slopes, often in areas of late snowmelt or seeps in sagebrush and aspen; sometimes in disturbed areas. Foothills to midmontane. Collections in Owyhee Co have been in dense false helebore patches down-slope from aspen with an open understory and a diverse flora of annuals	Regional endemic, upper Intermountain, central ID, ne OR, central WA, Elko Co Nevada; Camas and Owyhee
Poaceae	Pipilatherum micrathum (Trin. & Rupr.) Barkworth (Oryzopsis micrantha)	Small-flowered Ricegrass	S2		Cracks in a limestone cliff (opposite Blue Dome); also in open dry woods and rocky slopes at medium elevations.	Saskatchewan to ND, MT, s to NV, NM, AZ, CA. In Idaho, just on the border of Butte CO east of campground below Birch Creek; disjunct from the east by several hundred miles.
Plantaginaceae	Plantago eriopoda Torr.	Alkaline Plantain	SR	L	Calcareous subirrigated meadows; highly alkaline; fairly low vegetative cover	CO and NE north in the plains states and west to c ID and through the Great Basin region to CO
Polypodiaceae	Polystichum kruckebergii W.H. Wagner	Kruckeberg's Swordfern	SS	c	Cliff crevices and talus slopes at middle to upper elevations.	Irregularly from s BC and nw WA to s CA, east to c ID w MT and n UT; Cassia, Custer, Idaho Cos.
Rosaceae	Potentilla bipinnatifida Dougl. Ex Hook.	Tansy Cinquefoil	SR	c	Lower foothill and valley sagebrush/grassland.	Idaho east to Minnesota, south to Utah, New Mexico, Nebraska; collections from near Chilly, near Clyde, and from south of Challis. Added to review in 2002
Primulaceae	Primula incana M.E. Jones	Jone's Primrose	S1	c	Moist alkaline meadows and streambanks, often on hummocks; in Yellowstone associated with thermal areas	Rocky Mts and w Canada south to CO, UT, n Cascades. In Idaho in Custer and Teton Cos., Bowery Hot Springs in East Fork above Guard Station; widespread but not common

Chenopodiaceae	Salicornia rubra A. Nels.	Red Glasswort	SS		Moist saline or alkaline bottoms	Southern BC and e WA to NV, KS, NM; Bear Lake, Bingham, Caribou, Cassia, Franklin and Oneida Cos.
Salicaceae	Salix farriae Ball	Farr's Willow	S2	c	Wet meadows, moist streambanks and lakeshores between 9000-9300'	Southern BC and AB, ne OR, east-central ID, w MT, nw WY. Custer Co (N of Leatherman Pass; White Cloud Peaks; Upper Merriam Lake Basin); quite a bit in Yellowstone
Crassulaceae	Sedum borschii R.T. Clausen	Borsch's Stonecrop	SM	L	Midmontane open to shaded cliffs and rocky slopes, west to nw exposures on a variety of parent material; often in Douglas-fir	Endemic to northern half of ID batholith, the 7 Devils Mts, Craigs, and sw MT. Idaho, Lemhi and Valley Cos..
Caryophyllaceae	Silene scaposa Robbins var. lobata Hitchc. & Maguire	Scapose Silene	SM		Slightly moist drainages, gravelly meadows and hillsides in sagebrush or PJ areas; often on limestone.	Southeast OR, n NV, Lost River and Lemhi ranges of east-central ID; Butte and Clark Cos.
Orchidaceae	Spiranthes diluvialis Sheviak	Ute Ladies tresses	G2		Meadows near springs, lakes and perennial streams on plains, in broad intermountain valleys, and in narrower mountain valleys at lower elevations.	Great Plains of western Nebraska and adjacent Wyoming, west about 600 miles across the Rocky Mountains and Intermountain Region to the Okanogan Valley in north central Washington, near the Canadian border; in Idaho, South Fork Snake River drainage between Palisades Dam and Heise.
Brassicaceae	Stanleya tomentosa Parry var runcinata (Rydb.) Rollins	Wooly Princess Plume	SR	c	Open slopes; ashy to scree substrates	Variety endemic to the Challis area. in the Challis volcanic area
Ranunculaceae	Thalictrum dasycarpum Fisch & Ave-Lall.	Purple meadowrue	S1		Deciduous riparian woods, damp thickets, moist woods, wet meadows; often within or adjacent to the floodplain	Eastern BC e to Ontario, s through the central US to the southeastern states, in the Rockies to NM, AZ, ID, ne WA. Bear Lake, Bonner, Boundary, Cassia, Fremont

Table 4. Endemic, dropped, and unlikely species. NPS'02 is the status reported by the Idaho Native Plant Society in 2002.							
Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Poaceae	<i>Agrostis oregonensis</i> Vasey	Oregon bentgrass	dropped			Montane wet meadows, fens, and stream margins.	Vancouver Island to California and western Nevada, east to north central Idaho (known from Shoshone Co.). Dropped-misidentification
Liliaceae	<i>Allium simillimum</i> Henderson	Dwarf Onion	ns			Open slopes and meadows in gravelly soils of granitic, calcareous or basaltic origin (Lesica and Shelly 1991)	Central and sw ID, sw MT; regional endemic; tracked in MT but not in ID
Asteraceae	<i>Antennaria arcuata</i> Cronq.	Arching Pussytoes	G2			In Idaho, in a moist to wet alkaline sedge/grass meadow in the Wyoming sage zone between a thermal spring and cold water channel with mosses, <i>Potentilla gracilis</i> , <i>Juncus</i> spp., <i>Deschampsia cespitosa</i> , <i>Iris missouriensis</i> , <i>Achillea millefolium</i> , <i>Antennaria rosea</i> , <i>Sisyrinchium douglasii</i> , <i>Distichlis stricta</i> , and <i>Poa pratensis</i> .	Central Wyoming (Fremont County; 20 locations), northeast Nevada (Elko County), central Idaho (a single site near Carey; Blaine County)
Brassicaceae	<i>Arabis fecunda</i> Rollins	Sapphire Rockcress	ns			Open, rocky, often eroding slopes developed from calcareous parent material in the foothills and montane zones, restricted to the contact zone with igneous rock. (MNHP web site)	Beaverhead and Ravalli Cos in MT; considered a regional endemic in the Pioneer and Sapphire mountains and not known from ID
Leguminosae	<i>Astragalus beckwithii</i> Torr. & Gray var. <i>sulcatus</i> Barneby	Beckwith's milkvetch	dropped	L	c	Sagebrush slopes from the Wyoming sage zone to the mountain big sage zone	Endemic to the Salmon River; several populations on BLM; dropped in 1993; considered relatively common with no threats
Leguminosae	<i>Astragalus ceramicus</i> Sheldon var. <i>apus</i> Barneby	Painted Milkvetch	dropped			Open sandy soil in sagebrush grassland in the foothills zone (Lesica and Shelly 1991).	No longer tracked by ID (found to be fairly common); still tracked in MT.
Leguminosae	<i>Astragalus drummondii</i> Dougl. ex Hook.	Drummond's milkvetch	SS			Plains, prairies, valleys at low to moderate elevations.	Great Plains species that reaches its western distribution in Idaho and Utah; known from Clark County
Leguminosae	<i>Astragalus eucosmus</i> Robins	Elegant milkvetch	dropped			Stream banks and shingle bars, often about willow thickets or with shrubby cinquefoil, in aspen groves, open spruce or fir forests, sometimes in meadows moist in spring, at highlatitudes on dry but cool, luffy banks and shores, from sea level northward up to 10,500 feet in the Rocky Mountains (Barneby 1964)	Dropped in Idaho in 1992. In Idaho, occurs from the Sawtooth Valley to Big and Little Lost drainages.
Leguminosae	<i>Astragalus platytropis</i> Gray	Broad-keeled Milkvetch	dropped	L	c	Valley benchland, slopes, ridges, usually on open windswept calcareous substrates, mountain sagebrush zone	Southwest MT, c ID, south to NV and the CA Sierras. Dropped in 1993; considered relatively common with no threats
Leguminosae	<i>Astragalus scaphoides</i> (M. E. Jones) Rydb.	Bitterroot Milkvetch	dropped	L		Sagebrush slopes from the Wyoming sage zone to the mt big sage zone	No longer tracked by either MT or ID; regional endemic in east-central ID and sw MT, but common within that area. Lesica has continued a long-term demographic study at the Agency Creek Enclosure. Additional work has been done by Elizabeth Crone, University of Montana-Missoula
Orchidaceae	<i>C. parviflorum</i> var. <i>pubescens</i> (Willd.) Knight (= <i>C. pubescens</i> Willd. var. <i>pubescens</i>)	Greater Yellow Lady's Slipper	S1			Wet areas, moist forests, seeps	Much of U.S., but apparently absent from MT, NV, UT, CO, NE. In Idaho, in Bonner, Boundary, Idaho Cos; I heard a report of this species in a wet aspen seepage up Freeman Creek.
Poaceae	<i>Calamagrostis tweedyi</i> (Scribn.) Scribn. ex Vasey	Cascade Reedgrass	G3/S2			Disturbed areas and moist meadows in subalpine fir, Douglas-fir and grand fir forests	Wenatchee Mts., central ID, nw MT; Idaho Co
Cyperaceae	<i>Carex abrupta</i> Mackenzie	Abruptbeak sedge	dropped			Moist meadows and seeps in coniferous forest	Western species (CA, OR, NV); east-central Idaho in Bighorn Craigs

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Cyperaceae	<i>Carex chordorrhiza</i> Ehrh ex L.f.	Creeping sedge	S1			Fens and Sphagnum bogs.	Known from nw MT and adjacent ID; not likely here, but possible in fens. Circumboreal, principally of boreal and subarctic regions, extending south in North America to the upper Midwest and Pacific Northwest states. In Idaho, only known from Bonner County; also in northwest Montana.
Cyperaceae	<i>Carex duriuscula</i> C.A. Mey. (<i>C. stenophylla</i>)	Needleleaf sedge	dropped			Dry alluvial fans in the Challis-Mackey area; on Antelope Flat ACEC; <i>Poa secunda</i> and <i>Sitanion hystrix</i> .	Northern Great Plains, to the east base of the Rocky mts., and at scattered stations in BC, ID, OR, NV, AZ; also widespread in Eurasia. Recommended dropped in 1994 because relatively common in ID.
Cyperaceae	<i>Carex leptalea</i> Wahl.	Bristlystalked sedge	ns			Sphagnum bogs, swamps and lake shores.	Southern Rocky Mountains, from southern Wyoming to New Mexico and West to Utah, Nevada and southern California. In Idaho known from Bonneville Co.
Cyperaceae	<i>Carex occidentalis</i> Bailey	Western sedge	S1			Open to lightly wooded slopes and dry meadows, generally at middle elevations, but extending to subalpine and alpine areas (CDC). Dry habitats at mid-elevations but extending to the spruce-fir zone, sometimes to subalpine or even alpine habitats (Lesica and Shelly 1991).	Southern Rockies, from s WY to NM and west to UT, NV, and s CA; occurs in Beaverhead Co., not unlikely in adjacent ID. Known from Bonneville Co.
Cyperaceae	<i>Carex paupercula</i> Michx.	Poor sedge	S2			Nutrient poor bogs and fens, often with Sphagnum moss, in the montane zone (MNHFP web site).	Our calcareous fens are nutrient rich, but this species is worth watching for.
Scrophulariaceae	<i>Castilleja covilleana</i> Henderson	Rocky Mt. Paintbrush	ns			Rocky mountain slopes, terraces and summits (6000-8700 in MT)	Regional endemic, central ID to western MT.
Scrophulariaceae	<i>Castilleja crista-galli</i> Rydb.	Cockscomb Paintbrush	ns			Dry mountainsides	BONAP has confirmed in MT and WY, suspected in ID; Hitchcock et al (1959) notes specimens from Idaho (Lemhi and Custer cos.) are atypical.
Scrophulariaceae	<i>Chionophila tweedyi</i> (Canby and Rose) Henderson	Tweedy's snowlover	ns			Open slopes, mountains, and talus, near timber line in the mountains	ID and MT (BONAP): central ID and adj sw MT; relatively common within its limited range (Hitchcock and Cronquist 1973)
Polemoniaceae	<i>Collomia debilis</i> (S.Wats.) Greene var. <i>camporum</i> Payson	Flexible Alpine Collomia	G2	L		Stable granitic talus slopes, rock slides and road banks on quartzite talus	Endemic to the North Fork Salmon River, unconfirmed records for the Bitterroot Valley, MT (not tracked by MTNHP). While Salmon BLM contains what appears to be suitable habitat, the species appears to be confined to the North Fork drainage.
Boraginaceae	<i>Cryptantha caespitosa</i> (A.Nels) Payson	Tufted cat's-eyes	G3			Dry often barren, probably calcareous, clay, gravelly or sandy knolls, ridges and draws; with sagebrush or juniper	Southwest WY, ne UT, Bear Lake Plateau Region of sw ID; Bear Lake Co.; specimen in Salmon BLMs herbarium (now disappeared) had been keyed to this species, but never verified.
Boraginaceae	<i>Cryptantha salmonensis</i> (A.Nels & J.F. Macbr.) Payson	Salmon River cat's-eye	ns			Dry slopes and washes	Endemic to east central ID
Orchidaceae	<i>Cypripedium fasciculatum</i> Kellogg ex S. Wats	Clustered Lady's Slipper	S2			A number of different coniferous forest types, primarily where fairly moist, shaded and at least some soil present. Montana occurrences are mostly in warm, dry mid-seral montane forest in the Douglas fir/ninebark and grand fir/ninebark habitat types. In Idaho, mostly in western hemlock or western red cedar forests. In Uintas found in high elevation old growth lodgepole forests.	Scattered in OR, WA, ID, MT, CA, UT, WY, CO. In ID: Benawah, Clearwater, Idaho, Kootenai, Latah, Shoshone Cos.

Table 4. Endemic, dropped, unlikely species

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Orchidaceae	<i>Cypripedium parviflorum</i> Salisb.	Small Lady's Slipper	ns			Fens, damp mossy woods, seepage areas, and moist forest-meadow ecotones in the valley to lower montane zones.	BC to WA and OR, east of the Cascades to ID, MT, WY, UT and CO; sparse throughout its range. NOTE BONAP has in much of eastern and central US, west to MT, OR, WA, UT, but absent from ID
Primulaceae	<i>Douglasia idahoensis</i> D. Henderson	Idaho dwarf-primrose	G2			North and east facing slopes on open subalpine ridges in whitebark and subalpine fir on gravelly unstable soils derived from granitic parent material.	Endemic to central and n ID; Idaho, Boise, Elmore and Valley Cos.
Brassicaceae	<i>Draba argyreae</i> Rydb.	Silvery Draba	dropped			Subalpine to alpine, usually in rock crevices	BONAP has only in ID; Sawtooth and Smoky Mts of c ID (Hitchcock and Cronquist 1973); dropped in 1994
Brassicaceae	<i>Draba daviesiae</i> (Hitchc.) Rollins (D. <i>apiculata</i> var <i>daviesiae</i> Hitchc.)	Davies Whitlow-grass (Bitterroot draba in Lesica and Shelley 1991)	ns			Open, rocky soil and talus in the subalpine and alpine zones.	Ravalli Co. MT and Custer Co. ID (regional endemic)
Brassicaceae	<i>Draba hitchcockii</i> Rollins	Hitchcock's Draba; Lost River willowgrass	ns			Open south-southeast facing slope of 30%. With <i>Cercocarpus ledifolius</i> , <i>Phlox hoodii</i> . Other species nearby include <i>Leucopoa kingii</i> , <i>Agropogon spicatum</i> , <i>Artemisia tridentata wyomingensis</i> , <i>Artemisia arbuscula nova</i> , and <i>Chrysothamnus nauseosus</i> . Soil thin, rocky, derived from limestone (NYBG specimen label data for isotype collection).	BONAP- only in ID
Brassicaceae	<i>Draba oreibata</i> J.R. MacBr. & Payson ex Payson	Limestone Draba	SR			Lower canyons to subalpine rock crevices.	BONAP- known from ID and UT and suspected in MT; Hitchcock et al notes in the Lost River Mountains and in Glacier Park, MT
Brassicaceae	<i>Draba sphaerocarpa</i> J.F. Macbr. & Payson	Globefruited Draba	ns			Montane gravel bars and subalpine to alpine ridges and talus slopes	BONAP- only in ID; Sawtooth Mountains
Brassicaceae	<i>Draba trichocarpa</i> Rollins	Stanley Whitlow-grass	G2		c	Open slopes and outcrops on granitic weatherings	Endemic to the Stanley Basin. ID
Droseraceae	<i>Drosera inlermedia</i> Hayne	Spoon-leaved Sundew	S1		c	Sphagnum fens and moist, acidic, sandy soils; often with <i>Carex livida</i> , <i>Scirpus caespitosus</i> , <i>Eleocharis pauciflora</i> , <i>Swertia perennis</i> .	BC to Newfoundland, s to ID in Boundary and Custer Cos (Sawtooth Valley peatlands)
Elaeagnaceae	<i>Elaeagnus commutata</i> Berhn. ex Rydb.	American Silverberry	dropped		c	Along streams and watercourses, riparian shrub communities; often with <i>Populus trichocarpa</i>	BC and Yukon east to Quebec, s to RM area in ID, MT and UT. Banks of Snake River near Menan, near Heise Bridge, Bowery Guard Station on the upper East Fork, between Bayhorse Campground and the Salmon River; on the Salmon R. south of the mouth of the East Fork
Polemoniaceae	<i>Eriastrum sparsiflorum</i> var. <i>wilcoxii</i> (A. Nels.) Cronq.	Great Basin Woolstar	ns		c	Dry sandy substrates in the valley and foothills	Disjunct in the Challis area from the south; not considered rare, but uncommon
Asteraceae	<i>Ericameria parryi</i> (Gray) Nesom & Baird var. <i>montanus</i> (L.C. Anderson) Nesom & Baird (<i>Chrysothamnus parryi</i> var. <i>montanus</i>)	Centennial Rabbitbrush	G1			High elevation slopes or windswept ridge crests with southerly exposures between 8,800 and 10,000 feet, restricted to rocky, calcareous substrates of the Beaverhead Conglomerate Formation where bedrock is at or near the surface, resulting in minimal soil development.	Endemic to the Red Conglomerate Peaks area in the southern Beaverhead Range of ID and MT.
Asteraceae	<i>Ericameria parryi</i> (Gray) Nesom & Baird var. <i>salmonensis</i> (L.C. Anderson) Nesom & Baird (<i>Chrysothamnus parryi</i> var. <i>salmonensis</i>)	Salmon River Rabbitbrush	ns		c	Canyons and slopes along the Salmon River and tributaries in dry, often unstable substrates and on more stable slopes	East Idaho endemic
Asteraceae	<i>Erigeron asperugineus</i> (D.C.Eal.) Gray	Rough Fleabane	ns			Rocky or gravelly slopes and ridges on open soil or scree at moderate to high elevations	Central ID, ne NV, sw MT; regional endemic
Asteraceae	<i>Erigeron evermannii</i> Rydb.	Evermann's Daisy	ns			High elevation on shifting talus or in dry rocky meadows	Endemic to central ID and sw MT

Table 4. Endemic, dropped, unlikely species

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Asteraceae	<i>Erigeron formosissimus</i> Greene	Beautiful daisy	ns			Meadows and open ground in the mountains, mid montane to subalpine	S. Rockies and Black Hills, disjunct in sw MT and sw Alberta; not known from ID.
Asteraceae	<i>Erigeron salmonensis</i> S.J. Brunfeld and Nesom	Salmon River Fleabane	G3	L		Cracks, crevices and ledges on steep to vertical north-facing canyon cliffs and buttresses	Endemic to the lower 25 miles of Middle Fork and lower canyons of tributaries, and a nearby location along Main Salmon R.
Polygonaceae	<i>Eriogonum meledonum</i> Reveal	Guardian Buckwheat	G2		c	Open rocky granitic outcrops and exposed ridgelines and slopes in low sagebrush and Mt. Big sagebrush communities; often with <i>Draba trichocarpa</i>	Stanley Basin endemic
Cactaceae	<i>Escobaria missouriensis</i> (Sweet) D.R. Hunt (<i>Coryphantha missouriensis</i>)	Nipple Cactus	dropped	L	c	Sagebrush flats and gentle slopes.	East of Rocky Mountains, with stations in east-central ID. Records in Butte and Clark; should be noted and locations reported - not uncommon in Lemhi CO at 4000-8000 in sagebrush communities Dropped in 1996.
Asteraceae	<i>Eupatorium maculatum</i> L.	Spotted Joe-pye Weed	SR			Found in moist meadow, springs, and swamp thicket habitats in valley bottoms and plains.	Known from collections around Fort Hall Bottoms north of Pocatello.
Polemoniaceae	<i>Gilia congesta</i> var. <i>palmifrons</i> (Brand) Cronq. (<i>Ipomopsis congesta</i> var. <i>palmifrons</i> (Brand) Day)	Ballhead gilia	ns	L	c	Lower elevations; open sandy soils	St. Anthony sand dunes and in Lemhi and Custer counties. Not considered rare.
Polemoniaceae	<i>Gilia leptomeria</i> Gray	Great Basin Gilia	ns			Open sandy soils on flats and gentle slopes in the valleys	Disjunct in Idaho from the main distribution to the south; not rare
Crossosomataceae (Celastraceae)	<i>Glossopetalon spinescens</i> Gray var. <i>aridum</i> M.E.Jones (<i>G. nevadense</i>)	Spiny Greenbush	ns			Rocky canyon walls of the montane zone	Much of western U.S.; peripheral in MT where tracked; known from Ravalli CO; not tracked in ID.
Polemoniaceae	<i>Gymnosteris nudicaulis</i> (Hook. & Arn) Greene	Large-flowered Gymnosteris	dropped			Gravelly soils with <i>A. tridentata wyomingensis</i> and <i>Poa secunda</i> as well as <i>Leptodactylon pungens</i> , <i>Camissonia andina</i> , <i>Cryptantha circumscissa</i> , <i>Phlox aculeata</i> , <i>Mimulus nanus</i> (Cholewa and Henderson 1984)	BONAP: ID, OR, NV; found to be fairly abundant and dropped in 1994
Polemoniaceae	<i>Gymnosteris parvula</i> Heller	Small-flowered starlet	dropped		c	Open, dry to moderately moist slopes, flats, and drier meadows	Central OR to nw WY, s to CA and CO; Blaine, Camas, Caribou, Clark, Custer, Lincoln, Minidoka, Owyhee Cos.; found to be fairly abundant and dropped in 1996.
Boraginaceae	<i>Hackelia davisii</i> Cronq.	Davis' Stickseed	G3	L	c	Cracks, ledges and crevices in north-facing canyon walls and cliffs	Endemic to the Middlefork, Salmon River, and lower canyons of tributaries; Lemhi, Idaho, Custer, Valley Cos. Relatively common within its limited range (Henderson 1983)
Brassicaceae	<i>Halimolobos perplexa</i> var. <i>lemhiensis</i>	Puzzling Halimolobos	dropped			Sandy dry granitic material along the Salmon River below North Fork and along the North Fork just above North Fork ID; often on roadcuts	Found to be fairly common and dropped in the early 1990s
Asteraceae	<i>Hymenopappus filifolius</i> Hook. Idahoensis B.L.Turner	Hymenopappus (Fine-leaf woollywhite)	ns			Open slopes, often loose substrates, generally on volcanics; often on road cuts	East central Idaho endemic
Polemoniaceae	<i>Ipomopsis congesta</i> (Hook.) Grant ssp. <i>crebrifolia</i> (Nutt.) Day = <i>Gilia congesta</i>	Ballhead gilia	ns			Open, often eroding, sandy soil in the foothill zone (6700-6900' in MT) (Lesica and Shelly 1991) with <i>Artemisia nova</i> , <i>Elymus ambiguus</i> , <i>Agropyron spicatum</i> , <i>Lappula redowskii</i> , <i>Cymopterus glaucus</i> , <i>Langloisia setosissima</i> (Cholewa and Henderson 1984)	Ssp known from sw MT and w WY; the species as a whole OR to CA east to MT and NE. In Beaverhead CO in MT. Not known from ID (BONAP)
Rosaceae	<i>Kelseya uniflora</i> (S.Wats.) Rydb.	Kelseya	ns			Limestone rock crevices	Lewis & Clark and Meagher Cos, MT, Custer and Butte Cos, ID, and the Big Horn, WY; relatively common within its range and rejected by the Idaho Rare Plant Technical Committee (REPTC 1981)

Table 4. Endemic, dropped, unlikely species

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Brassicaceae	<i>Lesquerella carinata</i> Rollins	Keeled Bladderpod	ns			Open, usually calcareous soils of grasslands and rocky areas in from the foothills to alpine zones	East central ID, nw WY and sw MT, regional endemic
Brassicaceae	<i>Lesquerella kingii</i> var. <i>cobresis</i>	King's Bladderpod	dropped			Open slick spots in volcanic soils on the Snake River Plain	Found to be fairly common and dropped in the late 1980s
Brassicaceae	<i>Lesquerella pulchella</i> Rollins	Beautiful Lesquerella	ns			Gravelly, calcareous soil of foothill slopes in sparsely vegetated mountain mahogany woodlands, and of subalpine to alpine slopes in fellfields and sparsely vegetated limber pine woodlands (MTNHP web site)	Only known from Montana; occurs on Polaris and Grant quads.
Poaceae	<i>Leymus salinus</i> (M.E.Jones) A Love ssp. <i>Salmonis</i> (Hitchc.) Alkins (<i>Elymus ambiguus</i> var. <i>salmonis</i>)	Salmon River Wild Rye	ns		c	Slopes and flats, often with <i>Artemisia tridentata wyomingensis</i> , <i>Atriplex confertifolia</i> ; replaces <i>Pseudoroegneria spicata</i> as the dominant bunchgrass on some range sites	Challis endemic BONAP has in ID, UT, and Nevada
Saxifragaceae	<i>Lithophragma tenella</i> Nutt. <i>Thompsonii</i> (Hoover) C.L.Hitchc.	Slender Fringecup	ns			Sagebrush desert to pine forest	East side of the Cascades in Washington, known from Okanogan and Grant to Yakima Counties; a very similar plant occurs in Lemhi Co, ID (Hitchcock and Cronquist 1973)
Umbelliferae	<i>Lomatium attenuatum</i> Everett	Taper-tip Desert-parsley	ns			Dry unstable moderate to steep south-facing scree slopes, often derived from limestone in openings in Douglas-fir and limber pine with sparse <i>Pseudoroegneria spicata</i> , <i>Leucopoa kingii</i> , <i>Oryzopsis hymenoides</i>	Occurs on Beaverhead, not known from ID (BONAP); tracked in MT.
Umbelliferae	<i>Lomatium idahoense</i> Coult. & Rose	Idaho Biscuitroot	ns		C	Open, often rocky slopes and dry meadows at moderate to high elevation in the mts.	Central ID endemic, Custer, Elmore, Blaine, Boise, and Camas Counties; relatively common within its narrow range
Asteraceae	<i>Machaeranthera lativirens</i>	Vivid Green Aster				Dropped- lumped, not a valid taxon	
Asteraceae	<i>Malacothrix torreyi</i> Gray	Torrey's Malacothrix	dropped			Dry loose sandy soils, and on bentonite (near Salmon) in <i>A. tridentata</i> var. <i>wyomingensis</i> and <i>Atriplex confertifolia</i> communities	Disjunct along the Salmon and Lemhi Rivers from its main distribution in the Great Basin and S. Rockies. Dropped in ID (Nancy Cole found many sites when surveying for the ID Power transmission line in 1991); still tracked in MT.
Scrophulariaceae	<i>Mimulus primuloides</i> Benth	Primrose Monkey-flower	ns			Wet meadows and open moist places; midmontane	Sw OR, central ID, adj MT
Poaceae	<i>Oryzopsis swallenii</i> Hitchc & Spell. (<i>Achnatherum swallenii</i> (Hitchc & Spell.) Barkworth)	Swallen's Ricegrass	dropped			Calcareous and volcanic soils; common associates include <i>Artemisia arbuscula</i> , <i>A. frigida</i> , <i>Haplopappus acaulis</i> , <i>Poa secunda</i> , <i>Hymenopappus filifolius</i> var. <i>idahoensis</i>	Clark, Custer and Lemhi Counties; relatively common in the Challis area. Dropped in 1993 - considered relatively common with little threat
Polygonaceae	<i>Oxytheca dendroidea</i> Nutt.	Tree-like Oxytheca	dropped			Dry sandy to rocky places mostly in sagebrush or P.J.	Western WY through SRP to central WA, s through e OR, w NV, e CA Bingham, Butte, Elmore, Fremont, Lincoln Cos. Lots found on the INEL during 1993 and the species dropped from the list
Leguminosae	<i>Oxytropis parryi</i> Gray	Parry's Locoweed				Subalpine to alpine	Known in MT from Beaverhead CO.
Hydrophyllaceae	<i>Phacelia incana</i> Brand	Hoary Scorpionweed	ns		c	Calcareous dry slopes from the foothills to moderate elevations	Custer Co. populations are disjunct from main population in WY, NV, and UT. Rejected for listing in the early 1980s (REPTC 1981), but uncommon in Idaho.
Polemoniaceae	<i>Phlox kelseyi</i> Britt. var. <i>kelseyi</i>	Kelsey's Phlox	dropped	L	c	Alkaline moist meadows, often on hummocks; also around hot springs	MT, WY, e ID, central ID, disjunct in e NV; Caribou, Clark, Custer, Lemhi, Teton Cos. Dropped in 1997
Brassicaceae	<i>Physaria geyeri</i> (Hook.) Gray var. <i>purpurea</i> Rollins	Geyer's Twinpod	dropped			Mountain sage to Douglas-fir and Ponderosa pine woodlands; sparsely vegetated unstable slopes and road cuts on fine, gravelly talus, sand or ash with <i>Eriogonum ovalifolium</i> , <i>Collinsia grandiflora</i> , <i>Phacelia hastata</i> .	This species was considered in the early 1980s, but never placed on the list because it was known from many sites.

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Poaceae	<i>Poa abbreviata</i> R.Br. ssp. <i>marshii</i> Soreng	Marsh's Bluegrass	G2		c	Rocky, high elevations	Blaine, Butte, Custer (only known from 3 sites)
Asteraceae	<i>Pyrocoma integrifolia</i> (Porter ex Gray) Greene (<i>Haplopappus integrifolius integrifolius</i>)	Entire Leaved Goldenweed	SR			Shrub-steppe; Camas Prairie remnant	In Idaho, around Hill City (weedy along railroad ROW) Notes from 2001: collected in southern Beaverhead MTs, the Centennial Range, and the Henry's Lake areas in ID. Moseley (1991) lists several collections in Lemhi County that may be this subspecies. One 1976 collection "seven miles east of Leadore on State Route 29," may be possible to relocate. Habitat in the six collections is varied, including alkaline meadows, open hillsides and forest openings.
Grossulariaceae	<i>Ribes hendersonii</i> C.L.Hitchc. (<i>R. oxyacanthoides</i> ssp. <i>hendersonii</i> (Hitchc.) Sinnott	Henderson's Gooseberry	ns			Limestone cliffs and talus	Lost River Range, also in other ranges of Custer and Lemhi Cos; also in Anaconda Range of Montana; range possibly continuous (FPNW)
Umbelliferae	<i>Sanicula graveolens</i> Poepp. Ex DC		SS			Sparsely wooded to open slopes and flats	Southern BC to s CA, west to w MT, nw WY; Valley and Fremont Cos.
Saxifragaceae	<i>Saxifraga apetala</i> Piper	Tiny swamp saxifrage	ns			Moist, open often gravelly soil in meadows and on rock ledges in the montane, subalpine and alpine zones (Lesica and Shelly 1991)	In MT, in Beaverhead, Deer Lodge, Granite and Ravalli Cos; not known from ID (BONAP)
Scheuchzeriaceae	<i>Scheuchzeria palustris</i> L	pod grass	S2			Sphagnum peatlands, lake margins	Circumboreal, s AK to Newfoundland, s to NJ, IA, WI, ID, n CA. In Idaho, mostly in northern counties; one site in Valley Co. (Tule Lake) and one in Fremont.
Poaceae	<i>Sporobolus asper</i> (Michx.) Kunth (<i>S. compositus</i> (Poir.) Merr.)	Rough dropseed	S1			Open forest and grasslands on the plains	Most of the U.S. except for Nevada and California.
Poaceae	<i>Stipa pinatorum</i> M.E. Jones (<i>Achnatherum pinatorum</i> (M.E. Jones) Barkworth	Pine Needlegrass	dropped			sagebrush zone to montane ridges; rocky slopes and outcrops	Sierras e through NV and n AZ to se OR, east central ID, UT, CO, WY. Clark, Custer and Valley Cos. Dropped in 1997
Poaceae	<i>Stipa shoshoneana</i> Curto & Henderson		dropped			Moist crevices of intrusive or extrusive igneous, metamorphic, or sedimentary cliffs and rock walls. Common associated species include <i>Heuchera grossulariifolia</i> , <i>Ribes cereum</i> , <i>Potentilla glandulosa</i> , <i>Elymus spicatus</i> , <i>Cercocarpus ledifolius</i> , <i>Pseudotsuga menziesii</i> , <i>Amelanchier alnifolia</i> (Curto and Henderson 1998).	Lemhi and Custer Counties, canyons of the Middle Fork of the Salmon River and its eastern tributaries, Camas and Loon Creeks, the Salmon River Range and extending southeast to the southern Lemhi Range in Butte County, with a small disjunct population in the Belled Range of southcentral Nevada (Curto and Henderson 1998). Relatively common within its range
Saxifragaceae	<i>Sullivantia hapemanii</i> (Coul. & Fisher) Coul. var. <i>hapemanii</i>	Hapeman's sullivantia	G3	L		Wet, open calcareous soil, usually on cliffs or steep banks in the valley zone (Lesica and Shelly 1991); hanging gardens	Northwest WY and adj. MT; east central ID in Idaho and Lemhi Cos. In the Middlefork, regional endemic
Scrophulariaceae	<i>Syntheris pinnatifida</i> Wats. <i>Canescens</i> (Pennell) Cronq	Cutleaf Syntheris	ns			open rocky slopes at high elevations	Southwest MT and c. ID
Saxifragaceae	<i>Telesonix jamesii</i> (Torr.) Raf.	Telesonix	ns			rocky soils, talus, cliff crevices; often on limestone; alpine ad subalpine	MT, e ID, s to NV, UT, CO; Fremont Co
Ranunculaceae	<i>Thalictrum alpinum</i> L.	Alpine meadowrue	ns	L	c	Moist areas, often in calcareous wetlands	Circumpolar, ranging south along the Sierras and Rocky MTs
Brassicaceae	<i>Thlaspi idahoense</i> Payson var. <i>aileeniae</i> Rollins	Stanley Thlaspi	G3		c	Sleep open slopes on whitish granitic sand and among small rocks on mountain big sagebrush and low sagebrush flats on glacial outwash terraces	Stanley Basin endemic
Asteraceae	<i>Tonestes aberans</i> (A.Nels.) Nesom & Morgen (<i>Haplopappus aberrans</i> (A. Nels.) Hall	Idaho goldenweed	dropped			Crevices in granite cliffs and rock outcrops in the montane zone (Lesica and Shelly 1991)	Regional endemic, central ID and sw MT; dropped in ID in 1994, still tracked in MT

Table 4. Endemic, dropped, unlikely species

Family	Scientific Name	Common Name	NPS'02	L	Cu	Habitat	Distribution and Notes
Asteraceae	<i>Townsendia condensata</i> Pary ex Gray (T. spathulata Nutt, misapplied)	Cushion Townsend-daisy	ns			Open rocky, often limestone-derived soil of windswept slopes and ridge tops in the alpine zone	Northwest WY, w. Montana and central Idaho, and disjunct in Utah and CA (IM Flora; Bonap shows same). IMF calls "rare and local." Tracked in MT and WY.
Asteraceae	<i>Townsendia florifer</i> (Hook.) Gray	Showy townsendia	ns			Open soil on flats and eroding slopes in sagebrush-grassland in the foothill zone (Lesica and Shelly)	WA, OR, NV, CO, ID, MT; tracked in MT; common in Idaho
Asteraceae	<i>Townsendia spathulata</i> Nutt.	Sword townsendia	ns			Open rocky limestone-derived soils of slopes and windswept ridgelops in the valley and foothills zones (Lesica and Shelly)Reported near the Clark Canyon Reservoir on thin soils on a limestone outcrop with <i>Oxytropis lagopus</i> and <i>Cymopterus bipinnatus</i> and near Townsend on a limestone bench on an east facing slope with <i>Artemisia nova</i> and <i>Lesquerella alpina</i> . (Lesica, P. 1986. Noteworthy Collections. Madrono 33:311-312.)	Central WY and sw and sc MT; regional endemic; no longer tracked in MT; not known from Idaho, but possible

Table 5. Alpine species known or expected to occur in Lemhi and Custer counties, but not expected on BLM lands.

Family	Scientific Name	Common Name	NPS'02	County	Habitat	Distribution and Notes
Ranunculaceae	<i>Anemone drummondii</i> Wats. var. <i>drummondii</i>	Drummond's thimbleweed	S1		Alpine	Disjunct in central Idaho from coastal ranges; rejected by the Idaho Rare Plant Technical Committee (REPTC 1981)
Asteraceae	<i>Artemisia campestris</i> ssp. <i>borealis</i> var. <i>purshii</i>	Northern Sagewort	S1	c	Alpine slopes and fellfields	The subspecies <i>borealis</i> is circumpolar, with variety <i>purshii</i> found in Idaho at high elevations in the White Cloud Peaks (head of Railroad Ridge in Custer County).
Ranunculaceae	<i>Caltha leptosepala</i> D.C. var. <i>sulfurea</i> C.L. Hitchcock	White marsh-marigold			Alpine	Endemic to the Lost River Range; rejected for listing by the Idaho Rare Plant Technical Committee (REPTC 1981)
Cyperaceae	<i>Carex breweri</i> Boot. var. <i>paddoensis</i>	Brewer's sedge	SS	c	Wet to dry soil or talus high in the mountains near or above timberline; often in alpine scree.	Cascade mts from Mt. Adams northward and disjunct to stations in CO, WY UT and central ID; in Custer Co. known from Railroad Ridge.
Cyperaceae	<i>Carex incurviformis</i> Mackenzie var. <i>incurviformis</i>	Coastal-sand sedge	S2	c	Wet rock ledges, steeply sloping meadows, and moist tundra in the alpine zone.	Rocky mts of British Columbia, Alberta, MT and disjunct in the Pioneer Range in central ID- Kane Lake Cirque on seepy ledges in a steeply sloping meadow at 11,000'.
Cyperaceae	<i>Carex misandra</i> R.Br.	Short-leaved sedge	SR	l	Rock ledges and tundra in the alpine zone	Circumboreal, south to CO and UT; sparse, but locally common in Beartooths; Lemhi Co.
Cyperaceae	<i>Carex stramineiformis</i> Bailey	Mt. Shasta Sedge	SS	c	Open rocky gravelly slopes, often near persistent snowbanks, near or above timberline in grass/orb communities (BNF) or with open subalpine fir and whitebark pine	Sierra Nevada and the White Mts of CA and NV, central Idaho and the Wasatch Mts. In Idaho from Blaine, Boise, Custer and Valley Cos.
Umbelliferae	<i>Cymopterus douglassii</i> Hartman and Constance	Douglas' Wavewing	G3	cl	Relatively unstable calcareous and dolomitic substrates; open subalpine and alpine ridges, slopes, woodland openings	Endemic to east central ID- Custer and Lemhi CO, Lost River Range
Primulaceae	<i>Douglasia idahoensis</i> D. Henderson	Idaho Dwarf-primrose	G2		North and east facing slopes on open subalpine ridges in whitebark and subalpine fir between 7200-9000' with ballhead gilia, alpine fleecellower, <i>Lewisii kelloggii</i> . Substrate poorly differentiated, generally coarsely decomposed bedrock with poor stability-highly erosive.	Central and n Idaho endemic, Idaho, Boise and Valley Cos.
Brassicaceae	<i>Draba fladnizensis</i> Wollen	Austrian Draba	S2	c	Subalpine forest with gravelly soils derived from granitic parent materials.	Circumboreal, sporadic in RM from central ID and sw MT to n UT and CO; known from Kane Lake Cirque. Custer Co
Brassicaceae	<i>Draba globosa</i> Payson (<i>Draba apiculata</i> C.L.Hilchc.)	Pointed Draba	S2	cl	Alpine fellfields	Uintas, western and scentral WY, Beartooth Plateau, White Clouds; Custer Co.
Asteraceae	<i>Erigeron humilis</i> Graham	Low Fleabane	SM	cl	Moist alpine areas, usually near small rivulets and streams, where the water table keeps the soil moist throughout the growing season.	Circumpolar, s to nw MT, n WY, CO; Lost River, Lemhi and Pioneer MTs of east central ID; Butte, Custer and Lemhi Cos.
Gentianaceae	<i>Gentianella propinqua</i> (Richards.) J. Gillet	Four-parted Gentian	SM	c	High elevation meadows and streambanks	Alaska south in the RM to BC, MT, and ID, eastward to eastern Canada; Custer and Fremont
Gentianaceae	<i>Gentianella tenella</i> (Rottb.) Boerner	Slender Gentian	S2	c	Moist subalpine and alpine meadows	Circumpolar, south in the Rockies to CO and central ID. Custer Co.
Papaveraceae	<i>Papaver radicalum</i> Rottb. ssp. <i>kiuanense</i> (D.Love) D.F. Murray	Alpine poppy	X	l	Open rocky soil of slopes where snow lies later in the year in the alpine zone	Yuk, BC, Alta, so to CO and NM; sparse
Saxifragaceae	<i>Parnassia kotzebuei</i> Cham.	Kotzebuei's Grass of Parnassus	SM	c	Moist rock ledges, crevices and meadows, subalpine to alpine	Alaska to Greenland, s to n Cascades and in scattered stations in the Rockies; Kane Lake Cirque; Upper Wildhorse Creek drainage; Rock Creek Cirque below the north face of Borah, lake shore near headwaters of w branch of East Fork of the Pahsimeroi.
Hydrophyllaceae	<i>Phacelia lyallii</i> (Gray) Rydb.	Lyall's Phacelia	SS	l	Talus slopes and rock crevices at high elevations; usually above timberline	Alberta, s BC, w MT, east central ID and 7 Devils in w ID. Idaho and Lemhi Cos.
Ranunculaceae	<i>Ranunculus gelidus</i> Kar. & Kar.	Arctic Buttercup	S1	c	Moist open soil in tundra and talus slopes in the alpine zone	AK and n Canada, s to Alberta, Mt and CO

Ranunculaceae	Ranunculus pygmaeus Whalenb.	Pygmy Buttercup	SS	c	Sandy gravelly sites within alpine turf	AK to Greenland south along the Rocky Mt. Crest to CO. Custer Co. Idaho at Kane Lake.
Saxifragaceae	Saxifraga adscendens L. oregonensis (Raf.) Breit	Wedge Leaf Saxifrage	SM	c	Alpine and subalpine on moist ledges and crevices, along rivulets and gravelly meadows	Central and n Rocky Mts. Kane Lake Cirque, Merriam Lake Basin, Jim Creek Cirque s of Railroad Ridge, slope along Long Lost Creek, Rock Creek Cirque below n face of Borah
Saxifragaceae	Saxifraga cernua L.B.	Nodding Saxifrage	SS	c	Moist rock ledges, crevices, gravelly meadowss, streambankss; alpine	Circumboreal, s in the Rocky Mts to NM, ID and north Cascades of WA. Butte, Custer, Lemhi, Fremont, Blaine Cos.
Caryophyllaceae	Silene uralensis ssp. Montana (Lychnis apetalla var montana)	Petalless Campion	S1	cl	Above timberline; moist alpine tundra on quartzile substrate	Rocky Mts crests from MT and ID to e UT and CO; Blaine, Custer, Lemhi Cos.

Agastache cusickii (Greenm.) Heller

Cusick's Giant Hyssop Lamiaceae

Agastache cusickii Heller; *Lophanthus cusickii* Greenman

Description:

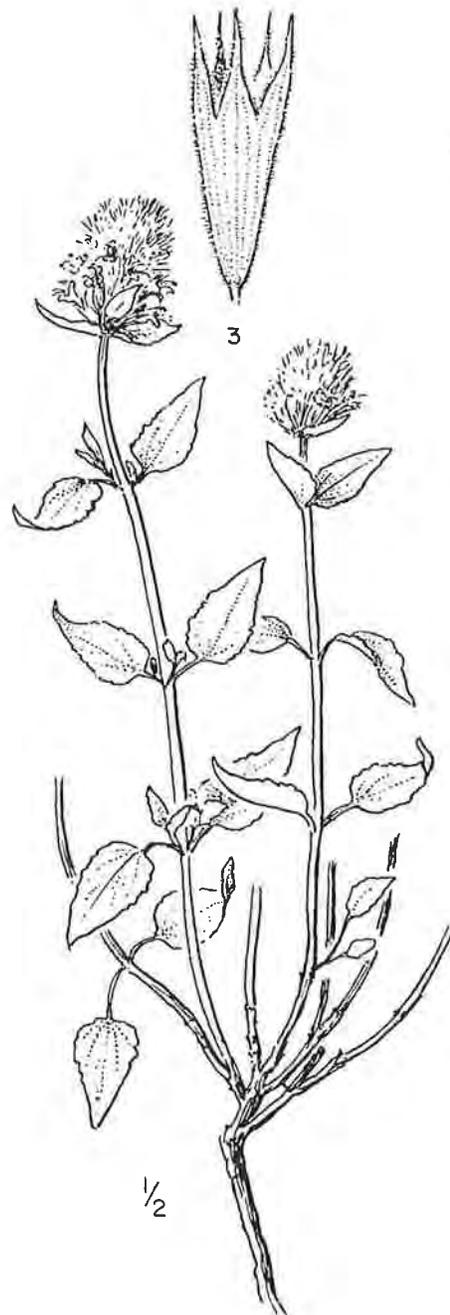
Perennial forb, 10-20 cm tall with numerous stems, woody at the base, stems often lying prostrate beneath the surface and spreading from the rootcrown. Opposite leaves 1-2.5 cm long, triangular with a rounded base; finely hairy. Flowers white, carried amongst purple-tipped bracts in a head-like inflorescence 1.5-4 cm long. Corolla tubular, 8-12 mm long; calyx purple-tinged, tubular with 5 pointed lobes. Stamens 5, protruding from the mouth of the flower tube. Flowering in late June-early July.

Distribution:

It is typically found in the Steens Mountains of southeast Oregon; the Santa Rosa, White Pine, and Toiyabe mountains of north and central Nevada; and the Tendoy Mountains in southwest Montana (Matthews 1993). It is also found in numerous locations in central Idaho (Cronquist et al 1984; Hitchcock and Cronquist 1973). The Plants database shows records for Montana, Oregon, and Nevada, but not Idaho.

Habitat:

Mid to upper elevations on dry rocky slopes to open talus. Cusick's giant hyssop is found on dry, rocky sites, and often on talus. In the Tendoy Mountains, Montana, Cusick's giant hyssop is common on limestone talus with *Artemisia tridentata* and *Achnatherum hymenoides* (Lesica et al 1986).



Agastache cusickii

Allotropa virgata Torr. & Gray ex Gray

Candystick Ericaceae

Description:

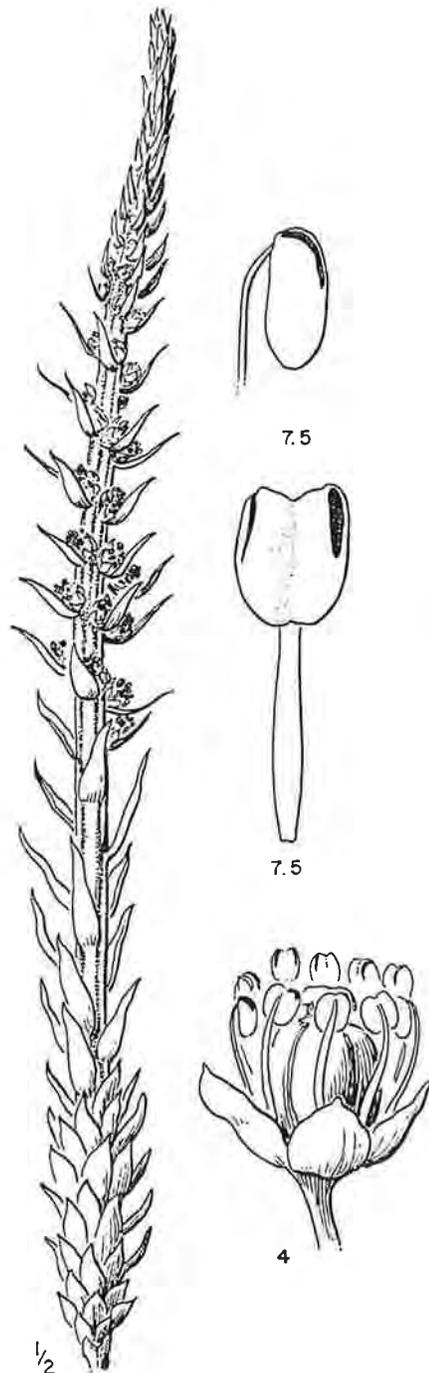
Fleshy, non-green plants with single or more often clustered, unbranched stems bearing the flowers and small, pointed leaves. Thick, brownish-red stems up to 40 cm tall, striped vertically with red and white, most obviously toward the base of the stem (small stems may be solid red). Flowers similar in color to the stem and round in outline. Flowers open outward, directly away from the stem, not downturned. Standing dead stems from previous years are almost always present. Old stems are dark reddish-brown with no white, and hollow. (Adapted from Lichthardt and Mancuso 1991).

Distribution:

East slope of Cascades to near the coast, British Columbia south to California; disjunct in Valley County, Idaho, and northwest Montana.

Habitat:

Gentle to moderate slopes with southeast to southwest aspects in grand fir and subalpine fir community types, on or just below a ridge crest or shoulder. Soils are typically coarse textured, granitic, and often shallow; adjacent soils derived from metamorphic rock is usually unoccupied, suggesting edaphic control. Communities are typically lodgepole pine/beargrass with low understories of grouse whortleberry and/or huckleberry and sparse regenerating trees. Candystick has also been found under ponderosa pine, Douglas fir, subalpine fir, and western red cedar. Understory diversity is low, typically limited to a small group of highly constant species: *Vaccinium scoparium*, *V. globulare*, *Chimophila umbellata*, *Arctostaphylos uva-ursi*, *Pterospora andromedea*, *Hypopitys monotropa*. (Description adapted from Lichthardt 1995 and Lichthardt and Mancuso 1991).



Allotropa virgata

***Anemone cylindrica* Gray**

Candle Anemone **Ranunculaceae**

Description:

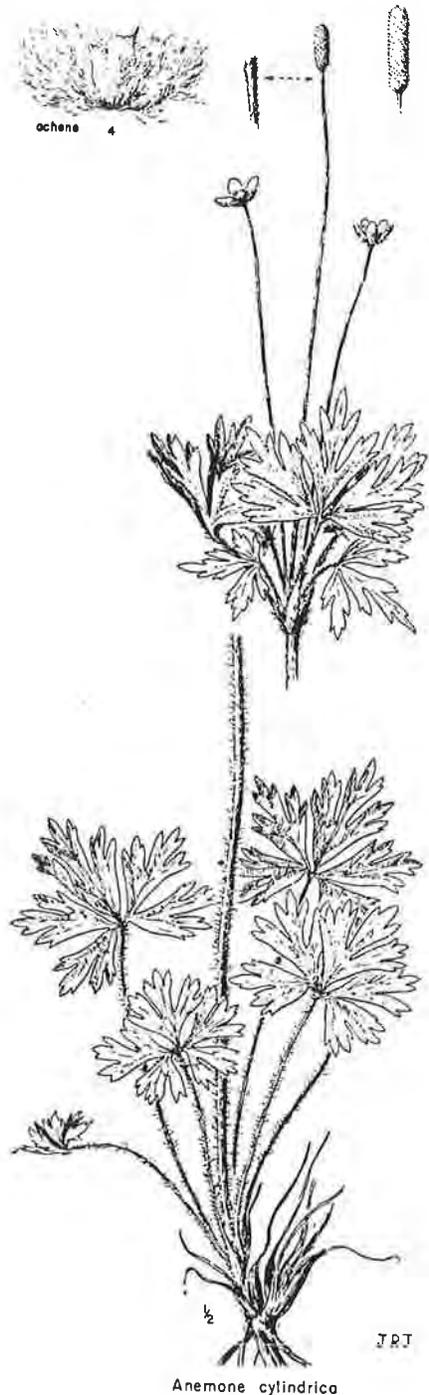
Perennial, 3-8dm tall from a simple or branched rootstock, but not rhizomatous. Plant grayish hairy throughout. Basal leaves many, blades 3-7cm broad, divided to the base or nearly so into 3-7 strongly toothed segments. Flowers 2-6; sepals 5, greenish-white, 8-12mm long; achenes woolly and borne in a cylindrical clusters 2-4cm long and barely 1cm thick. Flowering June and July.

Distribution:

British Columbia south in Rocky Mountains to Montana, New Mexico, Arizona and east to South Dakota, Missouri, and New Jersey. Reported for eastern Idaho by Davis (1952); note that Hitchcock et al (1964) says incorrectly reported for Idaho but that Hitchcock and Cronquist (1973) is less emphatic; occurs in southwest Montana and not unexpected in adjacent Idaho.

Habitat:

Prairies to the lower level meadows in sagebrush steppe in the mountains; usually slopes or flats with additional moisture (north-facing or subirrigated).



***Astragalus amnis-amissi* Barneby**

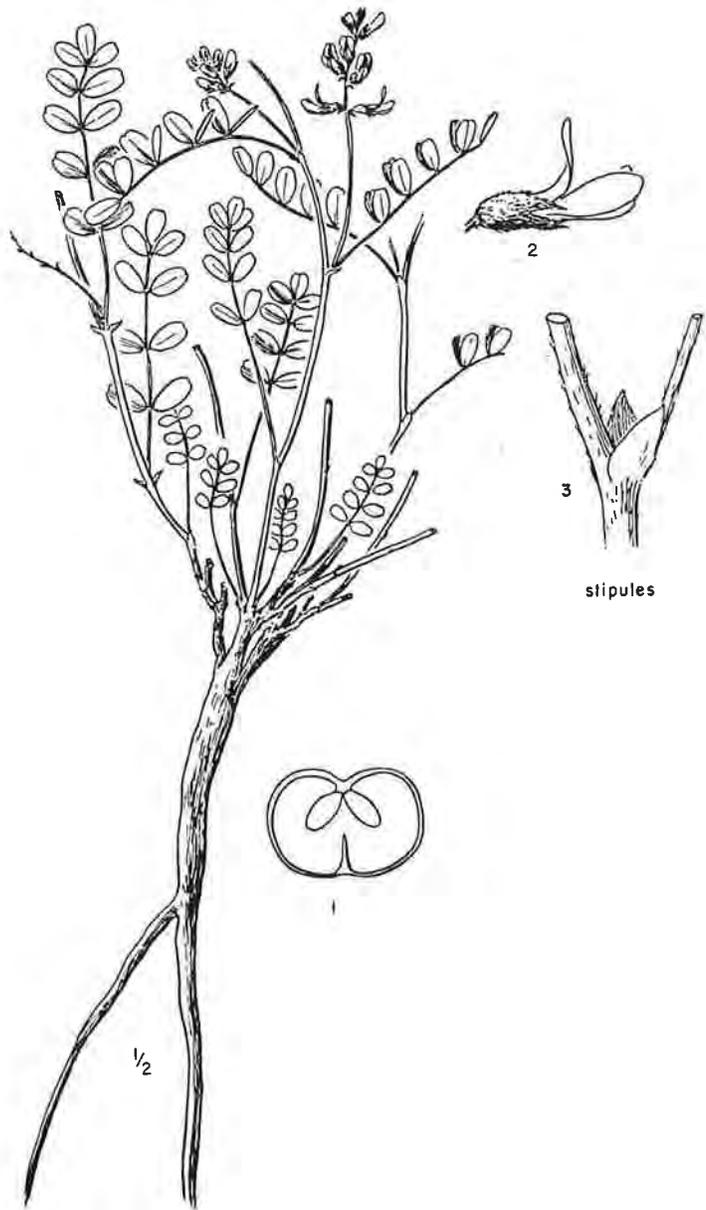
Lost River Milkvetch Fabaceae

Description:

Perennial with a taproot and superficial root crown, stems weakly ascending, 1-2.5dm long, bearing flowers from near or below the middle. Leaves 3-9.5cm long with 9-13 oval leaflets with a blunt to incurved tip. Flowering stalks with 5-12 flowers, petals whitish or tinted purplish-blue, the banner 9-10.5mm long. Pod 15-17mm long, 7-8mm in diameter, slightly obcompressed and shallowly indented underneath, slightly inflated, greenish to purplish, becoming golden and papery (adapted from Hitchcock et al 1961).

Distribution: An east-central Idaho endemic, known from canyons of the southern Lost River Range, Hawley Mountain and the southern tip of the Lemhi Range (Butte and Custer counties). Although not known from BLM lands, it should be watched for in suitable habitats.

Habitat: Limestone cliffs and steep talus, generally in moist, shaded pockets and crevices.



Astragalus amnis-amissi

Astragalus paysonii (Rydb.) Barneby

Payson's Milkvetch Fabaceae

Description:

Perennial, taprooted, 2-4.5dm tall. Diffuse, pale green, very sparsely hairy. Leaves 4-9cm long with 7-15 ovate leaflets, each 5-20mm long with a small notch at the apex. The flowers are small (banner 7-9mm), mostly white with a purple tinge at the base of petals, and arranged in a raceme consisting of 5 to 20 highly fragrant flowers. Stipules are 2-5 mm long and free from the stem (not attached around stem). Fruits are narrowly crescent-shaped, attached to a short stalk (1-1.5 mm long), and either curved or bend downward along the stem. Pods are 10-17 mm long and 2.5-3.5 mm broad, initially green then becoming papery and straw-colored at maturity, with 2 seed chambers and a distinct groove running along the back.

Distribution:

Regional endemic in Idaho and southwestern Wyoming. In Idaho, Payson's milkvetch is documented from the Nez Perce National Forest in northern Idaho (Idaho County) and from the Palisades Reservoir area of Bonneville County, southeastern Idaho (Lorain 1990; CDC database 2000). An historical record exists for the Yankee Fork of the Salmon River, in Custer County, apparently buried in mine tailings. Hitchcock (1961) describes this species as "rare and local."

Habitat:

Woodland openings, burned over forests, older road and trail cuts. Appears to respond favorably to disturbance and fire. Common associates include *Pseudotsuga menziesii*, *Lupinus caudatus*, *Mahonia repens*, *Poa pratensis*, *Koeleria nitida*, *Bromus anomalus*. Lorain (1990) noted that all populations she observed on the Nez Perce were in *Abies grandis* habitat types, but grew on seral sites (burns, logged units and older road cuts) with a scattered overstory of *Pinus contorta*, *Pseudotsuga menziesii*, *Larix occidentalis*. Commonly associated understory species included *Thermopsis montanus*, *Calamagrostis rubescens*, *Xerophyllum tenax*, *Linnaea borealis*, *Arctostaphylos uva-ursi*, *Vaccinium scoparium*, *V. globulare*, and *Fragaria vesca*. She found it "virtually restricted" to mineral soils of decomposed granite (Lorain 1990).



Astragalus paysonii

***Astragalus vexilliflexus* Sheld. var. *nubilus* Barneby**

White Cloud Milkvetch Fabaceae

Description:

Prostrate, taprooted, matted perennial; herbage with short silky hairs up to 0.8mm long. Leaves short-petioled with (5) 7- 13 crowded leaflets. Flower mostly 5-8 mm long and yellowish in color except for the purplish keel, the flowering stem is not raised above the leaves, so that the flowers can be almost hidden by the foliage; banner 5.2-6.2 mm long, 4-5 mm wide; wings 4.7-5.9 mm long, the claws 1.1-1.5 mm. Pods membranous, 7-11 mm long and 2.5-3 mm wide (Barneby 1964, 1989; Hitchcock 1961). White Cloud milkvetch is most likely to be confused with thistle milkvetch. The

following key, modified from Hitchcock and

Cronquist (1973) by Mancuso and Moseley (1990) distinguishes the two species:

1. Leaflets all continuous with the rachis, sharp-pointed to spine-tipped; raceme 1-3 flowered; flowers usually more purplish than White Cloud milkvetch.....*Astragalus kentrophyta*
1. Leaflets not continuous with the rachis, nor sharp-pointed; racemes usually more than 3 flowered; flowers mostly yellow..... *Astragalus vexilliflexus* var. *nubilus*

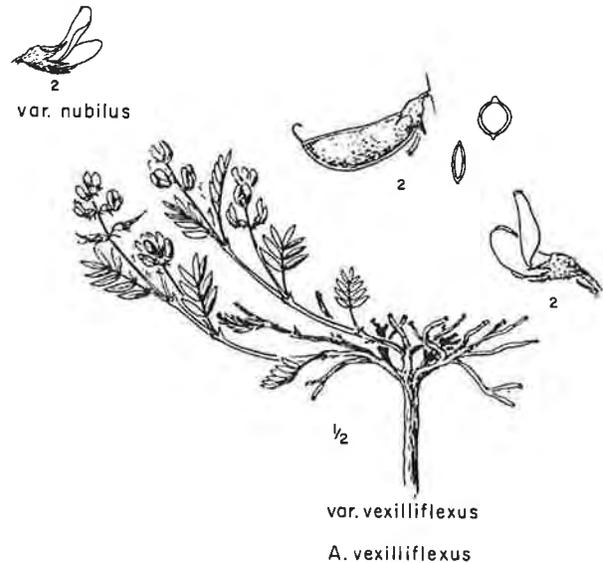
Astragalus vexilliflexus var. *vexilliflexus* occurs in the Salmon River Mountains. It differs in its purple flowers, strongly prostrate habit, and inflorescences that extend past the leaves (Moseley and Mancuso 1994).

Distribution:

White Cloud milkvetch is a narrow endemic known only from the White Cloud Peaks and Boulder Mountains in Custer County, Idaho. Several populations are known from the Sawtooth NRA: Bowery Ridge, Livingston Mine, Railroad Ridge, and Germania. A population is known from about 2 miles (and several hundred vertical feet) from BLM lands in the upper East Fork. There is also a rumor that Bill Osborne found this species on BLM land near the Thompson Creek Mine. I was unable to confirm, nor is there a recorded site in the CDC database.

Habitat:

Restricted to windswept, open, high-elevation (8400 to 9900 feet) ridgelines and (less commonly) slopes on shallow, rocky dry substrates derived primarily from Challis volcanics. Slopes gentle to steep, all aspects, although southerly exposures are the most common. Sites are relatively sparsely vegetated. White Cloud milkvetch occurs within *Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata*, *Artemisia tridentata* ssp. *vaseyana*/*Festuca idahoensis* and *Pinus albicaulis* habitat types. Common associates included *Pseudoroegneria spicata*, *Festuca idahoensis*, *Chrysothamnus viscidiflorus*, *Haplopappus acaulis*, *Lupinus argenteus*, *Astragalus kentrophyta*, *Phlox austromontanus*, *Bupleurum americanum* and *Carex rossii* (Mancuso and Moseley 1990; Moseley and Mancuso 1994).



Botrychium

Moonwort; Grapefern Ophioglossaceae

None of these species are known to occur near or on lands administered by the Salmon BLM, but the species are all easily overlooked, and range and habitat are poorly known for many of the species.

Scientific Name	Common Name	Co.	Habitat	Distribution
<i>Botrychium ascendens</i> W.H. Wagner	Triangular-lobed moonwort	G3	Mesic meadows along streams or on alluvial fans, often with <i>Fragaria virginiana</i> , <i>Calamagrostis rubescens</i> , <i>Senecio pseud aureus</i> , <i>Trifolium repens</i> , <i>Elymus glaucus</i> (Zika 1992)	BC, AB, ONT, AK, OR, WY, ID, MT, CA, NV. Bonner and Boundary co.
<i>Botrychium campestre</i> Wagner and Farrar	Prairie Moonwort	G3 c	Prairies, dry gravelly hillsides, dunes; ID location an alpine meadow	Central AB south to NB, IA; in NY and Ontario, and in the Pacific NW in OR and ID; ID population by Railroad Ridge.
<i>Botrychium crenulatum</i> Wagner	Wavy Moonwort	G3	Mesic to marshy openings in the understory of mature to old western red cedar stands	Widely scattered from CA and UT to OR and Alberta; Boundary Co.
<i>Botrychium lanceolatum</i> (Gmel.) Angstr. var <i>lanceolatum</i>	Lance-leaved moonwort	SS	Diverse habitats including wet to moist grassy and rocky slopes, roadsides and edges of lakes at fairly high elevations; soils often cold and subacid; cedar forests in northern ID	Alaska to OR and ID, and at higher elevations in CO, UT, NM, AZ; extensive range but rare and local
<i>Botrychium lineare</i> Wagner	Skinny moonwort	G1	A specific habitat description is problematic because of slender moonwort's widespread distribution ranging from sea level in Quebec to 9,840 feet in Colorado, occurring deep grass and forb meadows, under trees in woods, and on shelves on limestone cliffs. Montana populations occur along roadsides in early seral habitat. A Railroad Ridge population grows on sparsely vegetated rocky outcrops and ridgelines.	In Idaho, historic location in Boundary Co. Attempt in 2001 did not relocate; Kim Pierson (Sawtooth NF) located a population on Railroad Ridge.
<i>Botrychium lunaria</i> (L.) Sw.	Common moonwort	SR	Mesic to damp grassy/mossy meadows and on sandy to gravelly riverbanks in partial shade to full sun (Mantis and Wirt 1995)	Circumboreal, in the US in WA, MN, MI, NY, ME
<i>Botrychium minganense</i> Victorin	Mingen moonwort	SS I	Moist, shaded, mature to old growth cedar forests as well as open disturbed areas and alpine; often near riparian areas (Mantis and Wirt 1995)	Rare, but widespread, in almost all parts of Canada and Alaska, throughout western US, s to AZ; Boundary, Bonner, Clearwater, Idaho and Shoshone cos.
<i>Botrychium montanum</i> Wagner	Mountain moonwort	G3	Dark coniferous forests, often near streams or swamps	BC, WA, OR, CA, ID, MT; Bonner, Boundary, Latah, Shoshone cos.

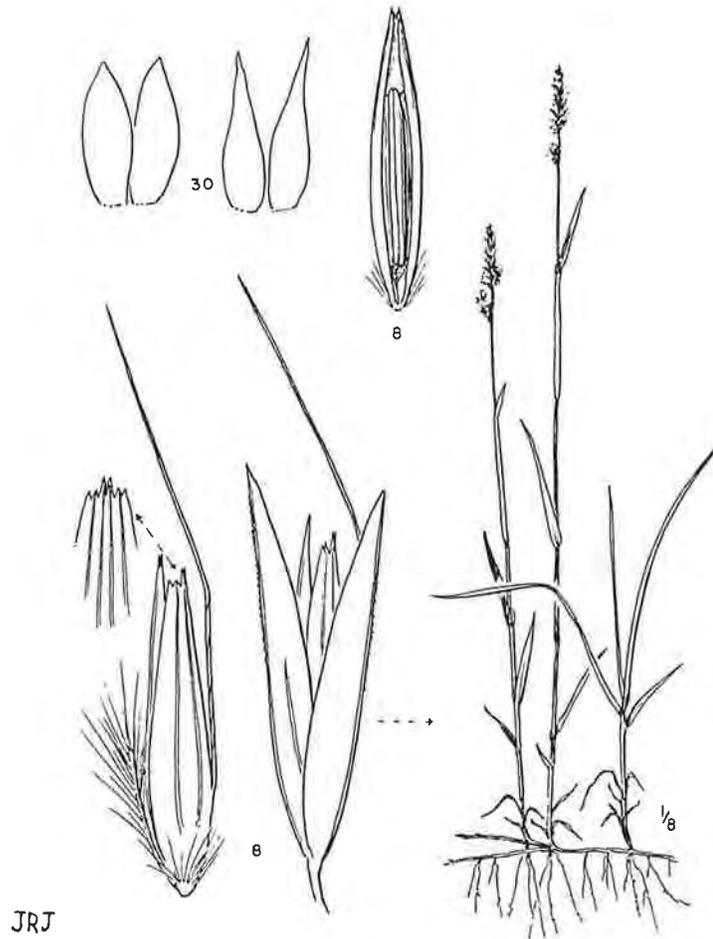
Botrychium paradoxum Wagner	Paradox moonwort	G2	Diverse habitats including snowbeds, open sunny meadows and shady areas; in MT one site in shaded fireweed clone, another in understories of dense mesic grassland on well-developed soils in montane/subalpine zones, and on black muck under dense cover (Mantis and Wirt 1995)	sw Canada, n ID, MT, UT. Boundary Co.
Botrychium pedunculosum Wagner	Stalked moonwort	G3	Brushy secondary growth habitats along streams and roadsides (Flora of NA, 1993)	Alberta, British Columbia, Saskatchewan and Oregon
Botrychium pinnatum St. John	Northern moonwort	SS	Diverse habitats including wet to moist grassy slopes, near springs, seasonally moist areas, streambanks, roadsides, and in mossy woods; generally montane; one Idaho population in a well-drained meadow on sandy alluvium in the subalpine fir zone (Mantis and Wirt 1995)	Rare and local over an extensive range, from Alaska and the Yukon south into the mountains of ne OR, n ID, n NV, MT; Boundary, Bonner, Idaho, Kootenai cos.
Botrychium simplex E. Hitch.	Least Moonwort	S2 c	Diverse habitats including meadows, marshes, bogs, swamps, roadside ditches, disturbed seral lodgepole pine forests, barrens; usually in subacid soils	High elevations from s CA to NC and n to AK and Newfoundland. Also widespread in the Old World. Boundary, Clearwater, Custer cos.

Calamagrostis tweedyi (Scribn.) Scirbn. ex Vasey

Cascade Reedgrass Gramineae

Description:

Plants with short, stout rhizomes, (4) 6-15 dm tall, glabrous except the leaf blades mostly scabrous on the dorsal surface; ligules 6-15 mm long, irregularly erose-jagged, and often lacerate; blades of the culm leaves flat, (5) 7-13 mm broad, rarely over 12 cm long, those of the innovations (young shoots on rhizome) scarcely half as broad and up to 20 cm long; panicle 8-16 cm long, compact, but about 2 cm broad when pressed, continuous or interrupted below; glumes (4.5) 5.5-7 (9) mm long; lemma slightly shorter than the glumes, scaberulose, awned from near midlength; callus very lightly bearded with hairs less than 1 mm long; awn twisted, geniculate, exceeding the glumes by about 5 mm; rachilla prolonged 2-4 mm; strongly bearded; palea subequal to the lemma; anthers purplish, about (3) 4 mm long; lodicules 1-1.5 mm long (Hitchcock et al 1969).



Calamagrostis tweedyi

Distribution:

Wenatchee Mts., central Idaho, northwest Montana; in Idaho known from Idaho Co.

Habitat:

Subalpine fir/beargrass (*Abies lasiocarpa*/*Xerophyllum tenax*) habitat type. Flowering in open areas, but vegetative in dense forests. Often in areas of burns or human disturbances (roadsides, campgrounds) (Moseley 1988).

Camissonia pterosperma (S. Wats.) Raven

Wing-seed Evening Primrose Onagraceae

Description:

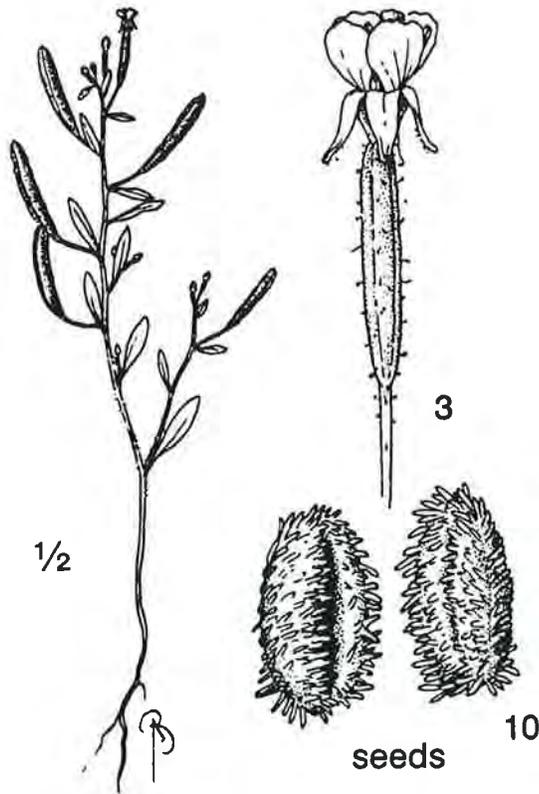
Small (2-14cm) annual, sparsely to very hairy and glandular in the inflorescence. Leaves all on the stem (not basal), narrow, 1.5-2.5mm long, not toothed, alternate. Flowers erect, in the leaf axils, with 4 white to yellow 1.5-3mm long petals. Fruits narrow capsules, 1.2-1.8cm long, smooth or sparsely glandular-hairy. (Description adapted from Cronquist et al 1997).

Distribution:

Southeast Oregon south through Nevada, east to western Utah and northern Arizona; also on the Snake River Plain (disjunct?). In Idaho known from Butte and Clark Counties.

Habitat:

Low to mid elevation limestone slopes with *Cercocarpus ledifolius* in the rubble at the base of outcrops and on volcanic slopes with *Juniperus osteosperma* and *Artemisia arbuscula*, *Cercocarpus ledifolius*, *Eriogonum mancum*. On volcanic sites, *Eriogonum ovalifolium* is also common. (Cholewa and Henderson 1984).



Carex buxbaumii (Wahlenb.)

Buxbaum Sedge Cyperaceae

Description:

Stems arising singly or a few together from well-developed creeping rhizomes, 3-10dm tall, not surrounded by old sheaths from previous years and often reddish at base. Leaves hairless, 2-4mm wide. Spikes, 1-3cm long, borne erect or closely ascending, and loosely sessile on the stem. Terminal spike, pistillate flowers are borne above the staminate flowers; the lateral spikes are entirely pistillate. Pistillate scales lanceolate to lance-ovate, brown to purplish black with a usually paler midrib, surpassing the perigynia, tapering to an awn-tip 0.5-3 mm long; perigynia 2.7-4.3 mm long, beakless or very shortly beaked, rather narrowly elliptic to sometimes elliptic-obovate or elliptic-ovate, up to barely over half as wide as long, firm-walled, not strongly flattened, light gray-green, hairless but densely covered with bumps. Achenes three-sided, 1.4-1.9mm long. (Description adapted from Hitchcock et al 1969).

Distribution:

Circumboreal, Alaska to Newfoundland, south to California, Nevada, central Idaho, Utah, Colorado. Widespread but uncommon. In Idaho, known from the Panhandle region, Sawtooth NRA (Redfish Lake and Stanley Lake near campground), and on the Payette National Forest; Valley, Custer, Blaine, Fremont, Teton, Bonner and Boundary counties.

Habitat:

Swamps, meadows, peatlands, bogs, marshes, wet meadows and streambanks in wide valley bottoms along low-gradient streams or lakeshores. On mineral mire, with various amounts of organic matter. 6400-9500 feet elevation. Often forms loose colonies around edges of wetland habitats, codominating with *Carex aquatilis*; other species often with low cover. *Pinus contorta* may occur on drier microsites or around edges of wetland. With *Carex oederi* at Redfish Lake (which also grows at Texas Creek). (Moseley et al 1994). Other associates: *Carex*

utriculata, *C. aquatilis*, *C. muricata*, *C. saxatilis*, *C. aperta*, *C. livida*, *C. simulata*, *Calamagrostis canadensis*, *Scirpus caespitosus*, *Potentilla fruticosa*, *Betula glandulosa*, *Agrostis scabra*, *Pedicularis groenlandica*, *Eleocharis palustris*, *Senecio cymbalarioides*, *Spiraea douglasii*, *Betula glandulosa*.

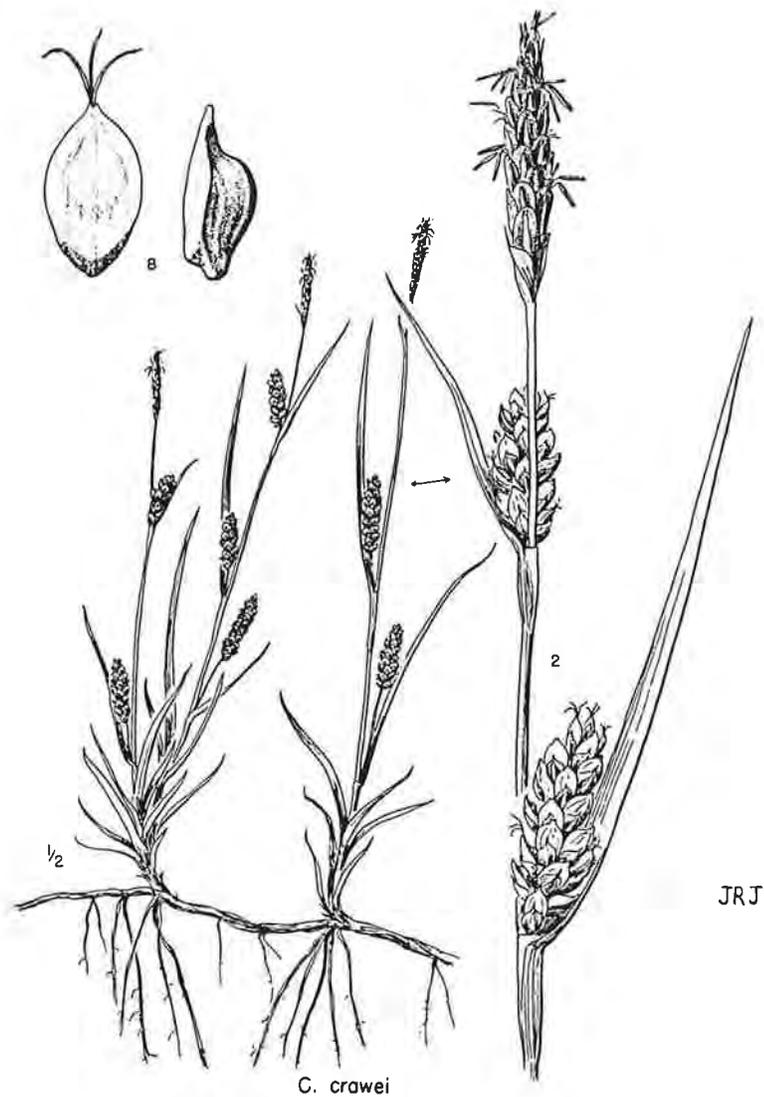


***Carex crawei* Dewey**

Crawe's Sedge Cyperaceae

Description:

Stems arising singly or a few together from well-developed creeping rhizomes, 1-4dm tall. Leaves flat, 1.5-4mm wide. Spikes cylindric, the lowest one on a stalk arising from near the base of the plant. Uppermost spike all staminate, the lower ones mostly pistillate, sometimes with a few staminate flowers at the tip. Pistillate scales shorter and often narrower than the perigynia, with firm, pale or greenish midrib that projects beyond the body of the scale; perigynia elliptic, tan to light brownish, often finely reddish-speckled, 2.3-3.8mm long, with evident nerves on the body. Achene triangular in cross-section, 1.3-1.7mm long. (Description adapted from Hitchcock et al 1969).



Distribution:

East-central Idaho (Clark County); Quebec to British Columbia, south to New Jersey, Tennessee, Missouri, Utah, Montana, Idaho; sparse and rare.

Habitat:

Valleys and foothills, gravelly calcareous soils on the shores of ponds and streams and other wet places. Most likely location in east central Idaho is in calcareous fens and wetlands such as around Leadore, Birch Creek, Pahsimeroi, and Thousand Springs wetland.

***Carex flava* L.**

Yellow Sedge Cyperaceae

Description:

Adapted from Hitchcock et al (1969): Stems 1-8dm tall, clustered, not at all rhizomatous. Leaves both at the base and along the stem, flat, mostly 2-5.5mm wide, the basal sheaths pale at the base. Terminal spike slender, staminate or rarely with some perigynia near the tip; side spikes pistillate, 2-5, short and stout, 6-17mm long, on short stalks or none and crowded close to each other and to the staminate spike, or one or more of the lower ones more or less set apart and on evident stalks. Perigynia mostly 3.7-6.2mm long, most of them spreading and recurved, relatively slender and tapering gradually to the poorly defined beak; strongly yellowish toward the base, usually more greenish (or eventually brownish) near the tip, with several prominent nerves on the upper surface. Stigmas 3. Achenes 1.2-



1.6mm long, a larger part of the perigynium thus empty.

Carex flava is very similar to *Carex oederi*. *Carex oederi* has smaller perigynia, narrower, channeled leaves and a generally less leafy appearance.

Distribution:

Throughout the boreal regions of North America and in the U.S. extending south as far as northeast Washington, central Idaho and northwestern Montana. In Boise, Bonner and Boundary Counties. In the 1991 Idaho Rare Plant Meeting reported from McArthur Lake and possibly Stanley Lake Creek. I located a population a few miles east of Stanley in 2001 associated with a small fen adjacent to the Salmon River.

Habitat:

Boggy or swampy places and along the shores of lakes; wet meadows and fens. Can be abundant at a site.

***Carex occidentalis* Bailey**

Western Sedge **Cyperaceae**

Description:

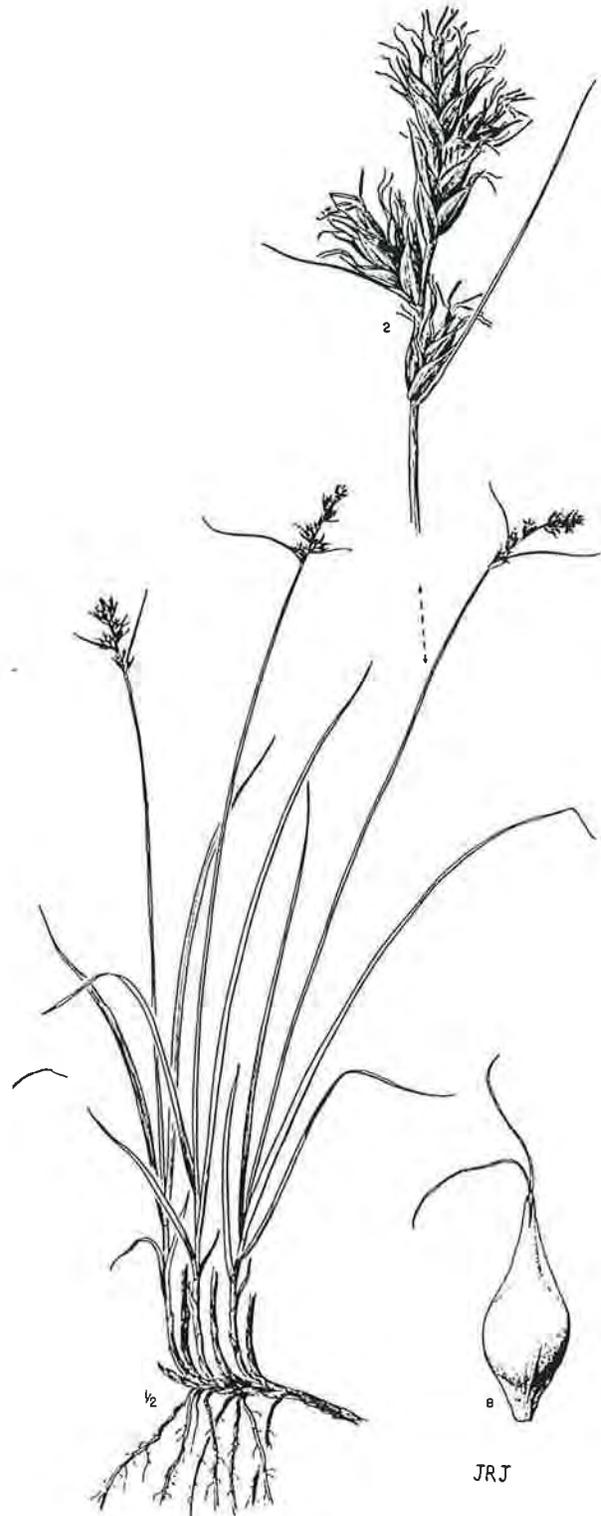
Rhizomatous from short-creeping stout black rhizomes; stems slender, 2-8dm tall. Leaves flat, sometimes with rolled margins; 1.5-2.5mm wide. Spikes 4-10, the uppermost sometimes hard to separate, forming a lax linear to oblong head 1.5-3cm long; staminate flowers at the tip and pistillate flowers at the base, although staminate flowers sometimes hard to distinguish. Perigynia spreading or loosely ascending; 2.5-4.5mm long, greenish to straw-colored, browning in age, widest near the middle. Achene 2mm long, flattened in cross-section, stigmas 2. (Description adapted from Hermann 1970.)

Distribution:

Southern Rockies, from southern Wyoming to New Mexico and west to Utah, Nevada, and southern California; occurs in Beaverhead Co.; not unlikely in adjacent ID. Known from an historical collection in Bonneville Co. about 10 miles south of Idaho Falls (in a lava field) (ICDC 2003).

Habitat:

Open to lightly wooded slopes and dry meadows, generally at middle elevations, but extending to the spruce-fir zone and sometimes subalpine and alpine areas (Hermann 1970).



Chrysosplenium tetrandrum (Lund ex Malmgr.) Th. Fries

Northern Golden Saxifrage Saxifragaceae

Description:

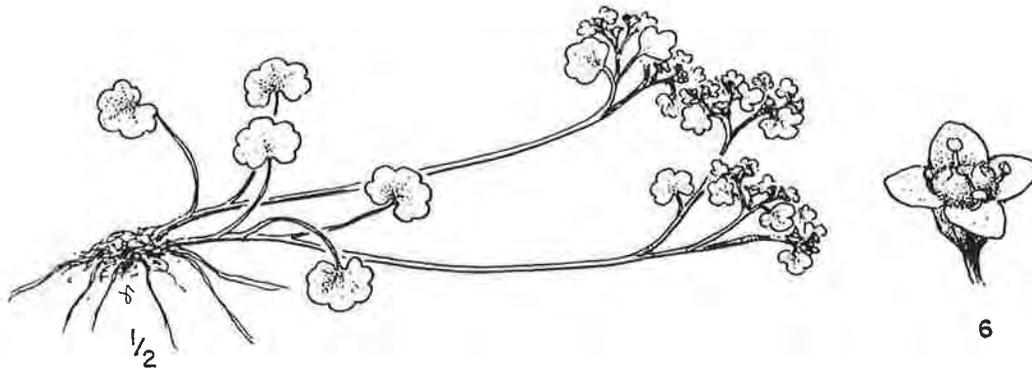
Slender, stoloniferous, the stems as much as 1.5dm long, with erect tips up to 10cm tall, branched near the tips in the inflorescence. Leaves simple, alternate, rounded, with 3-7 broad lobes, 5-12mm broad. Flowers about 3mm broad, greenish, inconspicuous, lacking petals; sepals 4; fruits capsules. (Adapted from Hitchcock et al 1961.)

Distribution:

Circumpolar, south in North America to British Columbia, Montana, Washington, Colorado, Idaho. Known in Idaho from the North Fork of Salmon River near Lost Trail Pass; three small sites on two creeks along Highway 93.

Habitat:

Seeps, wet rock ledges and streambanks in the montane zone (Lesica and Shelly 1991)
Potential in wet montane riparian forested bottoms throughout Lemhi County especially along the Continental Divide.



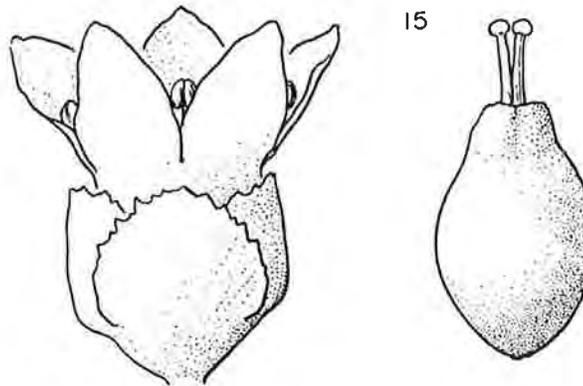
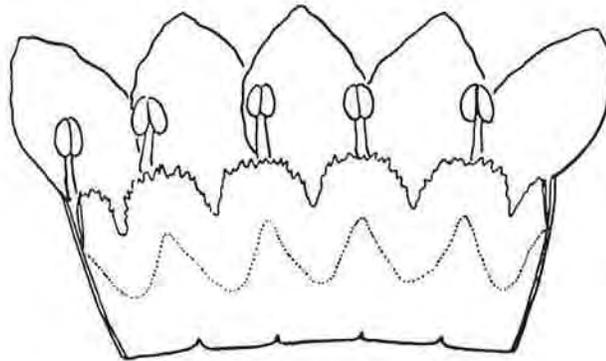
Chrysosplenium tetrandrum

***Cuscuta denticulata* (Engelm.)**

Sepal-toothed Dodder
Cuscutaceae

Description:

WNPS 2002 (adapted from Hitchcock et al 1959): Flowers sessile or subsessile in small clusters, 5-merous, about 2mm long. Calyx not fleshy, deeply divided, the lobes oval to orbicular, considerably overlapped, the margin irregularly erose-denticulate. Corolla not calyprate on the developing capsule, the tube campanulate, slightly exceeding the calyx, the lobes ovate-lanceolate to ovate, overlapping at the base, spreading to ascending, about equaling the tube. Stamens slightly exerted. Anthers 0.3mm long, about equaling the filaments, obovate-oblong, subtire to irregularly erose-dentate, united to midlength. Styles about 0.5mm long, stigmas capitate. Capsule narrowly ovoid, not circumscissile, crested-thickened around the base of the style, the interstylar opening small or none. Seeds usually single.



C. denticulata

Distribution:

California to Utah, Nevada, Arizona and Baja California. In Washington and Idaho, populations are disjunct from the rest of the range of the species. Historic site near Blue Dome, Clark County.

Habitat:

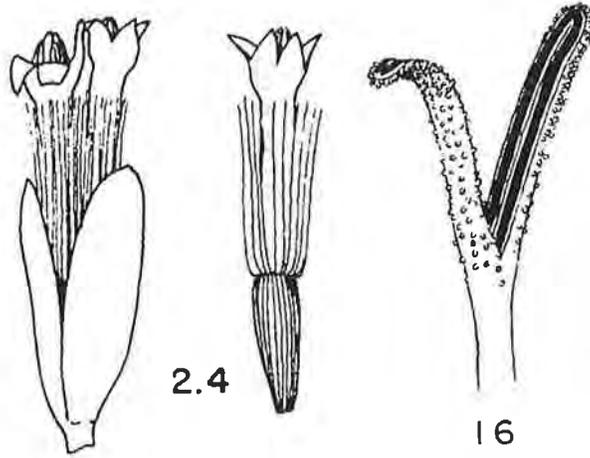
Clark county record record on dry gravelly soil of limestone alluvium reportedly "on sagebrush." Both *A. tridentata* ssp. *vaseyana* and ssp. *wyomingensis* occur near the Blue Dome site. In Washington, associated species at the currently known extant site include *Artemisia tridentata*, *Poa sandbergii*, *Oryzopsis hymenoides*, *Astragalus caricinus*, *Erigeron poliospermus*, *Cymopterus terebinthinus*, *Helianthus cusickii*, and *Bromus tectorum* (WNPS 2002).

Dimersia howellii Gray

Dimersia Asteraceae

Description:

Nearly stemless, cushionlike dwarf annuals, usually with cobwebby hairs at base. Leaf blades rounded, up to 1cm wide, toothless, sometimes with holes that can be seen when held up to the light. Flowers only 2 or 3 in each receptacle, white to pinkish or purplish. (Adapted from Hitchcock et al 1955)

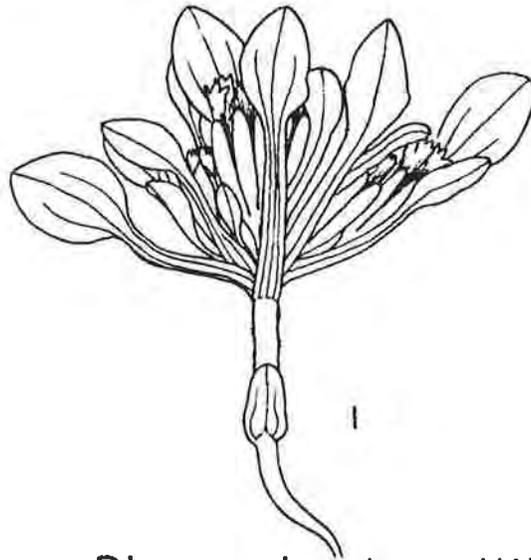


Distribution:

Northeast California and northwest Nevada to Baker County, Oregon and western and central Owyhee County, Idaho. Roger Rosentreter reported in the late 1980s that he thought he saw this species in Malm Gulch. I was never able to verify.

Habitat:

Open, dry gravelly, rocky or cindery soil in the valleys and lower foothills.



Dimersia howellii

Epilobium palustre L.

Swamp Willow-weed Onagraceae

Description:

Simple to branched perennial 1-4 (8) dm tall, from slender rhizomes which often end in small turions (white bulb-like appendages on the roots), finely gray hairy throughout or only sparsely so on the lower half; leaves mainly opposite, lacking petioles or nearly so, toothless or with sparse teeth, margins sometimes rolled, (1) 2-6 cm long, mostly 4 (8) mm broad. Flowers several to many in a loose inflorescence; petals white to pinkish, notched, 3-5 mm long; styles shorter than the petals; capsule linear, 3-6 cm long, usually canescent; seeds with white to tawny hairs (adapted from Hitchcock et al 1961).

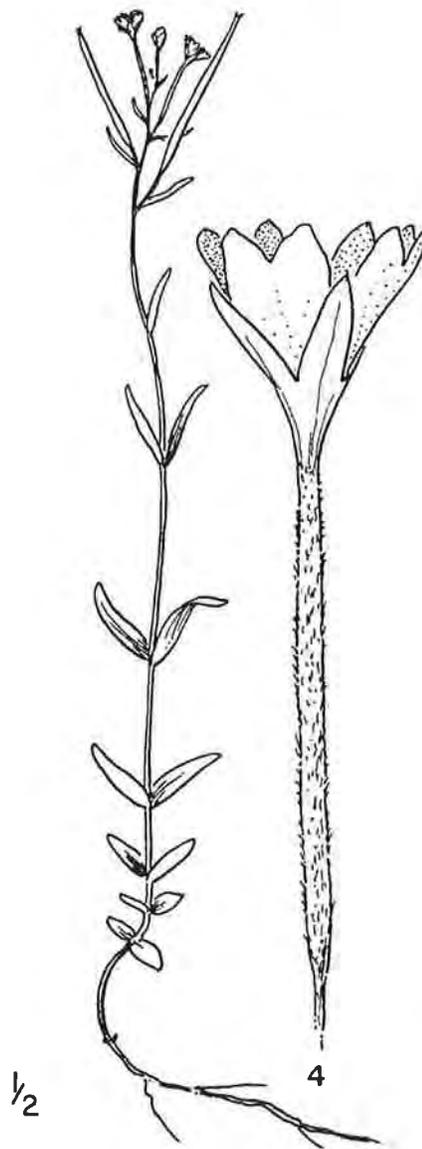
Distribution:

Alaska to Cascades of central Washington, east to the Atlantic, south in the Rocky Mountains to Colorado. Bonner, Boundary, Custer, Fremont counties in Idaho. The species was reported at Chilly Slough in 1994. The area was thoroughly searched by Rob Bursik and Cindy Lunte in 1997; only *E. watsonii* was found. Because this site is quite different from the two others in Custer Co. (one at Bowery Guard Station and the other in the Sawtooth Valley), I consider this record suspect, but not impossible.

Habitat:

Saturated, often highly organic soils in fens and wet meadows. Moseley et al 1994: The Sawtooth Valley population at Mays Creek Fen occurs in a dense *Carex utriculata* community with shallow standing water over a deep peat substrate. This area lies near the spring-fed source of Mays Creek and is extensively subirrigated. The few associated species include *Carex nebraskensis*, *C. aquatilis*, and *Saxifraga oregana*. The Bowery Hot Springs population on the East Fork occurs at a similar elevation but in a much different habitat. Although the surface horizon is organic, it is not a deep peat. It occurs near the source of a hot spring in a small patch of *Carex nebraskensis* that occurs within an *Eleocharis rostellata* community. The only other associates are *Epilobium watsonii* and *Primula incana*. The substrate at Mays Creek Fen is deep, *Carex* peat that is saturated by spring water. The Bowery Hot Spring population is underlain by calcareous deposits from the spring.

May occur in calcareous fens in Lemhi and Custer (*Primula alcalina* sites; e.g., Birch Creek, Texas Creek, Thousand Springs).



E. palustre

Epipactis gigantea Dougl. ex Hook.

Giant Helleborine Orchidaceae

Description:

Stems 1 to many from short rhizomes, mostly 3-7 (up to 12) dm tall; leaves numerous, sheathing, the lowest blades almost lacking, but gradually enlarged upward, almost hairless or with sparse short stubby hairs, mostly 7-14 (19) cm long and 1.5-5 cm broad. Flowers 3-15, rather showy, sepals coppery-green, lightly brownish-veined, 12-16 mm long; petals similar to the sepals, but thinner and (at least the venation) more brownish-purple; lip 15-20 mm long, the sac with prominent, raised purplish lines leading to the base, 3-lobed, the outer (basal) lobe prominent, the blade (central lobe) about as long as the basal lobes, somewhat curved downward, triangular-ovate, the tip flattened but with uprolled margins, greenish-yellow, the basal portion much thickened, yellow, the margins thickened and erect, with numerous linear callosities leading to the sac (adapted from Hitchcock et al 1969).

Distribution:

Cordilleran from central Mexico north throughout western U.S. and southern British Columbia. Many locations but nowhere common, and most populations fairly small.

Habitat:

Moist areas along streambanks, lake margins, seeps and springs (often calcareous). In the mountains of central Idaho, most common near thermal areas. Nearest site to Salmon BLM at Warm Springs hot springs near Elk Bend, persisting in areas inaccessible to bathers. Salmon BLM actions may affect this population through providing access (parking, access across private lands).



Epipactis gigantea

Ipomopsis polycladon (Torr.) V. Grant (*Gilia polycladon*)

Spreading Gilia Polemoniaceae

Description:

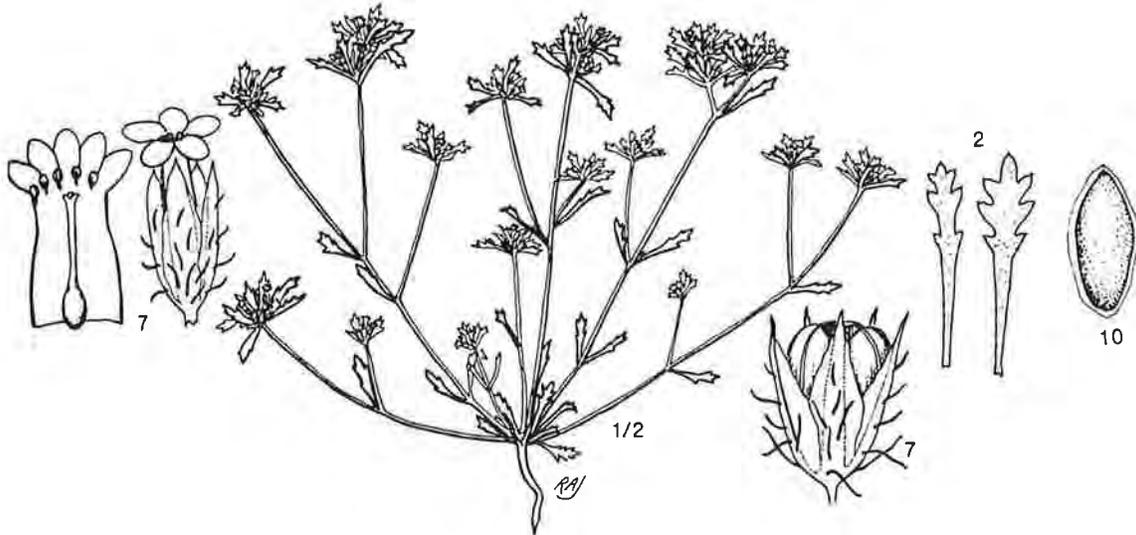
Taprooted annual or winter-annual with several slender rigid stems, widely ascending-spreading but not prostrate, with spreading crisp hairs and glands. Basal leaves mostly 1-3cm long and 2-10mm wide, with a few coarse teeth near the end. Flowers in dense clusters at the end of the stems. Petals united in a tube, then flaring into 5 petals, white to sometimes pinkish. Calyx 2-6mm long with thickened, broad, green spiny-pointed lobes about as long as the flower tube. Fruit a capsule 3-4.5mm long.

Distribution:

Throughout much of Great Basin: Nevada, Utah and adjacent Colorado and north to the Snake River Plain, and south to west Texas, southern California, southern Arizona and adjacent Mexico. In Idaho occurs in Owyhee, Powell and Butte counties. I collected a similar species near Friday Spring in Round Valley, but the material was far past prime and difficult to identify.

Habitat:

Dry, sparsely vegetated sites, usually on gentle slopes in open places in the foothills and valleys on sandy to small gravelly soils. Likely associates include *Artemisia tridentata* ssp. *wyomingensis*, *Poa secunda*, *Atriplex confertifolia*.



Juncus hallii Engelm.

Hall's Rush Juncaceae

Description:

Densely tufted perennial, stems numerous, round, 1-4dm tall. Basal leaves bladeless or with a reduced, bristle-like blade; one or two upper leaves with slender channeled blade 4-20cm long.

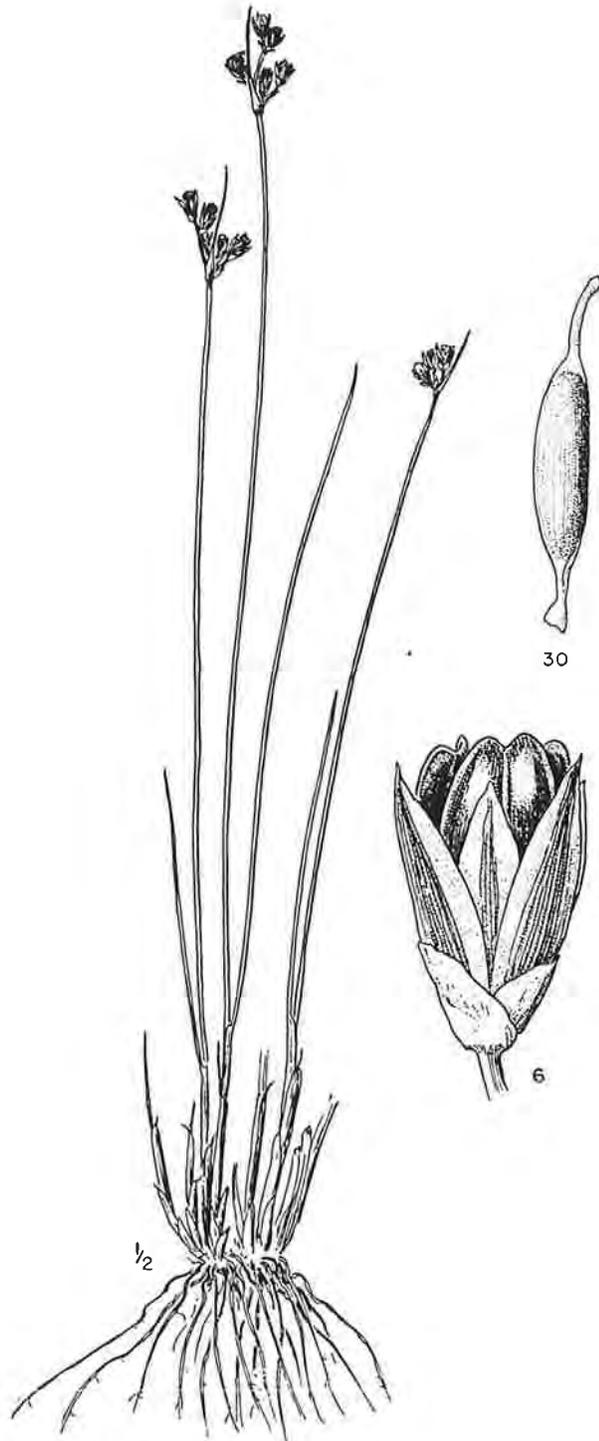
Inflorescence either terminal or apparently lateral (due to the inflorescence bract erect appearing stem-like); flowers mostly 2-7, loosely clustered. Each flower with two small bracts at the base; tepals 6, nearly equal or the outer three slightly longer, 4-5.5mm long. Fruit a capsule, the three segments indented at the tip (retuse).

Distribution:

Scattered stations in Idaho (Bonneville, Clearwater, Fremont, Lemhi, Owyhee counties), southwest Montana to Colorado and Utah. This species likely occurs on BLM lands but has not been included on survey lists and probably overlooked.

Habitat:

Moist (sometimes wet) meadows and sparsely wooded rocky slopes at mid to upper elevations in the mountains. The location in Lemhi County (based on a 1974 record) in upper Big Timber Creek is at 8700'.



J. hallii

Lesquerella paysonii Rollins

Payson's Bladderpod Brassicaceae

Description:

Short-lived perennial, densely silvery-gray hairy, stems 0.3-1.5 dm long, decumbent, slender and unbranched, arising laterally from the simple caudex; basal leaves 1-4 (6) cm long, 4-10 (15) mm wide, the blades broadly triangular to rhombic or elliptic, often wavy-margined or shallowly lobed, narrowing gradually or abruptly to the slender petiole, this sometimes lobed and the leaf pinnatifid; cauline leaves 0.5-1.5 cm long, 2-6 mm wide, elliptic and narrowing to a short petiole; inflorescences compact, the buds ellipsoid; sepals 5-7.5 mm long, oblong to elliptic, boat-shaped, the lateral ones markedly saccate; petals yellow, 8-10 mm long, 1.5-2.5 mm wide, narrowly spatulate; filaments slender, not dilated, paired stamens 5.5-7 mm long, single stamens 4-6 mm long; silques 5-9 mm long, substipitate, elliptic and strongly obcompressed but not keeled (distinguishing it from other species, especially the closely-related *L. carinata*, which is the species common to the Salmon area), the valves pubescent on the exterior and usually glabrous on the interior; styles 2-4 mm long, sometimes pubescent at the base (adapted from Rollins and Shaw 1973 and Moseley 1996).

Distribution:

Western Wyoming, east-central Idaho (Bonneville County), southwest Montana (Beaverhead and Granite). Endemic to the carbonate mountain ranges of west-central Wyoming and adjacent Idaho with two disjunct populations known from southwestern Montana. In Idaho, it occurs on the ridges and high peaks of the Snake River Range above the escarpment that parallels the Snake River (Moseley 1996).

Habitat:

Moseley 1996: In Idaho, *Lesquerella paysonii* mostly occurs on ridgelines and less so on slopes in openings in sagebrush and forest stands. The substrate consists of carbonate parent material with gravelly, skeletal soils. Plant communities are open, with low cover of forbs, grasses, and an occasional shrub. Most of the ground cover is exposed rock and soil. Elevations range from 6,000 ft to 9,950 ft, with most populations occurring above 8000 ft.

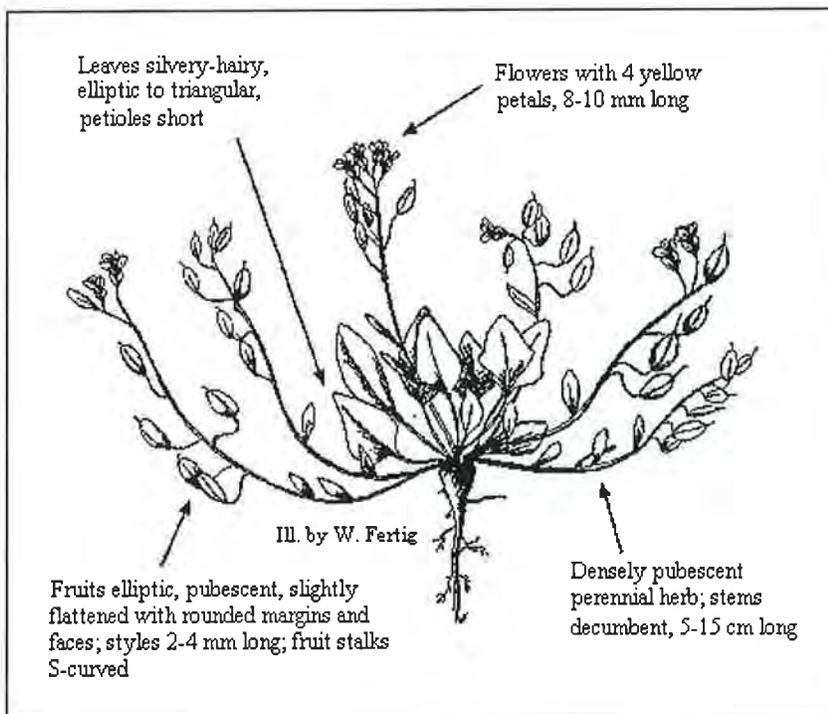


Illustration by Fertig (1994) used with permission from the Wyoming Natural Heritage Program

***Lewisia kelloggii* Brandg.**

Idaho Bitterroot Portulacaceae

Description:

Low perennial arising from a fleshy, usually branched root. Leaves all basal, 2.5-6.5cm long, narrow, dark green, with a notched tip; flat and lying close to the ground. Flowers May-June. Flowering stems leafless, 5-20mm long, each bearing a single flower. Flower petals 5-11, white, 10-15mm long. Similar to *L. pygmaea* which has longer, more-linear leaves without a notch.

Distribution:

Sierra Nevada and disjunct in central Idaho (Boise, Custer, Elmore, Lemhi, Valley counties).

Habitat:

Moderate to high elevations (the two Lemhi County records and single Custer County record are from about 9000 feet) on upper ridges and slopes. Gravelly soils on fractured bedrock, usually near snowbands or where moist in early spring. Generally associated with high elevation forbs, occasionally with sparse overstory of conifers.



L. kelloggii

***Muhlenbergia racemosa* (Michx.) Britton,
Sterns & Poggenb.**

Green Muhly Poaceae

Description:

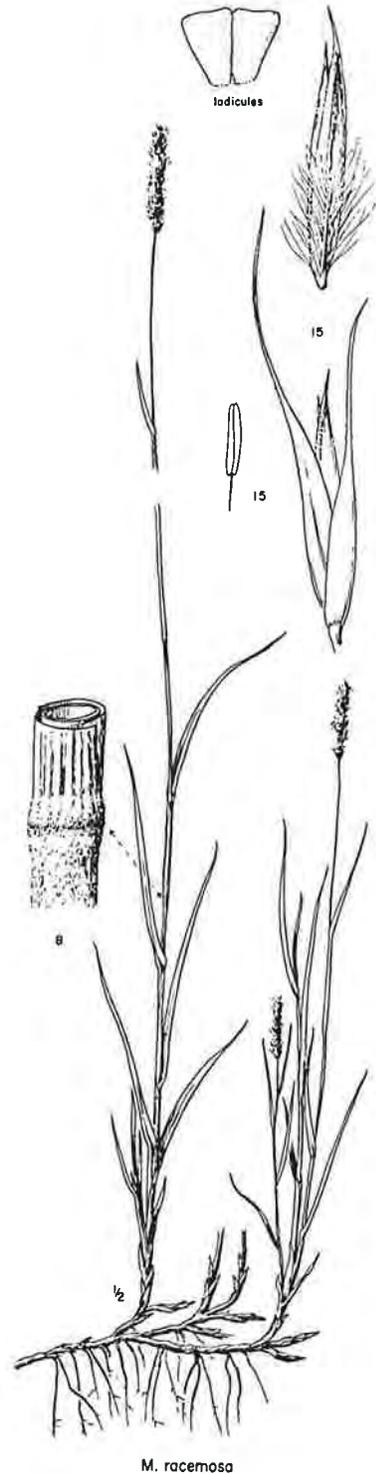
Perennial from long, creeping, scaly rhizomes, stems 2.5-6dm tall, stiffy erect, usually branching at about midlength, hollow. Ligules 0.6-1.5mm long. Blades flat, 2-5mm broad and 5-15cm long, roughened with short stubby hairs. Inflorescence 4-17.5cm long, narrow and spikelike. Spikelets 1-flowered, light green. Glumes nearly equal in length, 4-6mm long, usually longer than the lemma, narrow, tapering to a short awn, with short stubby hairs. Lemma 2.2-3.7mm long, with long soft hairs on the lower half.

Distribution:

British Columbia south on the east side of the Cascades to northeast Oregon, Nevada, Arizona, northern Mexico and east to Newfoundland, Oklahoma, Tennessee, Maryland. In Idaho known from Fremont (Island Park area), Bannock, Bonner, Teton counties.

Habitat:

Saturated soils in fens, on peat and mineral hummocks.



Nassa viridula (Trin.) Barkworth

Green Needlegrass Poaceae

Stipa viridula Trin.

Description:

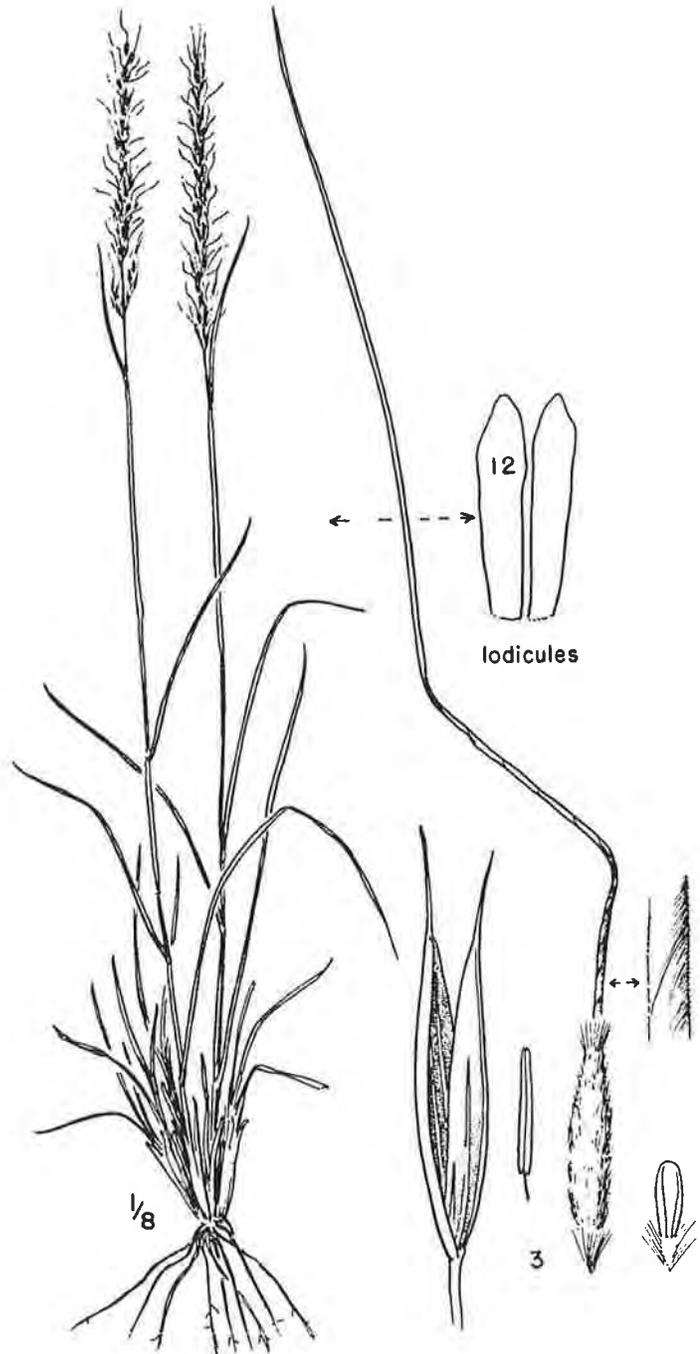
Tufted perennial, 5-11dm tall, stems hairless or sometimes with sparse stubby hairs. Collar of leaf sheaths usually with long hairs, ligules rounded, the upper ones up to 3mm long; blades 3-6mm broad. Inflorescence narrow, 10-25cm long. Glumes membranous, 9-12mm long, narrowed into a long tip, the lower one with 5 nerves. Floret 5-6mm long and 1mm thick, with long hairs near the base and at the tip and slightly shorter hairs on the body; awn 2.5-3.5cm long, mostly lacking hairs, twisted and twice bent.

Distribution:

Most common east of the Continental Divide; British Columbia, Alberta, Saskatchewan, south through Montana to New Mexico and Arizona and east to Wisconsin and Illinois. In Idaho: Caribou, Clark, and Owyhee counties. Records from 1992 Rare Plant Conference note plans to use this species in seedings in the Soda Springs area.

Habitat:

Mancuso and Moseley 1992: Plains, prairies, foothills at lower elevations, to mountain meadows, open woodlands and hillsides at higher elevations. It is quite drought resistant, and is adapted to grow on a wide range of soils, but does especially well on clay soils and moderately alkaline soils derived from calcareous shales.



***Orogenia fusiformis* Wats.**

Tapered-root *Orogenia* Umbelliferae

Description:

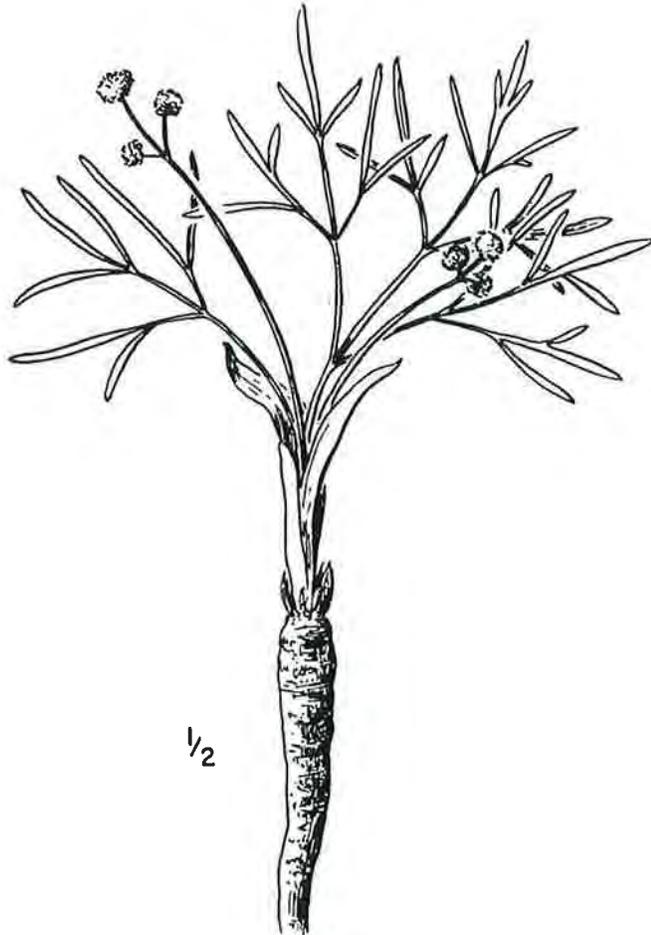
Perennial, from an elongated thickened root. Leaves mostly 2 or 3, each divided into 3-5 leaflets which are further divided into 3-5 linear segments 1-4.5cm long and 0.5-4mm wide. Flowering stalk extending only a few centimeters above the ground. Tiny white flowers with 5 petals are borne in an inflorescence of fairly congested roundish clusters; inflorescence 1-2cm long, longer than wide. Flowering April-May. Fruit hairless, elliptical, obscurely ridged, 3-4mm long.

Distribution:

Southern Washington to Ravalli County, MT and south to Oregon, southern Idaho, Utah and western Colorado. Several occurrences in Montana along the Idaho border.

Habitat:

Open slopes and ridges from the lower foothills to moderate elevations, usually with *Artemisia tridentata*. Often flowering at the edges of retreating snowbanks.



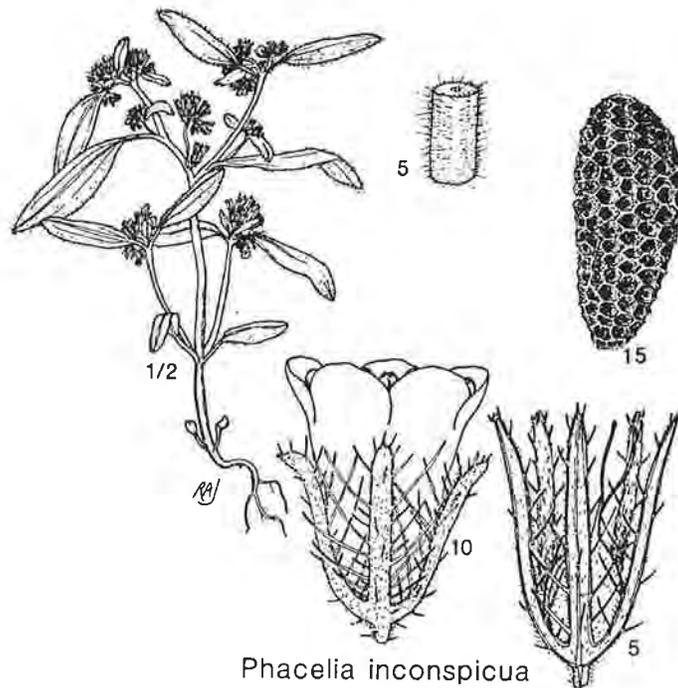
Orogenia fusiformis

Phacelia inconspicua E.L. Green

Obscure scorpion-weed Hydrophyllaceae

Description:

Moseley 1989: An erect-stemmed annual up to 1.5 dm tall, freely branching from the base. The many elliptical leaves are 3.5 cm long or less, green above and somewhat paler below. They are entire and softly pubescent and possess a short, winged petiole. The inflorescence is generally shorter than the leaves. Individual flower stalks are 1 to 3 cm long and bear 3 mm tubular, whitish flowers with linear, pubescent, 3 mm long calyx segments. The lobes of the corolla are erect, and not spreading. The stamens are equal to or barely exceed the corolla in length, and have smooth stalks. The hairy style is 2.5 mm long. The ovoid capsule is tapered to a short beak and is about 3 mm long, somewhat pubescent, and produces 2 seeds.



Distribution:

Humboldt Mountains in Nevada, western Butte County and adjacent Blaine County in Idaho. Four known occurrences in Nevada and 6 locations in Idaho (Murphy 2002).

Habitat:

In Idaho known from 5400 to 6200 feet on northeast to east-facing aspects in concave lower to mid-slopes lying below rimrock of buttes or foothill ridgetops on the lee slopes of prevailing winds where accumulating snowdrifts persist into late spring. Volcanic, loose, sandy soils on rocky or bare slopes of sagebrush/grassland habitat. Often found on bare or sparsely vegetated microsites (sometimes associated with disturbances such as animal trails and small mammal diggings) in transitional areas between slightly more mesic communities with *Populus tremuloides*, *Prunus virginiana*, *Leymus cineris* and open xeric communities with *Purshia tridentata*, *Pseudoroegneria spicata*, *Balsamorhiza sagittata*. Common associated species include *Symphoricarpos oreophilus*, *Artemisia tridentata* ssp. *vaseyana*, *Bromus tectorum*, *Lithospermum ruderales*, *Lupinus* ssp., *Pseudoroegneria spicata* (Murphy 2002).

***Phacelia minutissima* L.F. Henderson**

Least Phacelia **Hydrophyllaceae**

Phacelia foliosepala Nels. & MacBr.

Description:

Dwarf, simple or branching annual up to 1 dm tall, shortly spreading-hairy and glandular. Leaves mostly on the stem, oblanceolate or linear-oblong, the blade up to about 1 cm long and 4 mm wide, tapering to the short petiole or base up to 4 mm long.

Inflorescence short and few-flowered, usually with leafy bracts below, often making up most of the height of the plant; calyx 2.5-4 mm, the narrow, linear or oblanceolate segments becoming distinctly unequal in length and width in fruit with one or more of them sometimes leaf-like and 1 cm long or more; corolla inconspicuous, 2.5-4 mm long, lavender, the petals fused into a tube, then flaring into 5 petals (adapted from Cronquist et al 1984).

Distribution:

Nevada, Wallowa Co, Oregon (considered extirpated), Kittitas Co, Washington; in Idaho, known from Camas County and approximately 20 sites in Owyhee County.

Habitat:

Ephemerally moist, bare-soil areas of riparian zones and meadows in sagebrush-steppe and lower montane forest; areas of late snowbank and seeps in sagebrush and aspen; collections in Owyhee County have been in dense false hellebore patches down-slope from aspen with an open understory and a diverse flora of

annuals; meadows, along streambanks and on slopes, sometimes in disturbed areas, from the foothills to moderate elevations in the mountains.



P. minutissima

Piptatherum micranthum (Trin. & Rupr.) Barkworth

Small flowered Ricegrass

Poaceae

Oryzopsis micrantha (Trin. & Rupr.)
Thurb.

Description:

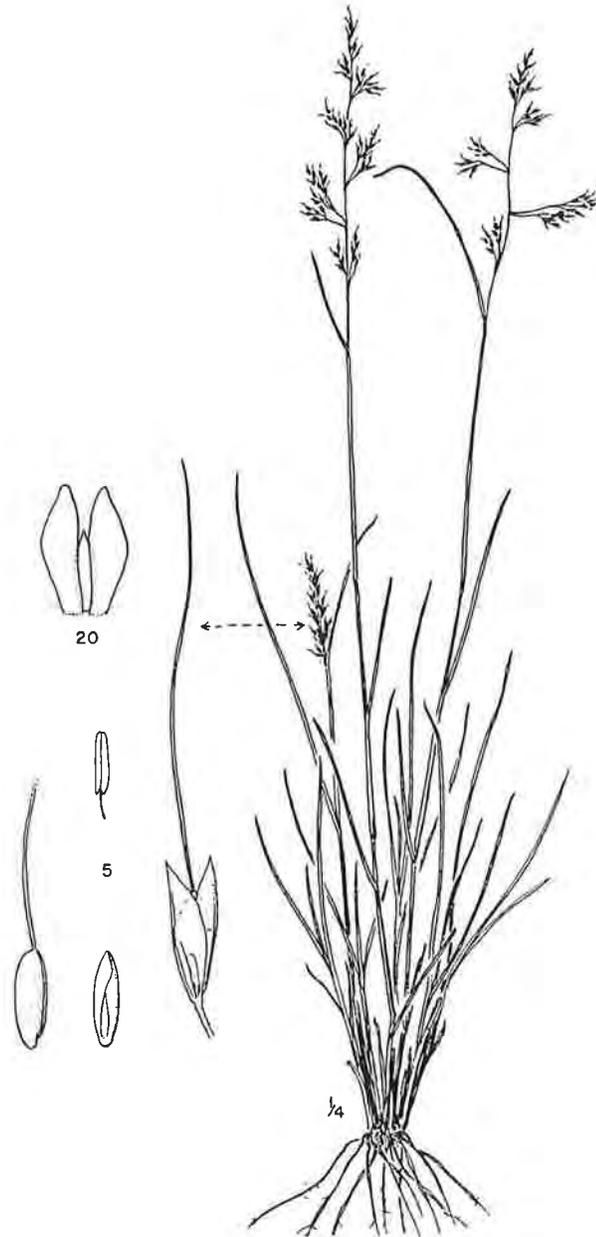
Perennial bunchgrass, stems numerous, hollow, lacking hairs, 3-7dm tall. Ligules 0.5mm long; blades flat to rolled, 1-2mm broad. Panicle 7-15cm long, somewhat open, the branches spreading to erect. Glumes papery 3-3.5mm long, nearly equal in length, narrowed to a fine point, 5-nerved. Lemmas greenish, 2-2.5mm long, with an awn up to 8mm long attached at the tip.

Distribution:

Locally frequent to common throughout the Great Basin, central Rocky Mountains and northern Great Plains; in Idaho a single record from Clark County (Curto and Henderson 1998; Moseley and Henderson 1994) is a range extension of about 100km south and west of the nearest location in Beaverhead Co, Montana. This site is directly east of the Birch Creek Campground on BLM (Idaho Falls Office). It is likely on the Salmon BLM as well.

Habitat:

Cracks and ledges in deep alcove of limestone cliffs; no associated species (Moseley and Henderson 1994).



***Plantago eriopoda* Torr.**

Alkali Plantain Plantaginaceae

Description:

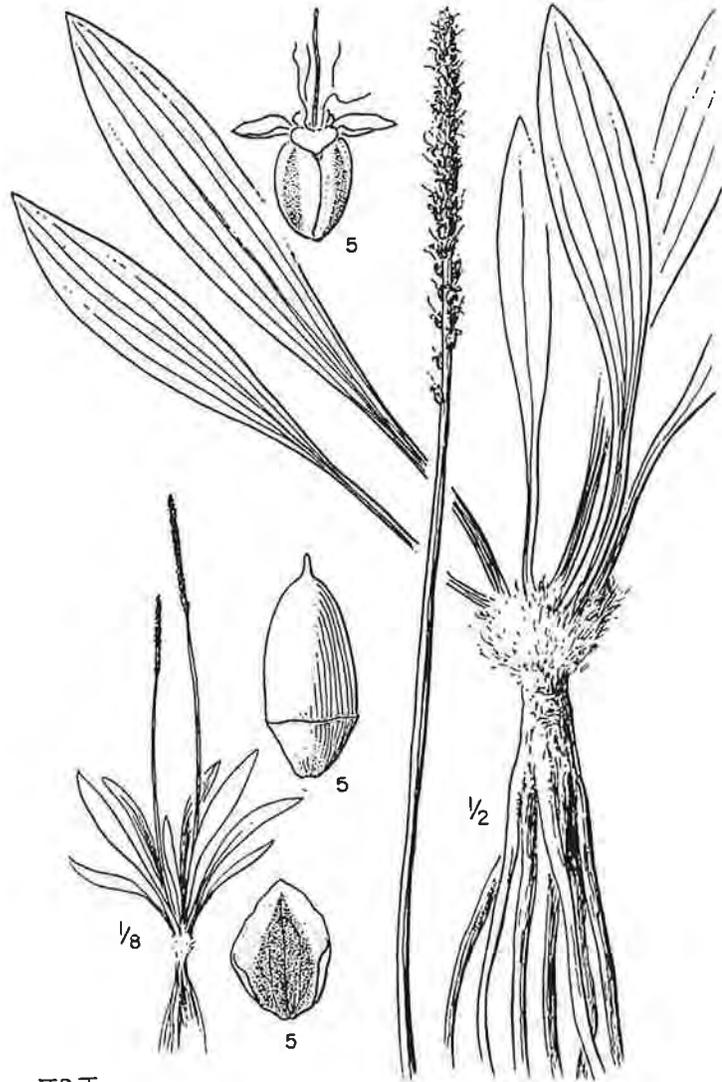
Perennial from a stout but short taproot, conspicuously brown woolly at the crown; leaves basal, somewhat fleshy, elliptic, several nerved, hairless or with scattered hairs, 15-30cm long (including petiole) and 2-5cm wide. Scapes surpassing the leaves, up to 3dm tall; flowering spikes 5-20cm long and 5-8cm thick. Bracts of flowers broad, 2mm long; flowers greenish, the corolla lobes spreading or turned back, 1-1.5mm long. Capsule 3-4mm long.

Distribution:

Plains states from Colorado and Nebraska northward, extending north into Canada and west to central Idaho and through the Great Basin to California. Occurs at the Birch Creek Fen.

Habitat:

Alkaline moist meadows; at Birch Creek grows on the moist, slightly hummocked, relatively sparsely vegetated flats with *Muhlenbergia richardsonis*, *Senecio debilis*, *Distichlis spicata*.



JRJ

P. eriopoda

Polystichum kruckebergii W.H. Wagner

Kruckeberg's Polystichum Polypodiaceae

Description:

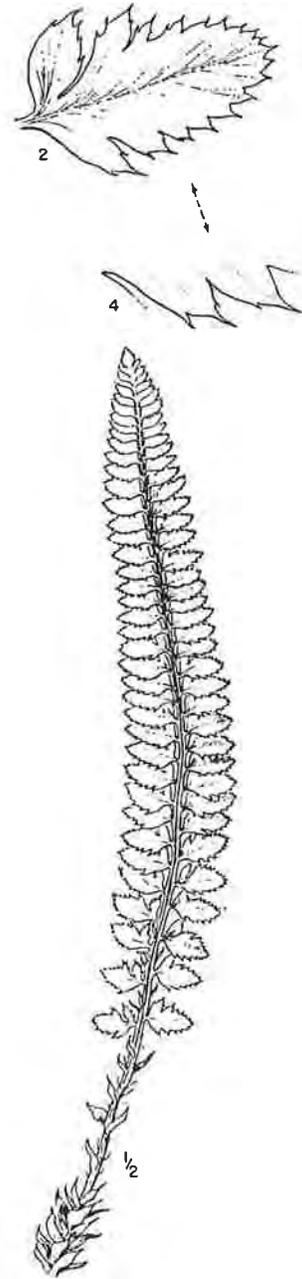
Leaves evergreen, 1-4dm long overall, petiole 3-20cm long, densely chaffy at base, becoming more smooth upwards. Pinnae ("leaflets") mostly 20-40 on each side, up to 1.8cm long and mostly 1-2 times as long as wide, points of teeth very long and sharp. Sori (spore-bearing structures) mostly on upper and middle leaves, borne on each side of the midvein of the pinnae.

Distribution:

Southern British Columbia south through western Washington and Oregon to northern California and east to central Idaho and northern Utah. In Idaho, two records from Custer County and one from Idaho County.

Habitat:

The two Custer County populations are at 8500 feet and 9700 feet in granitic rock crevices associated with *Sedum debile*, *Carex proposita* and *Epilobium obcordatum*.



Polystichum kruckebergii

***Potentilla bipinnatifida* Dougl. ex Hook.**

Tansy cinquefoil **Rosaceae**

Potentilla pensylvanica var. *bipinnatifida* (Dougl. ex Hook.) Torr. & Gray

Description:

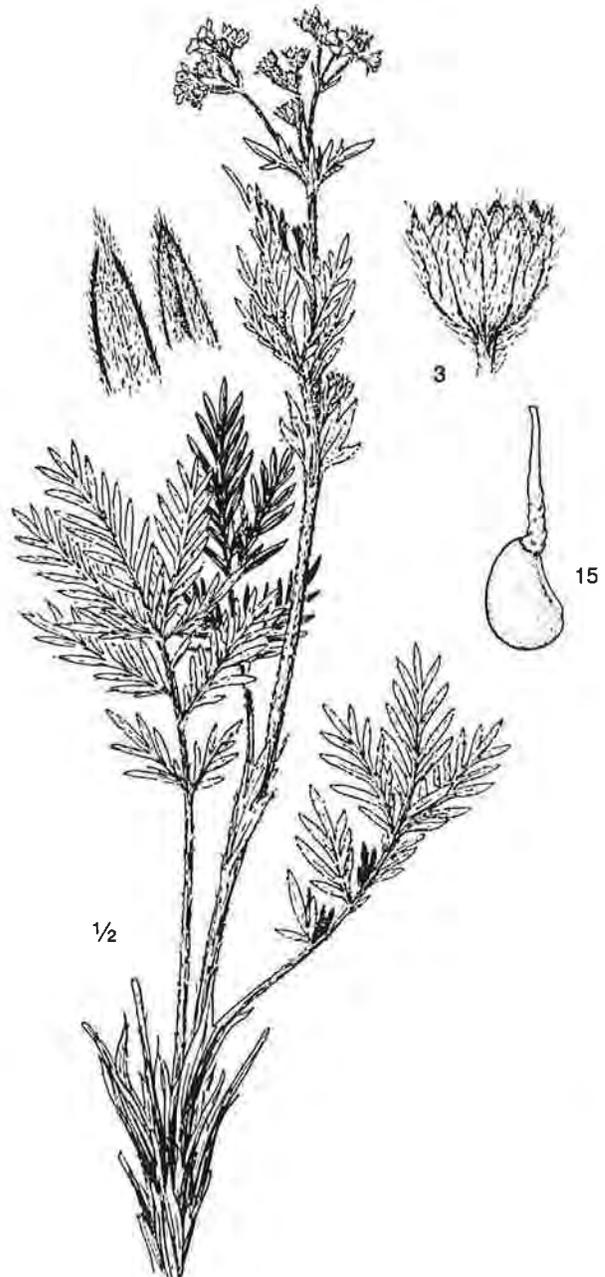
Perennial, stems few to several, clustered, erect or somewhat decumbent at base, 1.7-5dm long. Leaves mostly basal, petiole 5-8cm long; leaves 6-14cm long; leaflets 5-7, arising opposite on the stem with the terminal leaflet similar to the side leaflets, densely white hairy on the underside and sparsely silky-hairy on the upper side; leaflets 1.5-5cm long, deeply divided into several segments, each 6-14mm long with rolled-under margins. Flower petals 3-5mm long, pale yellow; stamens 20, sepals 3-6mm long. Similar to *P. pensylvanica*.

Distribution:

In U.S., Idaho east to Minnesota, south to Utah, New Mexico, Nebraska (no records from South Dakota, but expected) (BONAP 1998). In Idaho, collections from near Chilly, Clyde and around Challis.

Habitat:

Lower foothill and valley sagebrush and grassy meadows.



Potentilla bipinnatifida

***Primula incana* M.E. Jones**

Jone's Primrose

Primulaceae

Description:

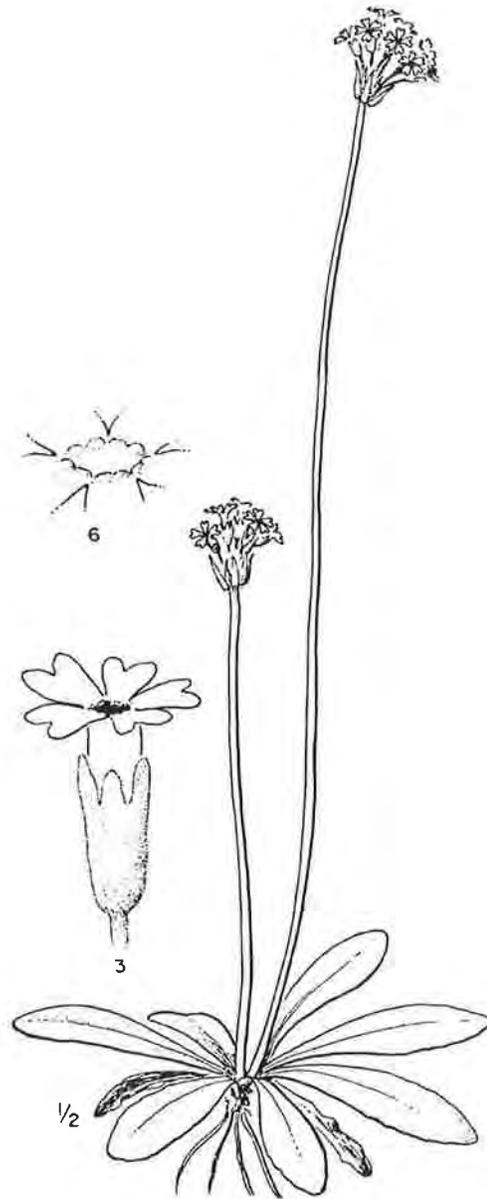
Plant gray-mealy, up to 4dm tall. Leaves basal, 3-6cm long, with wavy teeth along the margin. Flowering stem leafless; flowers 3-12, subtended by several linear bracts each 5-10mm long; petals 8-11mm, fused into a tube for lower 2/3rds, the flaring lobes 2-3mm long; lilac. Capsules about the same length as the calyx.

Distribution:

Rocky Mountain and western Canada, south to Colorado and Utah and to the northern Cascades. In Idaho, known from Teton and Custer (Bowery Hot Springs in the East Fork Salmon River above the Guard Station) counties. Widely distributed in western U.S., but nowhere common. In Montana, primarily in the southwest quarter of state.

Habitat:

Alkaline meadows; in Yellowstone associated with thermal areas; streambanks and moist meadows, moist alkaline soils of valley bottoms, often where hummocky. Note that in Montana, this species occurs at one of the historic *P. alcalina* sites near Monida. Communities may be dominated by *Eleocharis rostellata* or *Deschampsia cespitosa* with lesser amounts of *Carex praegracilis*, *Potentilla anserina*, *Potentilla fruticosa*, *Juncus balticus*, *Carex scirpoidea*, *Erigeron lonchophyllus*, and *Haplopappus uniflorus* (Jankovsky-Jones 1998).



Primula incana

***Salicornia rubra* A. Nels.**

Red Glasswort **Chenopodiaceae**

Description:

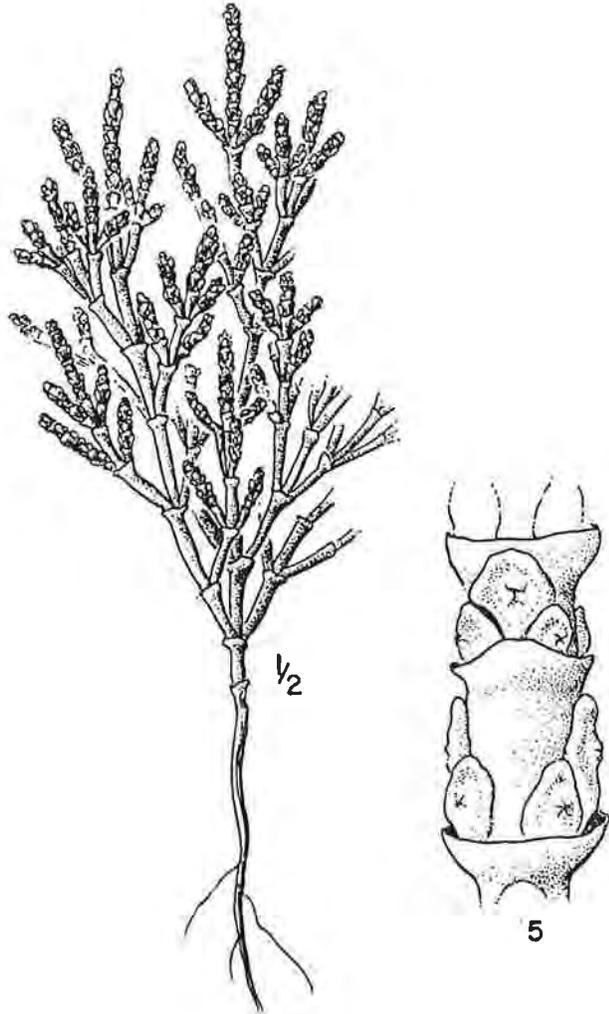
Annual, freely branched and erect, up to 2.5dm tall. Usually reddish, at least at maturity. Spikes generally numerous, slender, 1-3 (rarely to 10) cm long, the joints mostly about 2mm long and about as thick, the scales less spreading and more rounded than the lower leaves. Central flower of each cluster considerably above the others, the upper margin usually about even with the node above (adapted from Hitchcock et al 1964).

Distribution:

Southern British Columbia and eastern Washington to Nevada, east to Kansas and New Mexico; in Idaho known from Bear Lake, Bingham, Caribou, Cassia, Franklin, Oneida counties.

Habitat:

Moist saline or alkaline soils in valley bottoms.



Salicornia rubra

***Salix farriæ* Ball**

Farr's Willow Salicaceae

Description:

Erect freely branched shrub, 3-10dm tall; first year twigs finely hairy, dull brown to greenish black; older twigs dull to reddish brown and lacking hairs. Leaves slightly hairy when young, usually hairless when mature, glaucous below (with a bluish green covering that can be rubbed off), dull yellow-green above; blades entire or with wavy teeth, 3-5(7)cm long and 1-3(3.5)cm wide; petioles 2-8mm long. Aments emerging with the leaves, on leafy branches; pistillate aments 1-2.5(4.5)cm long; capsules hairless, 4-6mm long; stipes 0.2-1.0(1.5)mm, light brown to black; hairless to long silky-hairy. (Description adapted from Elzinga et al *in press*).

Distribution:

Southern British Columbia and Alberta, northeast Oregon, east-central Idaho, western Montana, northwest Wyoming. In Idaho known from Custer Co: upper Pahsimeroi below Pass Lake, upper Slate Creek 2 miles above Hoodoo Mine, and upper Merriam Lake Basin.

Habitat:

Subalpine (9600-9800 feet); wet to moist meadows, seeps, lake and stream edges, usually on organic soils.



S. farriæ

Sedum borschii (Clausen) Clausen

Borsche's stonecrop Crassulaceae

Description:

BONAP (1998) considers *Sedum borschii* synonymous with *S. leibergii*

Perennial, 7-12cm tall. Leaves alternate, crowded in the basal rosettes, oval and often less than 5mm long, some thickened and rice-like in appearance and perhaps serving as propagules for new plants, while others distinctly longer and more elongated.

Flowering stems few, unbranched, the leaves on the stem numerous and alternate, those at the base up to 25mm long. Flowers numerous in a spreading, somewhat open inflorescence. Petals yellow, 5-8mm long. Fruit a 5-parted follicle. *Sedum lanceolatum* is smaller with a smaller rosette. *Sedum stenopetalum* has linear leaves, strongly keeled tapered to a sharp point

Distribution:

Endemic to southwestern Montana and the Seven Devils Mountains and Salmon River Ranges in Idaho: Lemhi, Idaho and Valley counties.

Habitat:

Open or shaded rock slides, cliffs and other rocky areas from middle to high elevations in the mountains on northwest to western exposures, often with Douglas-fir. (Boise National Forest 2000).



Silene scaposa Robbins var. *lobata* Hitchc. & Maguire

Scapose silene Caryophyllaceae

Description:

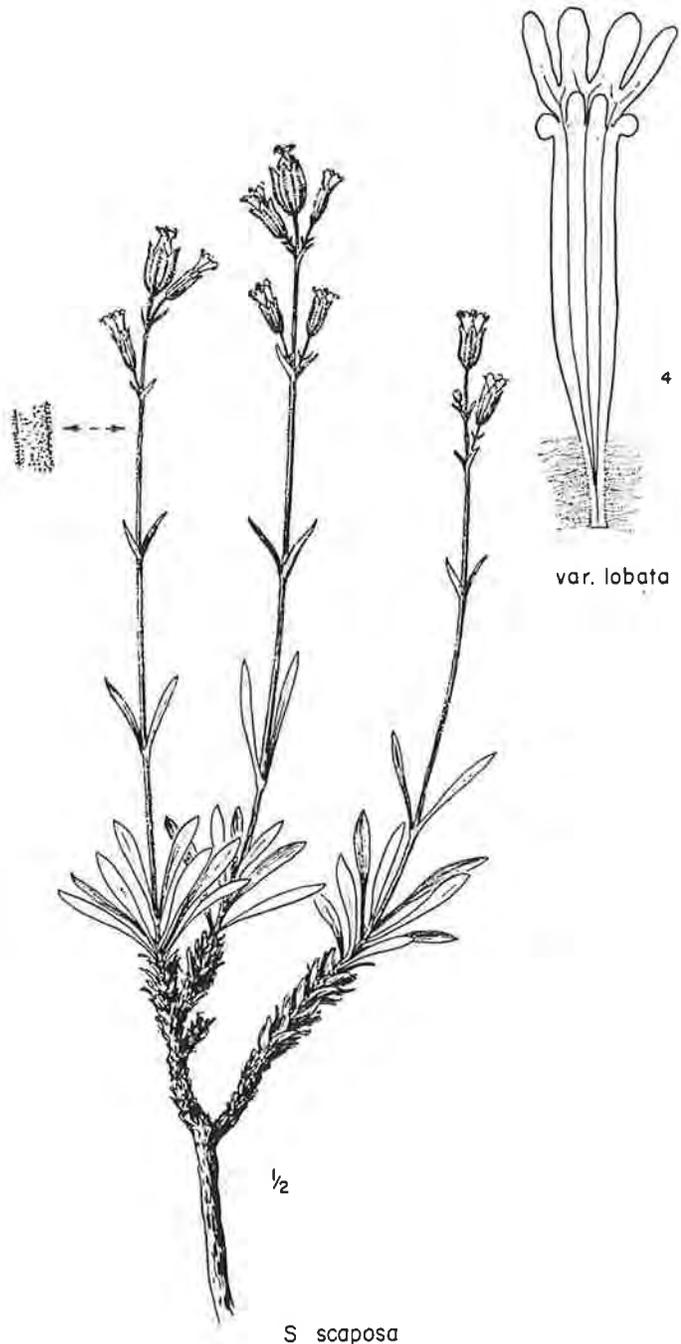
Perennial with several stems arising from a simple or branched rootstock; copiously hairy throughout, and also glandular on the upper half; stems unbranched 2-5dm tall. Basal leaves several to many, usually tufted, narrow, 2-8cm long and 2-15mm wide; blades narrowing to long petioles; stem leaves paired. Flowers usually several in an inflorescence. Calyx tubular, about 1cm long, with 10 prominent green nerves, glandular. Corolla white to pinkish or purple; petals 2..5-5.5mm long, equally 4 lobed at tip.

Distribution:

Southeast Oregon, northern Nevada, Lost River and Lemhi ranges of east-central Idaho: Butte and Clark counties. Suspected to occur in the Donkey Hills area.

Habitat:

Slightly moist drainages in gravelly meadows and hillsides in sagebrush/grass zone, sometimes near the interface with Mt. mahogany or Douglas-fir forests; common associates: *Cercocarpus ledifolius*, *Pseudoroegneria spicata*, *Artemisia tridentata vaseyana*, *A. tripartita*, *Penstemon radicosus*, *Arenaria congesta*, *Festuca idahoensis*, *Heuchera parviflora*, *Lupinus* sp.; usually on soils derived from limestone weatherings (Anderson and Henderson 1978).



Spiranthes diluvialis

Description:

Perennial orchid with one or rarely multiple stems 12-50 cm tall, hairless near the bottom but hairy on the upper half; stems arising from tuberously thickened roots up to 1cm in diameter. Leaves persisting during flowering, narrow, 1-cm wide and up to 28 cm long, the longest leaves at the base of the stem and rapidly reduced upwards, the topmost reduced to sheathing bracts. Inflorescence a dense spike of few to many white or ivory flowers clustered in a spike of 3-ranked spirals at the top of the stem. Floral bracts 9-33mm long (the lowermost). Flowers 7-15mm long, faintly fragrant with the scent of coumarin. Sepals and petals oriented perpendicular to the stem, the lateral sepals often spreading abruptly from the base of the flower. Sepals free to the base. Lip petal 7-12 x 2.5-6.8 mm, somewhat constricted in the middle.

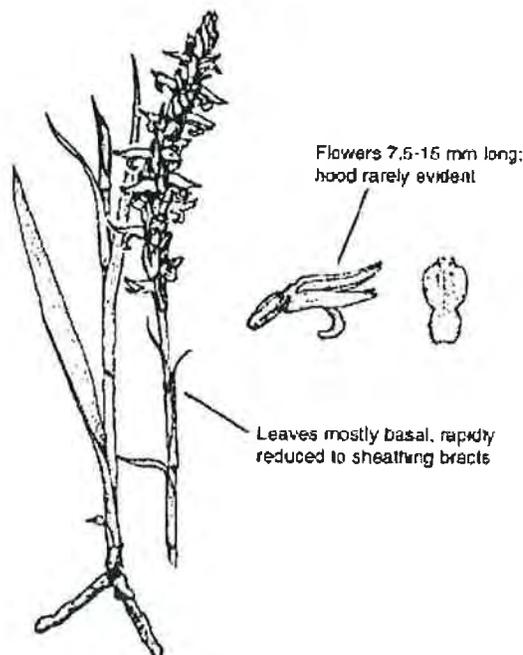
1. Petals free for (3.5)4.5-6.5mm; sepals free; lip not obviously violin-shaped; rachis of inflorescence with at least some hairs more than 0.2mm long; plants of middle and lower elevations....*S. diluvialis*
1. Petals free for 2-3.5mm; sepals fused, united with the petals to form a prominent hood above the lip; lip violin-shaped; rachis of inflorescence lacking hairs or with very short glandular hairs, mainly less than 0.1mm long; plants of middle to upper elevations.....*S. romanzoffiana*

Distribution:

Great Plains of western Nebraska and adjacent Wyoming, west about 600 miles across the Rocky Mountains and Intermountain Region to the Okanogan Valley in north central Washington, near the Canadian border. Recorded from as far south as the plateaus of southern Utah and southeastern Nevada (a 1936 collection not relocated). In Idaho, South Fork Snake River drainage between Palisades Dam and Heise (Moseley 1998).

Habitat:

Meadows near springs, lakes and perennial streams on plains, in broad intermountain valleys, and in narrower mountain valleys at lower elevations. Preferred habitat is thought to be early to mid-seral riparian habitats created and maintained by streams that are active within their floodplains, but *S. diluvialis* is also found in meadows and irrigated pastures not associated with fluvial systems (Moseley 1998). Sites usually remain wet throughout the growing season, and most populations (at least in Idaho) are probably submerged annually or regularly during high spring flows. Within the Challis volcanics and Idaho batholith portion of the Middle Rocky Mountain Ecoregion, the expected elevational range is 1,200 to 6,500 feet. Throughout its range, most populations occur below or just into the coniferous forest zone in the steppe, shrub-steppe and pinyon-juniper zones (Moseley 1998). In Idaho, populations of *S. diluvialis* are associated with communities dominated by *Eleocharis rostellata*, *Elaeagnus commutata*, *Salix exigua*, *Agrostis stolonifera* and *Equisetum variegatum* (Moseley 1998).



Perennial herbs 2-5 dm tall.

Names	based on Plants database								
NPS'02	Native Plant Society status based on 2002 meeting; see introduction for explanation of codes								
Treat	Treatment in this report: L species are BLM sensitive species; S species are species of interest, not currently known to occur on BLM								
H code	Habitat codes:	A	alpine						
		F	forests						
		HR	high elevation rocky						
		MR	mid elevation rocky						
		LR	low elevation rocky						
		S	sagebrush						
		W	wetland/riparian						
Family	Scientific Name	Common Name	NPS'02	Treat	L	Cu	Habitat	H code	Distribution and Notes
Asteraceae	<i>Agoseris lackschewitzii</i> D. henderson & R. Moseley	Pink Agoseris	SS	L	L		Moist to wet subirrigated montane or subalpine meadows	W	Mountains of east central ID, extending to sw MT and British Columbia
Asteraceae	<i>Aster junciformis</i> Rydb.	Rush Aster	SS	L		c	Calcareous wetlands with <i>Carex aquatilis</i> , <i>C. nebrascensis</i> , <i>C. simulata</i> , <i>C. uliculata</i> .	W	Alaska to BC and Quebec south to several northern states; Bonner, Boundary, Custer, Fremont, Koolenai, Teton, Valley
Fabaceae	<i>Astragalus amblytropis</i> Barneby	Challis Milkvetch	G3	L	L	c	Unstable gravelly to ashy clay substrate derived from volcanic and metamorphic rock; often on road cuts and fills, these usually relatively short-lived expressions of a more stable nearby population on natural substrate	LR	Endemic to east-central Idaho along the Salmon River and tributaries from Clayton north to Elk Bend.
Fabaceae	<i>Astragalus aquilonius</i> Barneby	Lemhi Milkvetch	G3	L	L	c	Washes and slopes, especially near and at the base; soils gravelly to sandy, usually from volcanic weatherings; also on open flats with relatively deep soils; sagebrush/bunchgrass and salt desert shrub zones	LR	East-central Idaho endemic, occurring in Butte, Custer and Lemhi Counties. Populations are known from the Lemhi Valley, and up the Salmon River Corridor and tributaries. Most sites are in the Challis Volcanic area, with the largest population center of 1000's of plants in the Bradbury Flat and Round Valley area.
Fabaceae	<i>Astragalus bisulcatus</i> (Hook.) Gray var. <i>bisulcatus</i>	Two-grooved Milkvetch	SS	L	L		Prairies, plains, foothills, and also barren sites, often on selenium-rich soils	S	Prairie provinces of Canada, s to KS, NM, AZ, including Utah, WY, east-central ID; Clark, Fremont, Lemhi Cos.
Fabaceae	<i>Astragalus diversifolius</i> Gray	Meadow Milkvetch	G2	L	L	c	Moist alkaline meadows associated with spring-fed fen systems (e.g., Birch Creek, Summit Creek) and less commonly in other moist subirrigated meadows (not associated with fens); mesic, not wet, with alkaline clayey soils, often whitish in appearance; surface usually flat, sometimes with swale topography or hummocks	W	Rocky Mountains, Colorado, western Wyoming, east central Idaho, western Montana and apparently in Alberta
Fabaceae	<i>Astragalus givivlorus</i> Sheldon	Plains orophaca	S1	L	L		Barren knolls, hilltops, gullied badlands; Railroad Canyon population on a gravelly calcareous slope adjacent to outcrops	MR	East base of Rockies from s Canada to CO, east to the northern Plains and west into e ID. Clark, Fremont, Lemhi Cos.
Fabaceae	<i>Astragalus leptaleus</i> Gray	Park Milkvetch	SM	L	L	c	Moist meadows, swales, turfy hummocks near mountain streams; often where alkaline	W	Western MT to central ID, s in the Rocky Mts to CO; Custer and Lemhi Co.

Poaceae	<i>Bouteloua gracilis</i> (Willd. ex Kunth) Lag. ex Griffiths	Blue grama	S1	L	L	c	Open sagebrush communities, our populations usually on flat or gently sloping alluvial fans	S	Great Plains species with isolated stations in Idaho: Pahsimeroi (Tater Creek), Kriley Gulch area.
Cyperaceae	<i>Carex livida</i> (Wahlenb.) Willd.	Pale Sedge	SS	L	L	c	Saturated organic soils in peatlands and swampy woods.	W	Interruptedly circumboreal, south in NA to the Pacific NW and other northern states; Blaine, Bonner, Custer, Fremont, Lemhi
Cyperaceae	<i>Carex parryana</i> ssp. Idahoa (Bailey) D.F.Murr.	Idaho Sedge	G2	L	L		Calcareous fens in Idaho, but a few of the Montana populations occur in non-calcareous wetlands; subirrigated, moist at the surface	W	Southwest MT and adj east-central ID; Clark, Lemhi, Caribou Cos.
Cactaceae	<i>Coryphantha vivipara</i> (Nutt.) Britt. & Brown (<i>Escobaria vivipara</i> (Nutt.) Buxbaum)	Cushion Cactus	SS	L	L		Open sagebrush/grassland sites in valleys and foothills.	S	Alberta and Manitoba, south to OR, NM and TX. In Lemhi Co. Much less common than <i>C. missouriensis</i> .
Apiaceae	<i>Cymopterus ibapensis</i> M.E.Jones	Ibapah Wavewing	SR	L	L	c	Gravelly open calcareous substrates from valley bottoms to above timberline.	MR, HR	Southeast OR, NV, UT, east-central ID; Butte, Custer and Lemhi Cos. Note from 2001: Discrepancy remains regarding the proper disposition of plants from the central Idaho mountains that were formally assigned to this name. <i>C. ibapensis</i> is now considered a variety of <i>C. longipes</i> .
Brassicaceae	<i>Draba globosa</i> Payson (<i>Draba apiculata</i> C.L.Hitchc.)	Pointed Draba	S2	L	L	c	Alpine fellfields, ridgecrests and slopes on shallow rocky soils	HR	Uintas, western and scentral WY, Beartooth Plateau, White Clouds; Custer Co.
Brassicaceae	<i>Draba incerta</i> Payson	Yellowstone Draba	SS	L	L	c	High mountain ridgecrests and tallus slopes; soils shallow to moderately deep but rocky	HR	Alaska, s to the mountains of WA, ID, UT, WY. Boundary, Custer, Fremont, Lemhi
Asteraceae	<i>Eatonella nivia</i> (D.C.Eat.) Gray	White Eatonella	SS	L	L	c	Dry sandy or volcanic, mid-elevation desert areas, often in sagebrush	LR, S	CA and NV, to se OR, adj sw ID, disjunct near the Salmon River in east-central ID. Adams, Custer, Elmore, Owyhee, Lemhi
Polygonaceae	<i>Eriogonum capistratum</i> var. <i>welshii</i> Reveal	Welsh's Buckwheat	G2	L	L	c	barren, windswept, gravelly clay slopes and ridges; often on broad alluvial fans with <i>Artemisia tridentata wyomingensis</i> , <i>A. arbuscula</i> , <i>A. frigida</i> , and <i>Atriplex</i>	S	Endemic to Custer CO. Chris Murphy surveyed in 2001.
Cyperaceae	<i>Kobresia simpliciuscula</i> (Wahlenb.) Mackenzie	Simple Kobresia	S2	L	L	c	Fens, wet meadows, pond edges and other wet places at moderate to high elevations; in east-central ID in calcareous fens	W	Circumboreal, in NA extending s across Canada and irregularly to CO, the Wallowa Mts. In OR, east-central ID, and w MT.
Gentianaceae	<i>Lomatogonium rotatum</i> (L.) Fr. Ex Nyman	Marsh Felwort	S1	L	L	c	Calcareous fens; often in dense graminoid vegetation	W	Circumpolar; in NA from Hudson Bay to Alaska, south in the Rocky to CO, to Maine in the eastern US; Custer and Lemhi Co.
Fabaceae	<i>Oxytropis besseyi</i> (Rydb.) Blank var. <i>salmonensis</i> Barneby	Challis Crazyweed	G3	L	L	c	Sandy washes or open slopes of rocky volcanic soil in Wyoming big sagebrush and salt desert shrub communitiess	LR, S	Challis endemic; Custer County, ID
Scrophulariaceae	<i>Penstemon lemhiensis</i> (Keck) Keck & Cronq.	Lemhi Penstemon	G3	L	L		Sagebrush communities; just below or in openings in the doug-fir zone; road cuts and fills; on natural sites often where soils are shallow, with platy rock outcrops	S	Continental Divide from Leadore north to Lost Trail Pass, west to Horse Creek Pass in the Bitterroot Mountains and south along the Salmon River Range approximately to Williams Creek. It is absent from the Lemhi Mountains. In Montana from just south of Darby, east to Butte, and south to Dillon -- in the Bitterroot, Highland, and Pioneer Mountains.
Brassicaceae	<i>Physaria didymocarpa</i> var. <i>lyrata</i> C.L. Hitchcock	Salmon Twin Bladderpod	G1	L	L		Rocky, sparsely vegetated, generally south-facing slopes; substrate coarse-textured, often 3-7cm in diameter, loose to relatively stable, but probably periodically experiencing down-slope movement	LR	Lemhi County, Idaho; in the lower Lemhi Valley and near Salmon

Primulaceae	Primula alcalina Cholewa & D. Henderson	Alkali Primrose	G2	L	L	c	Fen obligate; usually where subirrigated and moist at the surface; often on "bouncy" turf	W	Endemic to Custer and Lemhi Counties, Idaho; historical sites in adjacent Montana
Salicaceae	Salix candida Fluegge ex Willd.	Hoary Willow	SS	L	L	c	Fens, swamp; usually not right on the channel	W	Alaska to Labrador s to NJ, SD, Rocky Mts. Boundary, Bonner, Caribou, Custer, Fremont, Lemhi, Teton Cos.
Salicaceae	Salix pseudomonticola Ball	False Mountain Willow	S2	L	L	c	Moist to wet bottomlands; often where alkaline	W	Alaska east to w Quebec, s to ID, n WY, SD, Ontario; Clark, Fremont, Lemhi Cos
Cyperaceae	Scirpus rollandii Fern	Rolland Bullrush	G3	L	L	c	High valley wetlands on saturated calcareous soils, sometimes hummocked	W	Circumboreal, disjunct in CO, WY, MT, ID and CA. Clark, Custer, Lemhi Cos.
Brassicaceae	Thelypodium repandum Rollins	Wavy Leaf Thelypody	G3	L	L	c	Open slopes; ashy to scree substrates in the Challis volcanic area	LR	Challis endemic; Custer and Lemhi Counties, ID
Lichen	Xanthoparmelia idahoensis Hale	Idaho Range Lichen	G2	L	L		Bentonite slopes near Salmon and at a few spots up the Lemhi to about Lemhi, ID.	LR	Lemhi County, Idaho; in the lower Lemhi Valley and near Salmon
Labiatae	Agastache cusickii (Greenm.) Heller	Cusick's horse-mint; Cusick's giant hyssop	SR	S			Dry, open, limestone talus slopes, often with sagebrush or mountain mahogany in the montane zone	S, MR	Sensitive in MT, known from Beaverhead County; not tracked in ID; BONAP shows as suspected but unconfirmed in ID.
Ericaceae	Allotropa virgata Torr. & Gray ex Gray	Candystick	SS	S			Lodgepole pine with an understory of grouse wortleberry on gentle to moderate southeast and southwest facing slopes. Soils are coarse-textured, acidic, eroded granitics with a shallow duff layer.	F	Southeast British Columbia, south through Canada and the coastal ranges to the southern Sierra Nevada mountains; disjunct in Valley Co. Idaho and western Montana. Most populations are small. Plant is an obligate mycotroph.
Ranunculaceae	Anemone cylindrica Gray	Candle anemone	SR	S			Prairies to the lower level meadows in sagebrush steppe in the mountains; usually slopes or flats with additional moisture (north-facing or subirrigated).	S	British Columbia south in Rocky Mountains to MT, NM, AZ and east to SD, MO, and NJ. Reported for eastern Idaho by Davis (1952); note that Hitchcock et al (1964) says incorrectly reported for Idaho but that Hitchcock and Cronquist (1973) is less emphatic; occurs in southwest Montana and not unexpected in adjacent Idaho.
Fabaceae	Astragalus amnis-amissi Barneby ex CL Hitchc.	Lost River Milkvetch	G3	S		c	Limestone cliffs and steep talus, generally in moist shaded pockets and crevices	MR, HR	East-central ID endemic; Lost River Range, Hawley Mt, southern tip of the Lemhis; Butte and Custer Cos.
Fabaceae	Astragalus paysonii (Rydb.) Barneby	Payson's Milkvetch		S		c	Seral forest habitats, including burned over forests and older road and trail cuts	F	Regional endemic in Idaho and southwestern Wyoming; historical record in the Yankee Fork drainage.
Fabaceae	Astragalus vexilliflexus Sheldon var. nubilus Barneby	White Clouds Milkvetch	G2	S		c	Open ridgeline and slopes, sparsely vegetated; volcanic, granitic, and metamorphic substrates	HR	White Cloud Peaks and Boulders; endemic to Custer Co.
Poaceae	Calamagrostis tweedyi (Scribn.) Scribn. ex Vasey	Cascade Reedgrass	G3/S2	S			Disturbed or seral areas in subalpine fir forests, or in mature forests where usually vegetative	F	Wenatchee Mts., central ID, nw MT; Idaho Co.
Onagraceae	Camassonia pterosperma (S. Wals.) Raven	Wing-seed Evening Primrose	SS	S			Mixed sagebrush and juniper communities at low to moderate elevations; usually at the base of outcrops in rubble.	S, LR	AZ, CA, NV, UT and east central ID. Butte and Clark Cos at end of Beaverhead and Lost River Ranges.
Cyperaceae	Carex buxbaumii Wahlenb.	Buxbaum's Sedge	SS	S		c	Peat fens, marshes, wet meadows and streambanks, usually in broad montane valleys along low-gradient streams or lakeshores.	W	Widespread, but uncommon throughout boreal regions of NA, in the western US as far south as CO, UT, central CA; Blaine, Bonner, Boundary, Custer, Fremont, Valley, Idaho cos.
Cyperaceae	Carex crawei Dewey	Crawe's Sedge	SR	S			Foothills; gravelly calcareous soils on the shores of ponds and streams.	W	East-central ID, Clark CO; Quebec to BC, south to NJ, TN, MO, UT, MT, ID; sparse and rare

Cyperaceae	<i>Carex flava</i> L.	Yellow Sedge	SM	S		c	Boggy or swampy places and along the shores of lakes and streams; Stanley location is a fen.	W	Throughout Boreal regions of North America, reaching as far south as ne WA, central ID and MT. The similar <i>Carex viridula</i> occurs in Birch Creek; nearest location of <i>C. flava</i> is about 3 miles north of Stanley.
Cyperaceae	<i>Carex occidentalis</i> Bailey	Western sedge	S1	S			Open to lightly wooded slopes and dry meadows, generally at middle elevations, but extending to subalpine and alpine areas.	F, S	Southern Rockies, from s WY to NM and west to UT, NV, and s CA; Occurs in Beaverhead Co.; not unlikely in adjacent ID. Known from Bonneville Co.
Saxifragaceae	<i>Chrysosplenium tetrandrum</i> (Lund ex Malmgr.) Th. Fries	Northern golden saxifrage	S1	S		L	Seeps, wet rock ledges and streambanks in the montane zone.	W	Circumpolar, south in N. America to BC, WA, MT, CO. Known in Idaho from near Lost Trail Pass. Potential in wet montane riparian forested bottoms.
Cuscutaceae	<i>Cuscuta denticulata</i> Engelm.	Sepal-tooth Dodder	S1	S			Historic record says "on sagebrush" Community near Blue Dome includes both Wyoming and mountain big sagebrush	S	Historic site near Blue Dome. Clark, Idaho Cos; BONAP has records for much of the western US
Asteraceae	<i>Dimeresia howellii</i> Gray	Dimeresia	S2	S			Dry gravelly, rocky or cindery soils in the valleys or lower foothills.	LR	Northeast CA and nw NV to Baker Co., OR and Owyhee Co., ID.
Onagraceae	<i>Epilobium palustre</i> L.	Swamp Willow-weed	SM	S		c	Wet soils, fens, bogs; often alkaline; mostly likely in our calcareous fens	W	Alaska to Cascades of central WA, east to the Atlantic, s in Rockies to CO; also in Eurasia; in Idaho known from Bonner, Boundary, Custer, Fremont Cos.
Orchidaceae	<i>Epipactis gigantea</i> Dougl. ex Hook.	Giant Helleborine	S2	S		L c	Moist areas along streambanks, seeps and springs; especially common around hot springs, but also occurs around cold springs	W	Cordilleran areas from central Mexico n to BC; many locations in ID; occurs in the Warm Springs drainage near Elk Bend (on FS, but parking area on BLM).
Polymoniaceae	<i>Ipomopsis polycladon</i> (Torr.) V. Grant (<i>Gilia polycladon</i>)	Spreading Gilia	S2	S			Dry, open substrates; foothills and valleys; sagebrush/grassland, or sometimes Atriplex communities	S	Throughout much of Great Basin: Nevada, Utah and adjacent Colorado and north to the Snake River Plain, and south to west Texas, southern California, southern Arizona and adjacent Mexico. In Idaho Owyhee, Powell, Butte Counties.
Juncaceae	<i>Juncus hallii</i> Engelm.	Hall's rush	SR	S			Sparsely wooded rocky slopes and moist meadows and streambanks in the mountains to alpine	F, S, W	sw MT to CO, UT and scattered stations in ID; Boneville, Clearwater, Fremont, Lemhi, Owyhee; most collections from the 1970s, none later than 1988.
Brassicaceae	<i>Lesquerella paysonii</i> Rollins	Payson's bladderpod	G3	S			Calcareous open gravelly slopes and ridgetops in the sagebrush/grass and lower coniferous forest montane zone	MR	Western WY, e central ID, sw MT; Bonneville CO. Moseley 1996 suggested removal from sensitive list. Still tracked as G3, and still tracked by Montana and Wyoming.
Portulacaceae	<i>Lewisia kelloggii</i> Brandg.	Idaho Bitterroot	S1	S		L c	On gravelly soils, often fractured bedrock, usually near late snowbanks, upper ridges and slopes; with high elevation forbs and a sparse overstory of conifers	HR	Central ID (Boise, Valley, Elmore, Lemhi, Custer), and in the Sierra Nevada, CA.
Utriculariaceae	<i>Muhlenbergia racemosa</i> (Michx.) BSP	Green muhly	S1	S			Saturated soils in fens, on peat and mineral hummocks	W	British Columbia, s on the east side of the Cascades to ne OR, NV, AZ, n Mexico, east to Newfoundland, OK, TN, MD. Fremont Co- Island Park area, Bannock, Bonner, Teton
Poaceae	<i>Nasella viridula</i> Trin. (Barkworth) (<i>Stipa viridula</i>)	Green Needlegrass	S2	S			Plains, prairies, foothills at lower elevations, to mountain meadows, open woodlands and hillsides at higher elevations.	S, F	Most common east of the Continental Divide; BC, Alberta, Saskatchewan, s through MT to NM and AZ and e to WI and IL. Clark, Elmore, Owyhee Cos
Compositae	<i>Orogenia fusiformis</i> Wats.	Tapered-root Orogenia	SR	S			Open slopes and ridges from the lower foothills to moderate elevations, usually with <i>Artemisia tridentata</i> . Often flowering at the edges of retreating snowbanks.	S	Southern Washington to Ravalli County, MT and south to Oregon, southern Idaho, Utah and western Colorado. Several occurrences in Montana along the Idaho border. In MT on Beaverhead, Lick Creek and Jennings Camp quad.

Hydrophyllaceae	Phacelia inconspicua E.L. Greene	Obscure scorpion-weed	G1	S			Loose sandy soils in open sagebrush grass communities, on open microsites; often on north-facing slopes where late-melting snowbanks provides late spring moisture; sometimes near the edges of aspen clones	S	Northern Snake River Plain and nw Nevada; Butte and Blaine Cos.
Hydrophyllaceae	Phacelia minutissima L.F. Henderson	Least Phacelia	G3	S			Meadows, along streambanks, on slopes, often in areas of late snowmelt or seeps in sagebrush and aspen; sometimes in disturbed areas. Foothills to midmontane. Collections in Owyhee Co have been in dense false helebore patches down-slope from aspen with an open understory and a diverse flora of annuals	S	Regional endemic, upper Intermountain, central ID, ne OR, central WA, Elko Co Nevada; Camas and Owyhee
Poaceae	Piptatherum micrathum (Trin. & Rupr.) Barkworth (Oryzopsis micrantha)	Small-flowered Ricegrass	S2	S			Cracks in a limestone cliff (opposite Blue Dome); also in open dry woods and rocky slopes at medium elevations.	MR	Saskatchewan to ND, MT, s to NV, NM, AZ, CA. In Idaho, just on the border of Butte CO east of campground below Birch Creek; disjunct from the east by several hundred miles.
Plantaginaceae	Plantago eriopoda Torr.	Alkaline Plantain	SR	S	L		Calcareous subirrigated meadows; highly alkaline; fairly low vegetative cover	W	CO and NE north in the plains states and west to c ID and through the Great Basin region to CO
Polypodiaceae	Polystichum kruckebergii W.H. Wagner	Kruckeberg's Swordfern	SS	S		c	Cliff crevices and talus slopes at middle to upper elevations.	MR, HR	Irregularly from s BC and nw WA to s CA, east to c ID w MT and n UT; Cassia, Custer, Idaho Cos.
Rosaceae	Potentilla bipinnatifida Dougl. Ex Hook.	Tansy Cinquefoil	SR	S		c	Lower foothill and valley sagebrush/grassland.	S	Idaho east to Minnesota, south to Utah, New Mexico, Nebraska; collections from near Chilly, near Clyde, and from south of Challis. Added to review in 2002
Primulaceae	Primula incana M.E. Jones	Jone's Primrose	S1	S		c	Moist alkaline meadows and streambanks, often on hummocks; in Yellowstone associated with thermal areas	W	Rocky Mts and w Canada south to CO, UT, n Cascades. In Idaho in Custer and Teton Cos., Bowery Hot Springs in East Fork above Guard Station; widespread but not common
Chenopodiaceae	Salicornia rubra A. Nels.	Red Glasswort	SS	S			Moist saline or alkaline bottoms	W	Southern BC and e WA to NV, KS, NM; Bear Lake, Bingham, Caribou, Cassia, Franklin and Oneida Cos.
Salicaceae	Salix farriarum Ball	Farr's Willow	S2	S		c	Wet meadows, moist streambanks and lakeshores between 9000-9300'	W	Southern BC and AB, ne OR, east-central ID, w MT, nw WY. Custer Co (N of Leatherman Pass; White Cloud Peaks; Upper Merriam Lake Basin); quite a bit in Yellowstone
Crassulaceae	Sedum borschii R.T. Clausen	Borsch's Stonecrop	SM	S	L		Midmontane open to shaded cliffs and rocky slopes, west to nw exposures on a variety of parent material; often in Douglas-fir	MR	Endemic to northern half of ID batholith, the 7 Devils Mts, Craigs, and sw MT. Idaho, Lemhi and Valley Cos..
Caryophyllaceae	Silene scaposa Robbins var. lobata Hitchc. & Maguire	Scapose Silene	SM	S			Slightly moist drainages, gravelly meadows and hillsides in sagebrush or PJ areas; often on limestone.	S, LR	Southeast OR, n NV, Lost River and Lemhi ranges of east-central ID; Butte and Clark Cos.
Orchidaceae	Spiranthes diluvialis Sheviak	Ute Ladies tresses	G2	S			Meadows near springs, lakes and perennial streams on plains, in broad intermountain valleys, and in narrower mountain valleys at lower elevations.	W	Great Plains of western Nebraska and adjacent Wyoming, west about 600 miles across the Rocky Mountains and Intermountain Region to the Okanogan Valley in north central Washington, near the Canadian border; in Idaho, South Fork Snake River drainage between Palisades Dam and Heise.

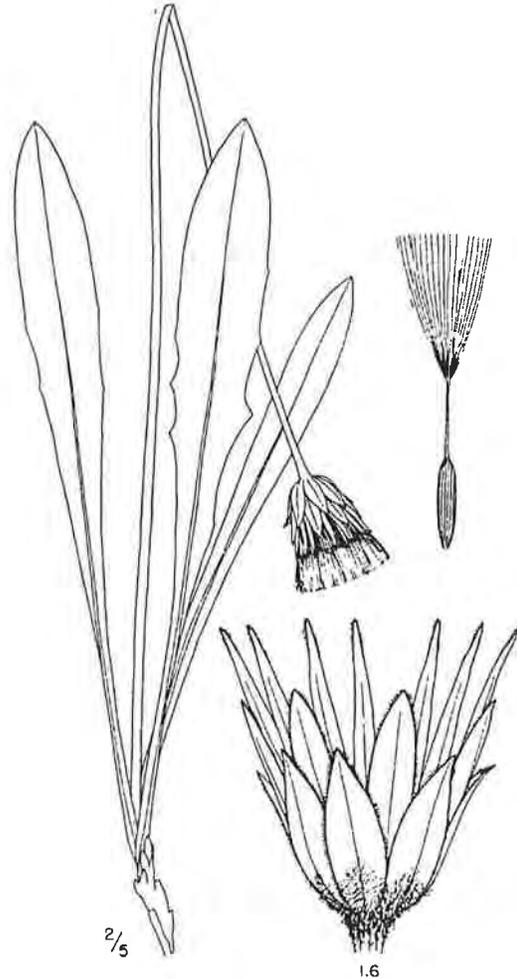
Brassicaceae	<i>Stanleya tomentosa</i> Parry var <i>runcinata</i> (Rydb.) Rollins	Wooly Princess Plume	SR	S	c	Open slopes; ashy to scree substrates in the Challis volcanic area	LR	Variety endemic to the Challis area.
Ranunculaceae	<i>Thalictrum dasycarpum</i> Fisch & Ave-Lall.	Purple meadowrue	S1	S		Deciduous riparian woods, damp thickets, moist woods, wet meadows; often within or adjacent to the floodplain	W	Eastern BC e to Ontario, s through the central US to the southeastern states, in the Rockies to NM, AZ, ID, ne WA. Bear Lake, Bonner, Boundary, Cassia, Fremont

Agoseris lackschewitzii D. Henderson & R. Moseley

Pink Agoseris Asteraceae

A. General Description

Herbaceous, perennial, taprooted, up to 40cm tall. Stems hairy the entire length. Plant with milky juice. Leaves in a basal rosette, up to 20cm long and 2.5cm wide, hairless, entire or with a few small teeth, sometimes with irregular dark purple spots. Flowers with pink rays, 5-10mm long. Capillary bristles very white. Floral bracts green, with a dark strip down the middle, and occasionally purple dots; in two to several series. Achenes roundish, 6-8mm long, with 10 ribs on the body; tapering gradually to a 4.2-6.6mm long beak. Blooms mid-July to mid August.



B. Technical Description

Henderson et al 1990: Plants perennial herbs with simple or branched caudex and a slender taproot, producing a basal rosette and 1-3 scapes. Leaves thin, oblanceolate, (4)6-20(27)cm long, 0.7-2.2(3.1) cm wide; Blade margins entire to rarely distantly toothed, both surfaces glabrous, the apex acute, slightly revolute, with a purple mucro, the base attenuate; petiole broadly to narrowly winged, $1/3$ to $1/2$ the length of the leaf, sheathing at the base, the margins villous with spreading multicellular hairs with clear cross-walls. Scape 6-39cm high, villous at base, becoming tomentose below the solitary head. Involucre campanulate, remaining so in fruit, 1.1-1.9cm long in flower, up to 2.5cm long in fruit; phyllaries mostly imbricate in 3-4 series, light green with a dark purple median stripe and light to heavy purple mottling, the inner lanceolate, acute, with white scarious margins, the outer similar or slightly broader and obtuse, densely villous basally, less so towards apex, the trichomes eglandular, translucent or occasionally with some purple pigment. Receptacle slightly convex, up to 7mm broad, chaffy, foveolate. Flowers all ligulate, perfect, 50-70 per head, pink at anthesis, drying to deep pink; ligules 5-10mm long, 1.5mm wide, 5-toothed, glabrous distally, pubescent proximally, with few multicellular hairs; tube 6.5mm long; anthers 1.2-1.8mm long, the apical appendages

lanceolate, 0.2-0.3mm long; style column 8-9mm long, purple, scabrous; style branches 0.4-0.8mm long, stigmatic for entire length, the abaxial surface scabrous, the apex rounded. Achenes terete, the body 6-8mm long, 10-ribbed, minutely scabrous on the ribs, glabrous to sparsely pubescent with short unicellular hairs between the ribs, gradually tapering to a slender, obscurely nerved or nervelss beak shorter than the body, the beak 4.2-6.6mm long. Pappus double; capillary bristles numerous, white, minutely scabrous, 6-12mm long.

The striking pink rays are obvious field characteristics, but surveyors should note that both *A. glauca* and *A. aurantiaca* sometimes age or dry a pinkish color. Achenes of *A. aurantiaca* have abrupt edges at the tip of the body that form highly-visible, graduated stairsteps that narrow the body into the beak; *A. lackschewitzii* achenes taper gradually. The leaves of *A. glauca* are usually thicker, wider and more glaucous, and *A. glauca* usually grows on sites that are drier and more open than those of *A. lackschewitzii* (Pavek and Schassberger 1992). Sometimes, however, the two species can be found together (Elzinga 1995).

C. Distribution

Southwest Montana (Beaverhead, Cascade, Deerlodge, Judith Basin, Madison, Meagher, Park, Silver Bow, and Sweetgrass counties) and adjacent Idaho (Fremont and Lemhi counties). In Idaho, known sites include Trail Creek ACEC, Big Eightmile Creek, Mill Creek, Upper Mill Creek Basin (just below uppermost lake), middle fork of Little Timber Creek, and the meadow southwest of Basin Lake. The first collection was made in 1948 in Cascade County, MT, between Kings Hill and Neihart. It remained unidentified until annotated by Douglass Henderson as *A. lackschewitzii* in 1987 (Pavek and Schassberger 1992).

D. Habitat

Montane to supalpine open moist flat to gently sloping meadows that remain saturated by subirrigation throughout the growing season, often in ecotones between wet meadows and forest. Soils are perennially moist, deep, and highly organic.

Associated species include *Carex rostrata*, *Carex scopulorum*, *Phleum alpinum*, *Poa leptocoma*, *Juncus balticus*, *Deschapsia cespitosa*, *Androsace septentrionalis*, *Pedicularis groenlandica*, *Polygonum bistortoides*, *Senecio triangularis*, *Zigadenus elegans*, and other moist meadow forbs, sometimes with a sparse overstory of *Abies lasiocarpa*, *Picea englemannii*, *Pinus albicaulis* and *Pseudotsuga menziesii* (Pavek and Schassberger 1992).

E. Reproductive Ecology

No studies have been done on *A. lackschewitzii*. Populations may consist of mostly non-reproductive individuals (Pavek and Schassberger 1992). Flowers are likely pollinated by insects. Flowers form abundant seed which can disperse at least several meters in wind. Germination sites are likely rare in the dense graminoids vegetation typical of false mountain dandelion sites, although I have observed some exposed soil in populations from small animal burrowing. Composites often form long-lived seedbanks, but it is unknown if *A. lackschewitzii* seed is stored in the soil.

F. Issues

i) Population Trends

Most known populations are quite small, ranging up to a few hundred plants. Nothing is known about population trends of this species. A community monitoring study in Montana at the Onion Park RNA near White Sulphur Springs, Montana captured some individuals of false mountain dandelion within plots, but the study was not designed to track trends in this species. The monitoring plots have not been reread since their establishment in 1995 (Elzinga 1995).

ii) Threats

Weeds: While some meadows contain non-native species, no invasive weeds have been noted either in reports or in personal visits. Two species that I would have concerns about if noted in a meadow are *Agropyron repens* and *Alopecurus arundinaceus*, both of which can become invasive.

Herbivory: Many of the sites containing false mountain dandelion are grazed by cattle or sheep (Jankovsky-Jones 1998; Pavek and Schassberger 1992). Sites that are highly saturated may experience little use due to animal aversion to wet sites. Most use on high-elevation sites probably occurs after flowering, and may have little impact. The effects of grazing are unknown, although sites with even heavy historical grazing still maintain populations. Effects of grazing may be mixed, with deleterious effects caused by direct impacts from trampling and herbivory and indirect effects of weed introduction, but advantageous effects caused by reducing competition and creating germination sites.

Timber Management: No marketable timber occurs on false mountain dandelion sites. Some potential may exist for impacts from harvest on adjacent sites, including direct impacts from incidental skidding or traffic across meadows and indirect impacts resulting from changes in water tables due to changes in snow catchment or evapotranspiration rates within harvested sections.

Other: Recreational activities may have potential impacts. The meadows are attractive grazing sites for recreationists using packhorses, llamas or goats. Traffic, both motorized and non-motorized, could cause trails and rutting in the meadows.

iii)

Management Needs and Recommendations

Trends for this species are unknown. It is unknown if any population requires specific management actions. Information should be collected by visiting known populations on BLM lands.

G. References

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***Aster junciformis* Rydb.**

Rush Aster Asteraceae

A. General Description

Conservation Data Center 2002: Slender, erect perennial 30-80 cm tall from creeping rhizomes seldom over 2 mm thick. The stems are mostly glabrous except for lines of appressed pubescence decurrent from the leaf bases. The linear-shaped leaves are 4-11 cm long by 2-6 (rarely to 9) mm wide, entire or subentire, scabrous on the margins, sessile, and often slightly clasping at the base. The lowermost leaves are sometimes reduced and sub-petiolate, but then soon deciduous. Flowers July through September. Each plant has a few uncrowded, to occasionally many, flower heads (or solitary in reduced plants). Rays commonly 20-50, white to pale blue or lavender, and 7-15 mm long. The mostly acute, glabrous, imbricate involucre bracts are 5-7 mm high and often have purplish tips and margins. The very slender habit combined with its more or less linear leaves, generally few, uncrowded flower heads, and saturated wetland habitat, helps distinguish it from most other aster-like plants.



Aster junciformis

B. Technical Description

Hitchcock 1955: Slender perennial from creeping rhizomes seldom over 2 mm thick; stem 1.5-8 dm tall, glabrous below, becoming puberulent in lines upwards; leaves linear or nearly so, commonly 2-5 (rarely 9) mm wide, usually slightly clasping, entire or subentire, the lowermost sometime reduced and subpetiolate, but then soon deciduous; inflorescence usually short

and broad, sometime more elongate, or the heads solitary in reduced plants; heads rather small, the disk 7-13 mm wide; involucre 5-7 mm high glabrous, its slender, mostly acute bracts more or less imbricate, often with purple tips and margins; rays commonly 20-50, white or pale bluish, 7-15 mm long.

C. Distribution

Alaska, Yukon and British Columbia to Quebec, south to Idaho, Colorado, South Dakota, Minnesota and New Jersey. Occurs in Chilly Slough near Whiskey Springs. Also in Teton County and several sites in northern Idaho. To be expected in calcareous wetlands throughout our area (e.g., Birch Creek, The Pines).

D. Habitat

Calcareous wetlands with *Carex aquatilis*, *C. nebrascensis*, *C. simulata*, *C. utriculata*.

E. Reproductive Ecology

Little is known about this species. Flowers bloom in late summer and are probably pollinated by insects. As a non-rhizomatous *Aster juncifolius* must reproduce by seed, but nothing is known about seed germination ecology or seedling establishment. Also unknown is average longevity of individuals and how often successful reproduction is necessary to maintain a population. Typically, however, asters are seedbanking. If *Aster junciformis* is long-lived, or forms a long-lived seedbank, consistent annual reproduction may not be critical.

F. Issues

i) Population Trends

No information is available. Sites are fairly stable environmentally and successionaly.

ii) Threats

Weeds: None known or expected in saturated sites like those of rush aster.

Herbivory: Saturated sites are generally too wet for livestock grazing, but may dry enough by fall (when the species is blooming and setting seed).

Timber Management: Not applicable.

Other: Water developments or other actions which alter wetland hydrology is the most significant threat (Jankovsky-Jones 1998).

iii)

Management Needs and Recommendations

Nothing is known about the trends of this species. Additional surveys in other fen sites in east central Idaho is recommended. Management that addresses conservation of calcareous fens would benefit this species.

G. References

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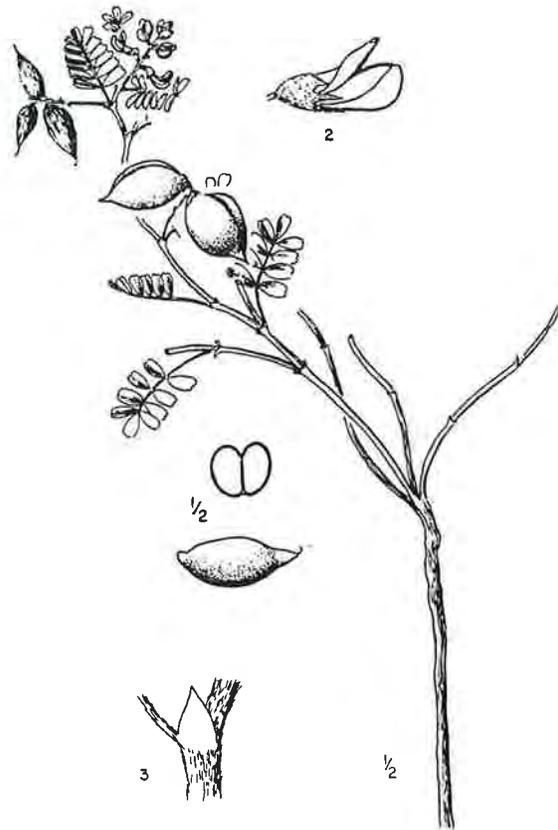
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Astragalus amblytropis Barneby

Challis Milkvetch Fabaceae

A. General Description

Perennial, less than 1dm tall, with a buried rootstock (up to 4-8cm below the surface; Rittenhouse 1990). Branches repeatedly forking. Foliage, neat, silvery, leaves 2-5cm long with 9-13 leaflets. Corollas 6-8mm long, pale to yellowish, sometimes with lilac veins; petals of nearly equal length. Pods 2-4cm long, inflated, unmottled, pale green with purpling on the side turned toward the sun, turning dark golden tan and papery at maturity; bilocular (with two complete chambers).



A. amblytropis

B. Technical Description

Hitchcock and Cronquist 1961: Grayish-strigillose perennial with a deep taproot and branched crown; stems several, prostrate to ascending, usually partially buried in talus and therefore rhizomelike at the base, 1-3dm long; leaves 2-5cm long; stipules deltoid, 1-2mm long, purplish, the lower ones connate; leaflets (7)9-13, oblong-obovate, usually emarginate, 5-10mm long; racemes 3-11-flowered, the peduncles much shorter than the leaves; pedicels 0.5-2.5mm long; calyx finely whitish-strigillose, about 1/3 the length of the corolla, the linear teeth subequal to the tube; corolla 6-8mm long, ochroleucous to yellowish, usually tinged with purple, the wings rather narrow, about equaling the much broader, very conspicuous keel; pod sessile, inflated, membranous, ellipsoid-ovoid, 2-3.5cm long, abruptly contracted to a short, acute, beaklike tip, completely 2-celled by the intrusion of the lower suture, broadly oval in section, with both sutures somewhat sulcate, strigillose, not mottled.

Astragalus amblytropis is similar to *Astragalus aquilonius* (see next species). The two species sometimes are found together, but *A. aquilonius* usually grows on slightly more stable substrates, and in sandy to gravelly washes, has reddish stems, a more upright habit, and shiny gold unilocular pods.

C. Distribution

Endemic to east-central Idaho along the Salmon River and tributaries from Clayton north to Elk Bend.

D. Habitat

Astragalus amblytropis grows on unstable gravelly to ashy clay substrate derived from volcanic and metamorphic rock, including rhyolitic, andesitic and bentonite weatherings. It is often found on road cuts and fills, these usually relatively short-lived expressions of a more stable nearby population on natural substrate. Substrate color ranges from white to reddish. Elevation of known sites ranges from 1300-2200 meters.

Rittenhouse (1990, 1994) measured substrate characteristics at 4 sites. Phosphorous ranged from 2.1-4.1ppm, pH from 8.3-7.9, potassium from 64-232ppm, and soil % organic matter was less than 0.3%. A comparison site that appeared visually suitable but did not contain any *A. amblytropis*, was similar in all characteristics except organic matter; it had nearly twice the typical amount with 0.4%. Soil particle size distribution was measured at 6 sites. Typically, soils were comprised of fragments 1-4mm in diameter, with some sites containing a small percentage of larger fragments (none more than 6%), and the fraction of smaller diameter material (<1mm) ranging from 10-38%. A single site that appeared visually suitable in the field was found on analysis to contain the highest percentage of fines (62%).

Vegetation is often sparse (<10% cover). Dominant associated species are *Atriplex confertifolia*, *Artemisia tridentata* ssp. *wyomingensis*, *A. arbuscula*, *Chrysothamnus parryi* ssp. *salmonensis*, *Elymus ambiguus* var. *salmonensis*, *Elymus elymoides* (*Sitanion hystrix*), *Achnantherum hymenoides* (*Oryzopsis hymenoides*), *Penstemon eriantherus*, *Hymenopappus filifolius*, *Cryptantha interrupta*, *Stanleya tomentosa*, *Mentzelia albicaulis*, *Chaenactis douglasii*, and *Phacelia glandulosa*. A complete list of species observed by Rittenhouse is presented in his thesis (Rittenhouse 1990)

E. Reproductive Ecology

Rittenhouse (1990) followed phenological stages over two growing seasons (1988 and 1989). He found vegetative growth begins in late March and continues through the growing season to September, although in dry years dormancy may begin as early as late July. Germination occurs from April to mid May. Flower buds are present in late April, and flowering initiates in May, continuing to August if soil moisture is adequate. Fruiting can begin as early as mid-May, and continue through August. Dispersal begins in middle to late July, and continues until snowfall. Pods stored under snow can remain intact and disperse in the spring as well.

Rittenhouse (1990) also noted stage classes and marked individual plants in 3 populations. Seedling class was demarcated based on leaf numbers; plants with a single leaf in late June were considered seedlings. I evaluated his original data, however, and found that some plants recorded as new plants in 1989 were reproductive. Rittenhouse does not address these in his thesis. These “new” plants may be seedlings that established after the original measurement in 1988, expressions of plants that were dormant throughout the growing season in 1988, or plants that germinated in the spring of 1989 and grew to reproductive stage. It must also be noted that not many plants were captured in these transects. Because of the uncertainty associated with seedlings, and limited number of plants monitored, interpretations must be made with caution.

Survival between 1988 and 1989 in Rittenhouse’s study was low among all stage classes at all 3 sites, ranging from 23 to 0%. Population structure is summarized in Table 1.

Table 1. Percent of population by size class in 1988 and 1989, percent survival between 1988 and 1989, and total number of plants contained within permanent transects at three monitoring sites.

	West Spar Canyon			East Spar Canyon			Leaton Gulch		
	1988	1989	% surv	1988	1989	% surv	1988	1989	% surv
seedlings	12.5	17	20	11	71	14	36	32	0
non-repro	32.5	83	23	13	14.5	12.5	23	52	12.5
reproductive	55	0	4.5	76	14.5	0	41	16	11
total plants	40	6		63	6		105	19	

Rittenhouse and Rosentreter (1994) conclude based on laboratory germination studies and field observations that seedlings produce 3-4 leaves during the first part of the first growing season, and then devote the remainder of the growing season effort to root elongation. Rittenhouse and Rosentreter (1994) note 3-4 leaf seedlings with taproots up to 46cm (it is not clear whether these are conclusively seedlings, given the problem outlined above).

Each flowering raceme contains 7-14 flowers, but only 1-2 usually form fruit (unpublished notes in Rittenhouse file at Salmon BLM). Flowers are primarily pollinated by the leaf cutter bee (*Ashmeadiella gillettii*), a solitary bee that nests in twigs and hollow stems of plants (Rittenhouse and Rosentreter 1994). Rittenhouse (1990) felt that pollinators were not limiting, but does not explain the low fruiting success rate. Within each pod, counts of mature and aborted seed found a range of 34-56% seed abortion (Rittenhouse and Rosentreter 1994).

Pods are dispersed by wind, with seeds falling from the dehisced distal end as the pod rolls along the ground. Rittenhouse (1990) noted that dispersal is primarily downhill, and the populations are densest near the base of slopes. Pods painted white to determine

dispersal distance were not relocated (Rittenhouse 1990), however, suggesting that dispersal can cover significant distances.

Pods have been observed with insect holes. Rittenhouse quantified pod predation at four populations. Maximum percentage of pods with predation holes was 12%, although up to 29% of the plants exhibited some pod predation. Predation was primarily from a bruchid seed weevil (*Acanthoscelides aureolus*) (Rittenhouse and Rosentreter 1994). While the weevil caused significant reduction in seeds within infested pods, Rittenhouse and Rosentreter (1994) conclude that the overall impact to populations is minimal because of the low percentage of pods affected.

F. Issues

i) Population Trends

No information is available for long-range population trends. Rittenhouse (1990) conducted counts in 1988 and 1989 in three populations using 50 meters of permanent transect length (in 1 or 2 transects) placed subjectively through the middle of the densest part of the populations. Numbers declined dramatically (Table 1, above). Counted populations also declined (Malm Gulch: 300 to 32; Fuller Gulch: 200 to 3; Morgan Creek: 300 to 25). Weather conditions were extremely dry, with only half the normal precipitation. Rittenhouse notes comparable or larger percentages of the population were in the seedling stage in 1989, although because this stage class was determined by number of leaves (1 leaf was considered a seedling, >1 leaf a mature plant), it is possible that these "seedlings" were actually small expressions of existing plants.

ii) Threats

Weeds: Weeds are not known to be a problem on sites with *A. amblytropis*. *Bromus tectorum* would be the most likely weed that may infest these sites and its occurrence should be watched.

Herbivory: Rittenhouse and Rosentreter (1994) note only one population exhibited herbivory, and conclude that it was caused by bighorn sheep or small mammals. No evidence of herbivory from livestock or foliage-eating insects was found (Rittenhouse and Rosentreter 1994). I have occasionally observed cattle trails across populations, but never any use by cattle. Dispersing pods sometimes pile up in a cattle trail.

Timber Management: No timber or trees occur on these sites.

Other: Mining exploration has impacted populations in the past. Road reconstruction and even simple grading can affect roadside populations. Often, however, these roadside populations are short-lived colonies arising from a nearby population on unaltered slopes. Source populations are often located above roadside colonies, which are initiated by pods rolling downslope and catching in roadside borrows.

iii)

Management Needs and Recommendations

While the number of populations and lack of extensive threats reduces conservation concerns for this species, it is recommended that known locations, many of which have not been visited in over a decade, be re-assessed for population size and threats.

G. References

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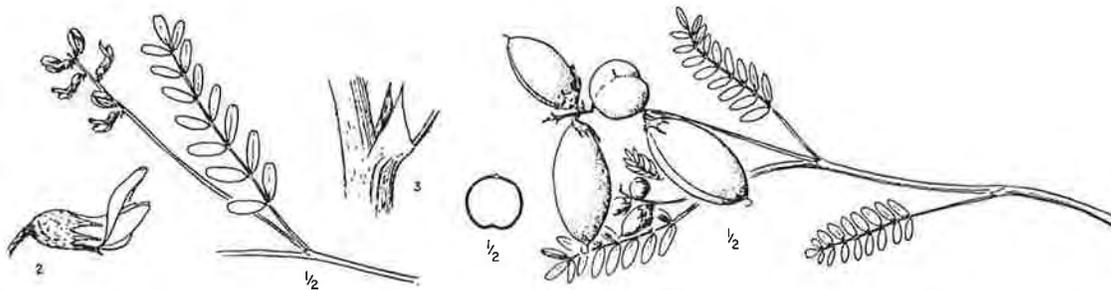
***Astragalus aquilonius* Barneby**

Lemhi Milkvetch Fabaceae

(*Astragalus wootonii* Shield var. *aquilonius* Barneby)

A. General Description

An erect perennial, often with reddish stems (especially late in the season). Flowers white to yellow to greenish, sometimes purple tinged, born in a loose 4-15-flowered raceme. Up to 3dm tall, with leaves 4-10cm long, made of 9-23 leaflets, each 5-16mm. long. Pods inflated, 3-4cm, one-celled, lower suture slightly indented, but not intruded, shiny tan-golden in color. Plants bloom late May through July, pods visible July through September. Plants often wither by August, but pods remain quite visible, even when no longer attached to the plant. Similar to *Astragalus amblytropis* (see discussion under that species).



B. Description

Barneby 1964: Commonly robust and rather coarse, perennial but of short duration, with a stout taproot and knotty root-crown or shortly forking, indurated caudex, strigulose-siliculous with fine, loosely ascending or incumbent hairs up to 0.5-0.75mm long, the herbage greenish-cinereous or the young leaves subcanescent, the leaflets medially glabrescent above; stems several or numerous, decumbent or weakly assurgent, (1)2-3.5dm (or in occasional precociously flowering seedlings only 0.4dm.) long, usually purple-tinged, simple or branched from 1-3 axils proceeding the first peduncle, together forming clumps of low, rounded outline; stipules 2-4mm long, submembranous, purplish, the lowest early becoming papery and brownish, mostly broader than long, amplexicaul-decurrent around $\frac{1}{2}$ - $\frac{2}{3}$ the stem, the median and upper ones narrower, with triangular or lanceolate, mostly erect blades; leaves 4-9cm long, all petioled but the upper ones shortly so, with (11) 15-19 (23) oval, elliptic-obovate, or broadly oblanceolate, obtuse or shallowly retuse, flat leaflets (4)5-18mm long; peduncles loosely 5-9-flowered, the

flowers ascending and declined in age, the axis 1.5-5.5cm long in fruit; bracts submembranous, lanceolate or lance-acuminate, 1.5-2.5 mm long, commonly purplish; pedicels very slender, at anthesis ascending at a wide angle, 2-4mm long, in fruit usually straight and divaricate but sometimes arched or twisted following the orientation of the humistrate pod; bracteoles 0-2; calyx 6.7-7.8mm long, loosely strigulose with white and fuscous hairs, the subsymmetric disc 0.8-1mm deep, the tube 3.7-3.9mm long, (2.2) 2.9-3.3mm in diameter, the slenderly subulate teeth 2.8-4mm long; petals greenish-white, often tinged or veined with dull lilac; banner recurved through 60-90°, ovate-cuneate or somewhat rhombic in outline, shallowly emarginate, 9.5-11mm long, 6-8.5mm wide; wings 8.6-9.5mm long, the claws 3.4-3.6mm, the obliquely obovate, obtuse or obscurely emarginated blades 5.7-6.6mm long, 2.4-3.2mm wide, both incurved but the left one more strongly so and its inner margin infolded; keel 7.8-8.9mm long, the claws 3.5-3.8mm, the lunately half-elliptic blades 4.7-6mm long, 2.1-2.8mm wide, incurved through 80-90° to the triangular, subacute, often obscurely porrect apex; pod loosely spreading, declined, or (when humistrate) ascending, sessile on the slightly elevated receptacle, the subsymmetrically ellipsoid or ovoid-ellipsoid, bladderly inflated, 2.5-4cm long, 1.3-1.7cm (or when pressed seemingly up to 2.2cm) in diameter, broadly obconic or rounded at base, contracted distally into a very short and obscure, deltoid, laterally flattened beak, otherwise a trifle obcompressed, shallowly sulcate ventrally, the thin, pale green but purple-cheeked, glabrous or strigulose valves becoming stramineous, lustrous, semitransparent, delicately cross-reticulate, the funicular flange 1-2mm wide; ovules (27)30-39; seeds brown, smooth but dull, 2.4-3.1mm long.

C. Distribution

East-central Idaho endemic, occurring in Butte, Custer and Lemhi Counties. Populations are known from the Lemhi Valley, and up the Salmon River Corridor and tributaries. Most sites are in the Challis Volcanic area, with the largest population center of 1000's of plants in the Bradbury Flat and Round Valley area. Sites of a few plants have been found along the Salmon River south of Morgan Creek, along the East Fork and along tributaries of both the East Fork and the main Salmon. The type location for the species is four miles south of Lemhi; this population has not been relocated since it was collected in 1944.

D. Habitat

Washes and slopes, especially near and at the base. Slopes usually less than 30°, often with a south aspect, although plants have been found on nearly every aspect as well as on flats. Soils gravelly to sandy, usually from volcanic weatherings. In the main population area, the species also occurs on open flats with relatively deep soils.

Sagebrush/bunchgrass and salt desert shrub zones. Common associates include: *Artemisia tridentata* ssp. *wyomingensis*, *Pseudorogneria spicata*, *Atriplex confertifolia*, *Elymus elymoides* (*Sitanion hystrix*), *Poa secunda*, *Elymus ambiguus* var. *salmonensis*,

Astragalus amblytropis, *Penstemon nitidus* var. *polyphyllus*, *Oxytropis bessyi* var. *salmonensis*, *Penstemon nitidus*.

E. Reproductive Ecology

Bladdery pods form by late summer and are dispersed by wind. Seed production can be quite prolific. No information is available on establishment requirements, seedling survival or seed banking, but it is suspected that seeds are stored in the soil. Young plants have been observed in early spring, but germination may take place during warm days in late fall after fall rains.

F. Issues

i) Population Trends

No information is available on the trend of known populations. Populations may consist of a few widely spaced individuals.

ii) Threats

Weeds: *Bromus tectorum* (cheatgrass) occurs at many sites; impacts are unknown.

Herbivory: Grazing occurs in nearly all populations, but plants have not been observed to be eaten. Pods accumulate in footprints of cattle on steep slopes.

Timber Management: Not applicable.

Other: Mining may be a significant threat in some areas. Exploration activities and gravel removal have both been observed to impact populations. Slope alteration from road maintenance and/or widening has also been observed to impact populations. Off-road vehicle use, especially when utilizing washes, may also cause adverse impacts.

iii) Management Needs and Recommendations

Some simple form of monitoring could be combined in some areas with co-occurring populations of *Thelypodium repandum* and *Astragalus amblytropis*.

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***Astragalus bisulcatus* var. *bisulcatus* (Hook.) Gray**

Two-grooved Milkvetch Fabaceae

A. General Description

Coarse, stout, erect, clump-forming, ill-scented leafy perennials up to 7dm tall; leaves 4-7cm long with 15-29 elliptical to oblong leaflets each up to 30mm long, rounded at the tip but sometimes with a short projection. Lowest stipules fused at the base, encircling the stem. Inflorescence a dense raceme up to 18cm long of 25-75 whitish to purplish or lilac flowers. Calyx with a pouch at base. Banner 10-17.5mm long, 5-7mm wide; wings 10-14 mm long, keel 10-13mm long. Stipe of the pod 3-5mm long, the body of the pod linear- or narrowly elliptical, 10-17mm long, 2-4.5mm in diameter; compressed top to bottom, forming grooves on either side of the front thickened and raised suture, becoming leathery or papery, golden in color when mature.

B. Description

Barneby 1964: Coarse or sometimes quite slender, ill-scented, leafy perennials, with a thick woody, pluricipital taproot, strigulose with fine straight, appressed hairs up to 0.3-0.6mm long, often quite thinly so, the thick-textured herbage either bright green or pallid and subglaucous, occasionally cinereous when young, the leaflets glabrous or nearly so above; stems several or numerous, either erect and ascending in clumps or decumbent with incurved-ascending tips, 1.5-5(7)dm long, simple or branched (spurred) at 1-3 nodes preceding the first peduncle, commonly fistular at base, green or purplish-tinged; stipules membranous early becoming pallid and scarious, 2.5-1mm long, the lowest broadest and shortest, at least in veneration connate into a subtruncate or bidentate (in age fragile and often ruptured) sheath, the median and upper ones progressively less connate upward, the uppermost free or united by a stipular line, with deltoid or triangular-acuminate spreading or deflexed blades; leaves 4-12cm long, the lowest shortly petioled, the rest sessile; leaflets (11)15-29, (0.5)1-2.5(3.2)cm long, ovate-oblong, oblong-elliptic, lance-elliptic or



A. *bisulcatus*

oblanceolate, obtuse (but often mucronulate), exceptionally emarginated, or (in some upper leaves) linear-elliptic and acute, flat or loosely folded; racemes 25-75-flowered, the axis 5-18cm long on fruit; bracts (2)2.5-7mm long; calyx either pallid or red-purple, the tube 3.3-5.7mm long, 2.4-4mm in diameter, the subulate or subulate-setaceous teeth mostly 1.5-4.5(6)mm, rarely only 0.7-1.3mm long; petals rose-purple, pallid but \pm tipped or suffused with purple or lilac, or (as commonly) whitish with maculate keel-tip, rarely pure white; banner (10)10.5-17.5mm long, 5-7mm wide; wings (9.5)10.5-14.5 mm long, the claws 3.9-6.5mm, the blades (6)7.4-10mm long, 2-3.2mm wide; keel (9.6)10-13mm long, the claws 3.8-6.8mm, the blades 5.6-8mm long, 2.6-3.3mm wide; anthers (0.55)0.6-0.8mm long; stipe of the pod 3-5mm long, the body linear- or narrowly oblong-ellipsoid, (8)10-17(20)mm long, 2-4.5mm in diameter, obcompressed with low-convex dorsal face and filiform dorsal suture, the ventral face flattened and excavated lengthwise along both sides of the elevated and \pm thickened suture as two deep and narrow or (when fully mature) shallow and open grooves, the thin, green, strigulose or glabrous valves becoming thinly leathery or papery, stramineous, smooth or faintly reticulate; ovules 4-14(15); seeds brown, smooth but dull.

CDC 2003: Two-grooved milkvetch is most likely to be confused with other robust, leafy milkvetches having many leaflets and many, relatively large flowers. *Astragalus canadensis* (Canada milkvetch) is most readily distinguished by its erect, sessile, more or less leathery-textured fruit pods. Additional distinguishing characteristics include its rhizomatous root system, pick-shaped pubescence, and greenish-white or yellowish-white-colored flowers. While the pods of *A. drummondii* (Drummond's milkvetch) are pendulous like two-grooved milkvetch, they differ in being bluntly three-angled in shape and having a longer stipe (5-11 mm long). In addition, the flowers tend to be larger (17-25 mm) and the foliage more hairy.

C. Distribution

Widespread and common over the prairie provinces of Canada, south to Kansas, New Mexico and Arizona; including extreme western Utah and Idaho. In Idaho in Clark, Fremont, Lemhi and Custer Counties; most common in the intermountain valleys of the Big Lost, Little Lost, Pahsimeroi, Lemhi, and Birch Creek. I have observed this plant on the east side of Center Ridge and at a spring behind Jensen's between Baldy and Haynes Creek (proposed for development in 1989 but not developed).

D. Habitat

Prairies, plains, foothills, bottomland sites. Often on barren sites with selenium-rich soils and where alkaline. While Great Plains populations are often found on dry gravelly soils of hillsides and benches, Idaho populations appear to be more common in moist swales, bottomlands and springs. Common associated species *Pascopyrum smithii*, *Juncus balticus*, *Poa juncifolia*, *Leymus cinereus*, *Spartina gracilis*, *Senecio debilis*, *Phlox kelsyi*, *Glaux maritima*, *Sarcobatus vermiculatus*, and *Potentilla fruticosa*.

E. Reproductive Ecology

The large flowers are probably pollinated by insects.

F. Issues

i) Population Trends

No information is available on the trend of known populations.

ii) Threats

Weeds: *Bromus tectorum* (cheatgrass) occurs at many sites; impacts are unknown.

Herbivory: Grazing occurs in nearly all populations, but because it is highly poisonous and unpalatable to cattle little direct impacts are expected even in heavily grazed sites (may be indirect impacts from weeds encouraged by heavy grazing).

Timber Management: Not applicable.

Other: Water developments.

iii) Management Needs and Recommendations

Inventory and assessment of the threats and status of this species are needed.

G. References

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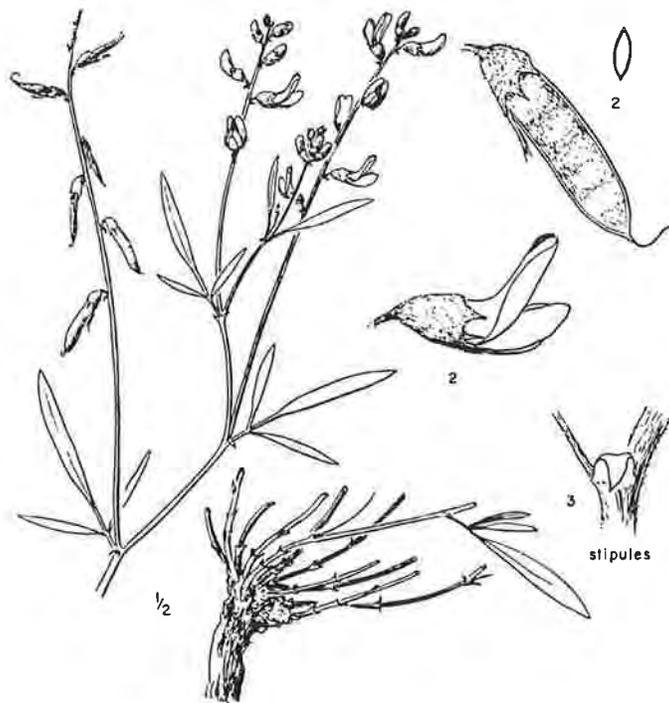
<http://www2.state.id.us/fishgame/info/cdc/cdc.htm>

***Astragalus diversifolius* Gray**

Meadow Milkvetch Fabaceae

A. Description

Perennial with trailing stems, solitary or forming entangled masses, stems procumbent and appearing almost rhizome-like from a thick taproot. Leaves few, 4-9cm long, divided into 1-2 pairs of linear leaflets; the terminal leaflet appearing as a prolongation of the midrib of the leaf (rachis). Flowers in loose racemes of 5-12 flowers, yellowish to creamy white or purplish tinged, flowering in July and August. Calyx distinctly reddish, with white to mostly black strigillose hairs. Flowers 10-12mm long, keel and wings nearly equal to the banner. Pod with strigillose hairs, compressed, 15-30mm long and 3-4mm wide, 1-celled.



Astragalus diversifolius

B. Technical Description

Hitchcock and Cronquist 1961: Strigillose perennial with trailing stems 3-6dm long that often are rhizome-like at the base; leaves 4-9cm long, the rachis 1-2mm broad; lateral leaflets usually 1-2 pairs, linear to linear-elliptic, 1-3cm long, mostly 2-5mm broad; terminal leaflets confluent with the rachis, 3-10mm broad; stipules 1-2mm long, lanceolate, only the lowest ones connate; racemes loosely 5-12-flowered, with peduncles equaling or longer than the leaves; pedicels 1-2mm long; flowers 10-12mm long, yellowish or purplish-tinged; calyx about half as long as the corolla, the teeth linear-lanceolate, about $\frac{1}{2}$ the length of the whitish to blackish strigillose tube; keel and wings subequal to the banner; pods strigillose, sessile, membranous, compressed, 15-30mm long 3-4mm broad, 1-celled, the sutures neither sulcate nor intruded.

Meadow milkvetch is quite distinctive, but occurs with four other *Astragali* and one *Oxytropis* in the wet meadows and riparian areas of east-central Idaho (Moseley 1992). The following key, modified by Moseley (1991) from Hitchcock (1961), will help distinguish meadow milkvetch from similar-looking riparian legumes of east-central Idaho:

- A. Keel of the corolla abruptly narrowed to a beaklike point; plants without leafy stems.....*Oxytropis deflexa*
- A. Keel of the corolla not abruptly beaked; plants with leafy stems.
 - B. Terminal leaflet is confluent (continuous) with the rachis; plants robust with prostrate stems from a taproot; flowers white; calyx red ... *Astragalus diversifolius*
 - B. All leaflets jointed to the rachis, including the terminal one.
 - C. Banner (measured along the curvature of the midvein) over 15 mm long; flowers purple, strongly erect, crowded into ovoid heads; stems arising from a buried rootcrown..... *A. agrestis*
 - C. Banner not over 15 mm long; flowers not strongly erect or crowded into ovoid heads.
 - D. Keel petals 2.5-6 mm long; herbage dark green; flower deep purple; pods pendulous..... *A. eucosmus*
 - D. Keel petals over 6 mm long.
 - E. Stipe of the pod 1.4-3.5 mm long, the valves inflexed as a narrow but evident septum 0.2-0.7 mm wide; racemes (5) 7-23- flowered, occurring at the ends of the stems and usually exceeding the leaves; petals lavender..... *A. alpinus*
 - E. Stipe of the pod not over 1.5 mm long, often obscure and reduced to a narrow stipe-like neck, the valves not inflexed; racemes mostly 2-3, rarely 5- flowered, occurring at about the middle of the stem, the leaves far surpassing the raceme; petals white, with purple keel tip *A. leptaleus*

C. Distribution

Meadow milkvetch is known from the intermontane valleys of east-central Idaho and the upper Snake River Plain near Springfield, Idaho, and is remotely disjunct at the southwestern edge of the Salt Lake Desert in western Juab and southwestern Toole counties, Utah, and in the Spring Valley in southern White Pine County, Nevada (Barneby 1989). It may also occur in the Green River and Platte River drainages of Wyoming, but these very early collections had vague location data and it has not been

found there in recent years. In Idaho, it is known from the Big Lost River Valley, Little Lost River Valley, Lemhi Valley, Pahsimeroi Valley, and the Birch Creek Valley, as well as an historical collection from the Springfield area near American Falls Reservoir. (Distribution description largely adapted from Moseley 1992).

D. Habitat

In east-central Idaho, meadow milkvetch grows in moist alkaline meadows associated with spring-fed fen systems (e.g., Birch Creek, Summit Creek) and less commonly in other moist subirrigated meadows (not associated with fens). Sites are mesic, not wet, with alkaline clayey soils, often whitish in appearance. Sites are usually flat, sometimes with swale topography or hummocks.

Vegetation is often sparse (<50% cover), usually mostly graminoid, although sometimes with sparse *Chrysothamnus*. Common associates include *Juncus balticus*, *Distichlis spicata*, *Pascopyrum smithii*, *Juncus balticus*, *Poa juncifolia*, *Leymus cinereus*, *Spartina gracilis*, *Senecio debilis*, *Phlox kelsyi*, *Glaux maritima*, *Sarcobatus vermiculatus*, and *Potentilla fruticosa*. In spite of the sparse vegetation, the often-straggly meadow milkvetch can sometimes be hard to spot.

E. Reproductive Ecology

No information

F. Issues

i) Population Trends

Nothing is known about the population trends of this species. In Birch Creek, several areas containing plants were included within the community monitoring cross-wetland transects (Elzinga 1997).

ii) Threats

Weeds: Weeds observed near meadow milkvetch populations in Birch Creek include *Hyoscyamus niger* and *Elymus repens*. *Potentilla recta* may be a threat.

Herbivory: Some sites are grazed and ungrazed sites have been grazed historically. Most sites, historically, were probably used in the late fall or winter but are currently used primarily as summer pasture. Information on effects of livestock grazing is completely lacking, and any discussion must be considered conjectural. It is unlikely that livestock eat meadow milkvetch preferentially, but may graze some plants inadvertently while eating adjacent forage. Trampling may cause greater damage; the moist clayey soils are easily compacted. Conversely, livestock grazing may benefit meadow

milkvetch by reducing graminoid competition. At the single site I know that is probably rarely grazed (just south of Leadore), graminoids are fairly dense and meadow milkvetch is sparser than at grazed sites I have observed.

Timber Management: NA

Other: The relatively narrow mesic zone occupied by meadow milkvetch suggests changes in hydrology, either drying or raising the water table, would probably be detrimental.

iii)

Management Needs and Recommendations

Significant unexplored habitat exists around Leadore, often on private land. Most known populations are based on quick estimates of size or extent. Because meadow milkvetch is easily overlooked, these estimates are probably low. Work during prime blooming, when the plant is most easily seen, should be done to determine spatial extent of populations and size. This information could provide a crude monitoring method.

G. References

Barneby, R. C. 1964. Atlas of North American Astragalus. Part 1. Memoirs of The New York Botanical Garden, Vol. 13. Bronx, NY: The New York Botanical Garden.

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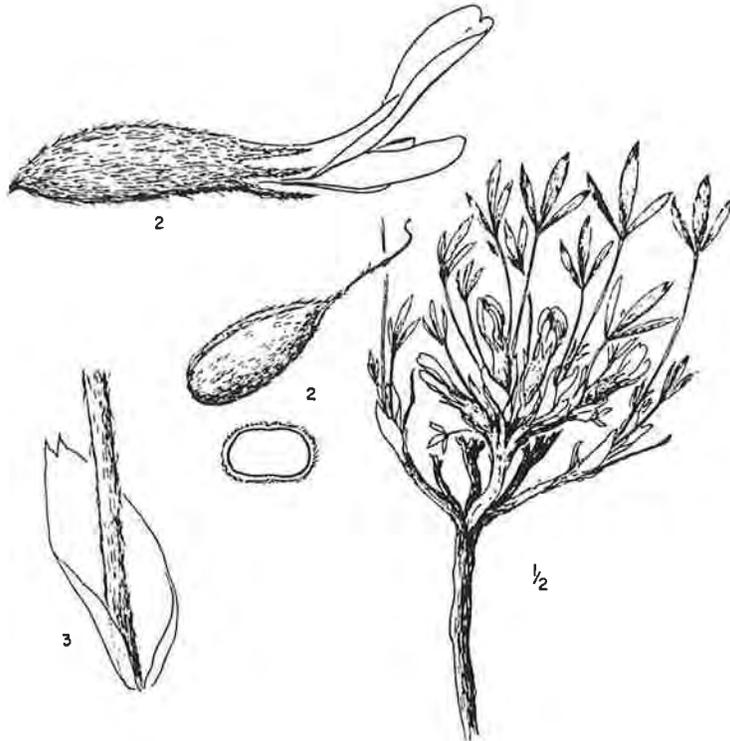
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***Astragalus gilviflorus* Sheld.**

Plains milkvetch, Plains orophaca Fabaceae

A. General Description

Densely tufted to mounded perennial forming mats up to 15cm in diameter. Leaves silvery from the fine appressed hairs up to 2.5mm long. Leaves up to 10cm long with slender, wiry leafstalks and three leaflets. Inflorescence of 2 (sometimes 1 or 3) whitish flowers (drying yellow) with a tip of pinkish lilac on the keel (rarely all pink-purple), blooming in May. Flowers often tucked into the foliage. Banner 16-28mm long. Pod 6.5-10mm long, 2.6-5mm in diameter, hairy, one-celled, becoming leathery in age.



A. gilviflorus

B. Technical Description

Barneby 1964: Tufted or somewhat mounded, the divisions of the closely forking, cespitose caudex beset with a thatch of persistent leaf-stalks and terminating in obconic crowns of rosulate leaves and sessile flowers, the herbage densely silvery-strigose throughout with fine, lustrous, appressed and some few narrowly ascending hairs up to 1.2-2.5(3.6)mm long, the hairs sometimes spreading late in the season; stipules broadly ovate or oblong-obovate, 6-13mm long, often transversely corrugated, glabrous dorsally except at base, thinly ciliate; leaves (1)1.5-10(13)cm long, usually dimorphic, those expanding with the flowers more shortly petioled and with shorter and broader leaflets than succeeding ones, the petioles slender, wiry, subpersistent, the leaflets obovate-cuneate to rhombic-obovate or narrowly oblanceolate, (3)7-27(37)mm long, mostly acute or acuminate, more rarely obtuse, flat or loosely folded, dorsally carinate by the midrib,

the terminal one usually a trifle longer than the lateral pair; peduncles obsolete or nearly so; racemes capitately 2 (rarely 1 or 3) – flowered, not elongating; bracts hyaline, lanceolate or broadly ovate-acuminate, when broad folded around the base of the calyx, 4.5-7.6mm long, commonly tridentate, the middle tooth often triangular-acuminate, the lateral ones shorter, either obtuse or acute, the margins entire or sharply denticulate, sometimes beset with a few minute processes; pedicels almost 0.0 up to 1.6mm long; calyx 9.3-20mm long, the subsymmetrically obconic disc 1.6-2mm deep, the membranous, narrowly cylindrical or cylindro-ellipsoid tube 6.5-16mm long, 1.6-4.3mm in diameter, the firmer subherbaceous teeth 1.6-4mm long, the whole becoming scarious, at first distended by the tumescent ovary, finally ruptured at base; petals commonly white (drying yellowish), the keel-tip pinkish-lilac, rarely all pink-purple or bluish, withering-persistent; banner nearly erect, oblanceolate or spatulate-oblanceolate, shallowly notched, 16-28mm long, 3-9.4mm wide; wings 12.2-24.2mm long, the claws 6.8-15.2mm, the straight nearly oblong or oblong-oblanceolate, obtuse or obliquely emarginated blades 6-11.2mm long, 1.2-3.2 (3.6)mm wide; keel 10.4-21.8mm long, the claws 6.7-15mm, the obliquely elliptic or lunately half-elliptic blades 4-7.5mm long, 1.5-3mm wide, gently incurved through $\pm 45^\circ$ to the bluntly triangular apex; pod erect, sessile (often concealed by imbricated stipules), subsymmetrically ovoid-ellipsoid, (6)6.5-10mm long, 2.6-5mm in diameter, obtuse at base, contract at apex into a short erect or declined cusp, the body a trifle laterally compressed, obtusely carinate ventrally by the thick suture, sometimes obscurely sulcate or flattened dorsally at or just above the base, the somewhat fleshy, densely strigose-hirsutulous valves becoming leathery, not inflexed.

C. Distribution

Southern Alberta to extreme southwestern Manitoba south to Colorado along the east base of the Rocky Mountains, east to the northern Plains; occasionally west into east Idaho in Clark, Fremont and Lemhi counties. Salmon BLM sites at Railroad Canyon, Hawley Creek, and on the west face of the Beaverhead between Cedar Gulch and the West Fork of Little Eighteenmile; other sites likely south along the west face of the Beaverheads to Reno Point.

D. Habitat

Sites in east-central Idaho have calcareous substrates, often loose scree, with little soil development on barren knolls, hilltops, outcrops and gullied badlands. All aspects are occupied. Common associated species include *Artemisia arbuscula* var. *nova*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia frigida*, *Cercocarpus ledifolius*, *Poa secunda*, *Achnantherum hymenoides*, *Petrophytum ceasptosum*, *Tanacetum nutallii*, *Penstemon aridus*, *Haplopappus filifolius* var. *idahoensis*, *Arenaria kingii*.

E. Reproductive Ecology

Little is known. The plant does not reproduce vegetatively, although individual mats expand in size. Occasional reproduction is necessary to maintain populations. Flowers are probably insect-pollinated.

F. Issues

i) Population Trends

Neither reliable estimates of population size exist, nor any information on population trends exists. Communities and sites are relatively stable in the absence of large human-caused disturbances (e.g. mining), except, perhaps, for weeds.

ii) Threats

Weeds: Unknown. It is likely that *Bromus tectorum* occurs on most or all sites.

Herbivory: Sparsely vegetated sites are little used by livestock.

Timber Management: Not applicable

Other: Mining is a potential threat, although no current activities occur at the sites.

iii) Management Needs and Recommendations

Additional survey work in the Leadore area would likely result in additional locations, especially between Railroad Canyon south to Birch Creek along the west face of the Beaverhead Mountains. Known sites should be visited to assess population sizes and threats.

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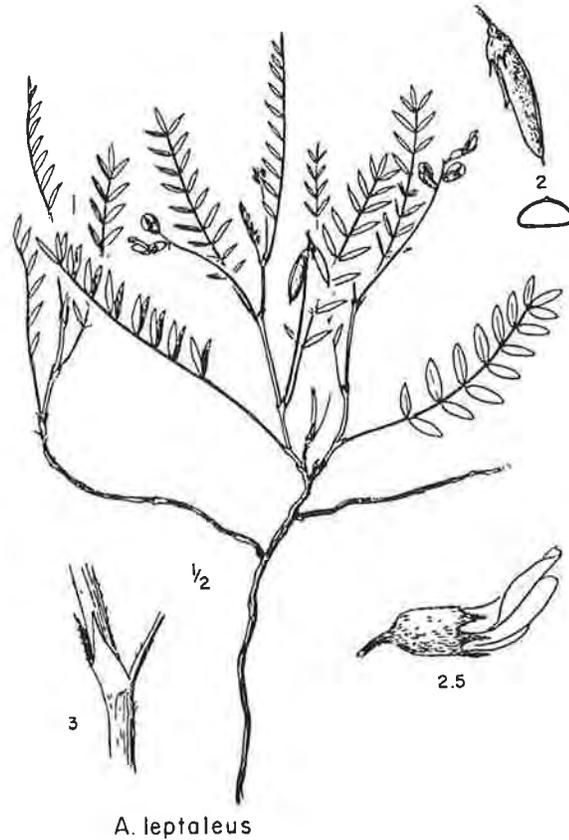
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Astragalus leptaleus Gray

Park Milkvetch Fabaceae

A. Description

Weak, lax, delicate perennial from a deeply buried taproot and creeping underground caudex. Herbage thinly hairy with fine appressed hairs, bright green in color. Stems 5-20 cm long, bearing flowers from near or well below the middle. Leaves 2.5-10cm long, divided into 15-23 bright green, thin-textured, elliptic leaflets each 3-15mm long, usually hairless on the upper surface. Inflorescences loosely 1-5 flowered; flowers white, tip of the keel purplish, appearing in June and July. Keel 8.5-11.8mm long, 4.8-7.2mm wide. Pod 8-14 mm long, somewhat obcompressed, with thin, black and white hairs (Barneby 1964; Caicco and Henderson 1981).



B. Technical Description

Barneby 1964: Weak, delicate, diffuse, with a slender taproot and widely branching subterranean caudex, thinly strigulose with fine, appressed hairs up to 0.2-0.5 mm long, the stems and herbage bright green, the leaflets glabrous above, the inflorescence commonly nigrescent; stems loosely tufted, in old plants very numerous and entangled, 5-20 (30) cm long, arising singly or few together from buds on the slender, buried caudex-branches, branched at the first emerged, usually congested nodes, floriferous upward from near or from well below the middle; stipules 2-5 mm long, thinly herbaceous or submembranous, usually several-nerved, the lowest becoming papery in age, all glabrous dorsally, fully amplexicaul and connate, the lowest into a short bidentate sheath, the upper ones longer, united through half their length or less, sometimes only at very base, with lanceolate free blades; leaves 2.5-10 cm long, petioled but the uppermost shortly so, with subfiliform rachis and (9) 15-23 (27) narrowly elliptic or lanceolate and subacute, or (in the lower leaves) often ovate and obtuse, thin-textured leaflets 3-15 mm long; peduncles filiform, ascending, 2-5.5 cm long, shorter than the leaf; racemes loosely 1-5

(commonly 2- or 3-) -flowered, the flowers ascending at anthesis, declined thereafter, the axis up to 1 cm long in fruit; bracts membranous, lanceolate or lance-ovate, 1.3-3.3 mm long; pedicels at anthesis straight, 1.2-2.1 mm long, in fruit arched outward, 1.4-2.5 mm long; bracteoles 0-2, minute when present; calyx 4-5.7 mm long, densely to quite thinly black- or rarely white-strigulose, the somewhat oblique disc 0.3-1 mm deep, the campanulate tube 2.7-3.4 mm long, 1.9-2.4 mm in diameter, the subulate or lance-subulate teeth 1.1-2.5mm long; petals white, the keel-tip maculate with dull bluish-purple; banner recurved through $\pm 45^\circ$, ovate- cuneate, notched, 8.5-11.8 mm long, 4.8-7.2 mm wide; wings 7.2-9.5 mm long, the claws 2.7-3.8 mm, the obliquely obovate, oblong-oblancheolate or -elliptic, obtuse or emarginate blades 4.9-6.5 mm long, 1.8-2.9mm wide; keel 6-7.3 mm long, the claws 2.8-3.9 mm, the obliquely half-obovate blades 3.2-3.9 mm long, 1.8-2.3 mm wide, incurved through 85-120 to the bluntly deltoid apex; anthers 0.3-0.5 mm long; pod pendulous, obscurely stipitate or sessile, the stipe not over 1.5 mm long, often reduced to a narrow neck, the body oblong-, lance-, or subclavate-elliptic in dorsiventral view, 8-14 mm long, 2.5-4 mm in diameter, slightly decurved, shortly subulate- or cuspidate-beaked, obcompressed and bluntly trigonous, with obtuse lateral angles and low-convex lateral faces, keeled ventrally by the prominent, convexly arched suture, flattened or shallowly and openly sulcate dorsally, the thin, green, sparsely black- or white-strigulose valves becoming stramineous and papery, not inflexed; ovules 6-10; seeds brown, smooth, lustrous, 1.8-2.1 mm long.

Moseley (1991) developed a key based on descriptions from Hitchcock (1961) to help distinguish park milkvetch from similar-looking riparian legumes of east-central Idaho:

- A. Keel of the corolla abruptly narrowed to a beaklike point; plants without leafy stems.....*Oxytropis deflexa*
- A. Keel of the corolla not abruptly beaked; plants with leafy stems.
 - B. Terminal leaflet is confluent (continuous) with the rachis; plants robust with prostrate stems from a taproot; flowers white; calyx red ... *Astragalus diversifolius*
 - B. All leaflets jointed to the rachis, including the terminal one.
 - C. Banner (measured along the curvature of the midvein) over 15 mm long; flowers purple, strongly erect, crowded into ovoid heads; stems arising from a buried rootcrown..... *A. agrestis*
 - C. Banner not over 15 mm long; flowers not strongly erect or crowded into ovoid heads.
 - D. Keel petals 2.5-6 mm long; herbage dark green; flower deep purple; pods pendulous..... *A. eucosmus*
 - D. Keel petals over 6 mm long.
 - E. Stipe of the pod 1.4-3.5 mm long, the valves inflexed as a narrow but evident septum 0.2-0.7 mm wide; racemes (5) 7-23- flowered, occurring at the

- ends of the stems and usually exceeding the leaves; petals lavender..... *A. alpinus*
- E. Stipe of the pod not over 1.5 mm long, often obscure and reduced to a narrow stipe-like neck, the valves not inflexed; racemes mostly 2-3, rarely 5-flowered, occurring at about the middle of the stem, the leaves far surpassing the raceme; petals white, with purple keel tip *A. leptaleus*

C. Distribution

Rocky Mountains, Colorado, western Wyoming, east-central Idaho, western Montana and apparently in Alberta (Hitchcock 1961; Barneby 1964).

Moseley (1991) recorded the history of locations in Idaho: "At least three collections of park milkvetch were made in Idaho during the 1940's, all were along the Big Lost River, between Mackey and Chilly. Steve Caicco "rediscovered" the species in 1981, along the North Fork Big Lost River, as part of an evaluation of rare plants on the Lost River Ranger District, Challis NF (Caicco and Henderson 1981; Caicco *et al.* 1983). In 1988, Caryl Elzinga extended the known Idaho range of park milkvetch to the East Fork Salmon River drainage, with the discovery of three populations along Road Creek. Results of our survey in 1991, increased the number of known populations in the Big Lost and East Fork Salmon drainages, plus we extended the known distribution in the state 50 miles to the east, with the discovery of populations along Birch Creek and along Texas Creek, in the Lemhi Valley."

D. Habitat

Park milkvetch occupies mesic sites in riparian areas, often on the ecotone between upland sagebrush/grass communities and saturated sedge-dominated communities. Soils are often dry at the surface by mid summer, but remain moist throughout the growing season. Soils are often alkaline loams.

The most common associates are *Poa pratensis*, *Juncus balticus*, *Carex simulata*, and *Sisyrinchium idahoense*. Park milkvetch will sometimes be found near the base of *Salix geyeriana* or *S. boothii*. Moseley (1991) lists the following as additional common species: *Oxytropis deflexa*, *Astragalus eucosmus*, *A. agrestis*, *A. alpinus*, *A. diversifolius*, *Hordeum brachyantherum*, *Trifolium longipes*, *Zizia aptera*, *Antennaria anaphaloides*, *A. microphylla*, *Glaux maritima*, *Haplopappus uniflorus*, *Senecio debilis*, *Phlox kelseyi*, *Ranunculus cymbalarioides*, *Iris missouriensis*, *Trichlochin maritimum*, *Deschampsia cespitosa*, *Salix brachycarpa*, *Polygonum viviparum*, *Potentilla fruticosa*, *Thalictrum alpinum*, *Pedicularis groenlandica*, *Betula glandulosa*, and *Hesperochiron pumilus*.

E. Reproductive Ecology

Moseley noted at the 1992 rare plant conference that he thought *Astragalus leptaleus* produced fewer flowers and fruit in heavily grazed areas. I have observed this species in dense vegetation in areas ungrazed for a few years (at Birch Creek), and noted few flowers under those conditions as well. It appears to spread fairly vigorously from its branching underground caudex

F. Issues

i) Population Trends

Nothing is known about population trends *Astragalus leptaleus*. Some populations are quite large and appear robust.

ii) Threats

Weeds: *Cirsium canadensis* occurs with some populations (noted at Birch Creek and Road Creek, and likely at others). The effects are unknown.

Herbivory: Several populations are in ungrazed areas (Birch Creek, some exclosures along Road Creek). Most populations are grazed. The moist sites where *Astragalus leptaleus* grows are concentration areas for cattle, which prefer the green forage in mid to late summer but often avoid the adjacent saturated riparian areas. These areas are also often used for lounging. The effects of livestock use are unknown. *Astragalus leptaleus* can be found in areas that have historically been grazed very hard for many years (e.g., Road Creek). Plants are, however, more robust in ungrazed areas, but this may be partially an elongating effect to try to capture more sunlight in the dense competing graminoid growth. In most ungrazed populations that I have observed, the associated graminoids overtop park milkvetch. Moseley (1991) observed few flowers and fruit in heavily grazed populations, but I have noted the same in ungrazed populations.

Timber Management: NA

Other: The hydrological requirements of *Astragalus leptaleus* are apparently fairly narrow, neither very wet nor dry. Thus changes in the hydrology of these areas, either making them wetter or drier, would seriously impact a milkvetch population. Some populations are maintained by irrigation (e.g., the population on the east side of the Birch Creek fen, which grows along an old irrigation ditch and the population at Eighteenmile Creek).

iii) Management Needs and Recommendations

Little information is known about the trend of this species. A simple observational form of monitoring would be useful to detect gross trends. A study comparing grazed and ungrazed populations would also provide insight into management needs for the species.

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Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griffiths

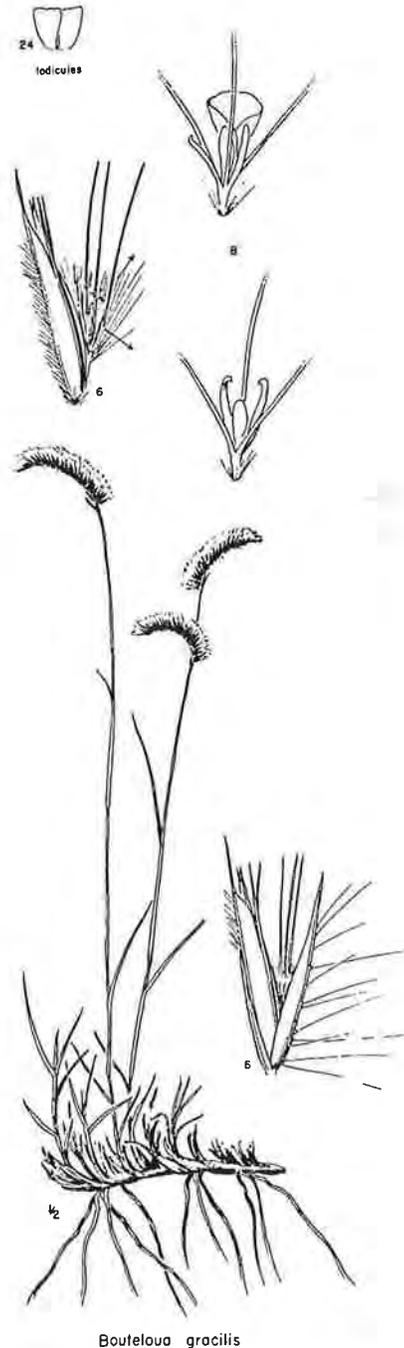
Blue Grama Poaceae

A. Description

Plants rhizomatous, forming mats, often with dead centers. Stems 2-5dm tall. Sheaths hairless or with soft long hairs, the throat with numerous stiff hairs up to 2mm long but collars usually without hairs. Blades flat, often crisped or curly, 1-2mm broad, hairless or slightly hairy with long soft hairs. Seedheads flaglike and distinctive. Spikes usually 2, spikelets 30-80, often purplish. Glumes unequal, one 2.5 the other 5.5mm long, with stiff hairs along the keel.

B. Technical Description

Hitchcock 1969: Perennial with short rhizomes forming thick mats, the leaves mostly basal and persistent; culms slender, 2-4(5)dm tall; sheaths glabrous to pilose, the throat with numerous stiff hairs mostly 1-1.5(2) mm long; collars usually glabrous; ligules about 0.5mm long; blades flat, often crisp or curly, 1-2mm broad, glabrous or commonly pilose, the hairs pustulose-based; spikes usually (1) 2 (3), spikelets usually 30-80, often purplish; glumes about 2.5 and (5) 5.5mm long, ciliate and more or less pustulose on the keel; fertile lemma about 6mm long, including the central awn-tipped lobe; palea about equaling the body of the lemma; anthers about 3mm long; lodicules about 0.3mm long; rudimentary florets consisting of lemmas only, the first with awns up to 5-6mm long, the second and (usually) third merely unawned rudiments.



C. Distribution

Alberta and Manitoba, south to California and Mexico. In the northern part of its range, it occurs primarily east of the Rocky Mountain. In Idaho, known from Clark and Lemhi Counties.

Tater Creek site (Pahsimeroi) is on the bench above Tater Creek approximately 1.25m up the creek, 400 yards south of creek on bench. Historic populations (noted in 1964) at Jesse Creek and Kriley Gulch. Other populations have been documented between Baldy and McDevitt Creek above Cherry Springs, and on both sides of Carmen Creek about a mile below the Freeman Creek junction. Helen Ulmschneider observed a population in 1995 along the Waller Gulch Pipeline (23N 22E Section 34 based on photographs in the rare plant photo folder; no other documentation available; not in the CDC database; this and the previous record may be the same population).

It has been hypothesized that the populations of *B. gracilis* in Lemhi and Custer County were introduced by bands of sheep that summered in Montana and returned to Idaho in fall (Bruce Easton, personal communication). Both known populations are at sites where sheep were historically concentrated (the Lemhi site is near an area known as the "shearing pens").

D. Habitat

Plains and foothills to middle elevations in the mountains. Both Salmon populations are on alluvial fans in *Artemisia tridentata* ssp. *wyomingensis* / *Poa secunda* sites.

E. Reproductive Ecology

Vegetative spread by tillering after disturbances is reported to be slow (Coffin and Lauenroth 1992), therefore the colonization by new individuals through seed production, germination and seedling establishment is important to maintenance of populations. It is suspected that *B. gracilis* does not maintain a persistent seed bank (Coffin and Lauenroth 1989). Soil texture appears to significantly affect seed production, with larger crops made on the coarser textured soils (Coffin and Lauenroth 1992).

F. Issues

i) Population Trends

Little is known about the size or trends of the Idaho populations. The Pahsimeroi location (Tater Creek) is the only one I have observed. It is a circular clone about 3m in diameter, with a dead center (observation in 1991).

ii) Threats

Weeds: Nothing is known.

Herbivory: All known populations are within grazed areas. The impact of grazing on the species locally is not known. Coffin and Lauenroth (1992) compared basal cover, basal diameter, and seed production on 5 grazed and 5 ungrazed sites in northeastern Colorado. They found no significant differences for seed production and other indicators of reproductive effort, but did find that basal cover and average basal diameter of *B. gracilis* was significantly higher on grazed sites.

Timber Management: Not applicable.

Other: Off-Highway vehicle use may be a problem at low elevation sites. The site near Salmon is in an area often used by local residents for dirt biking.

iii) Management Needs and Recommendations

Populations should be revisited to determine size and condition.

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***Carex livida* (Wahlenb.) Willd.**

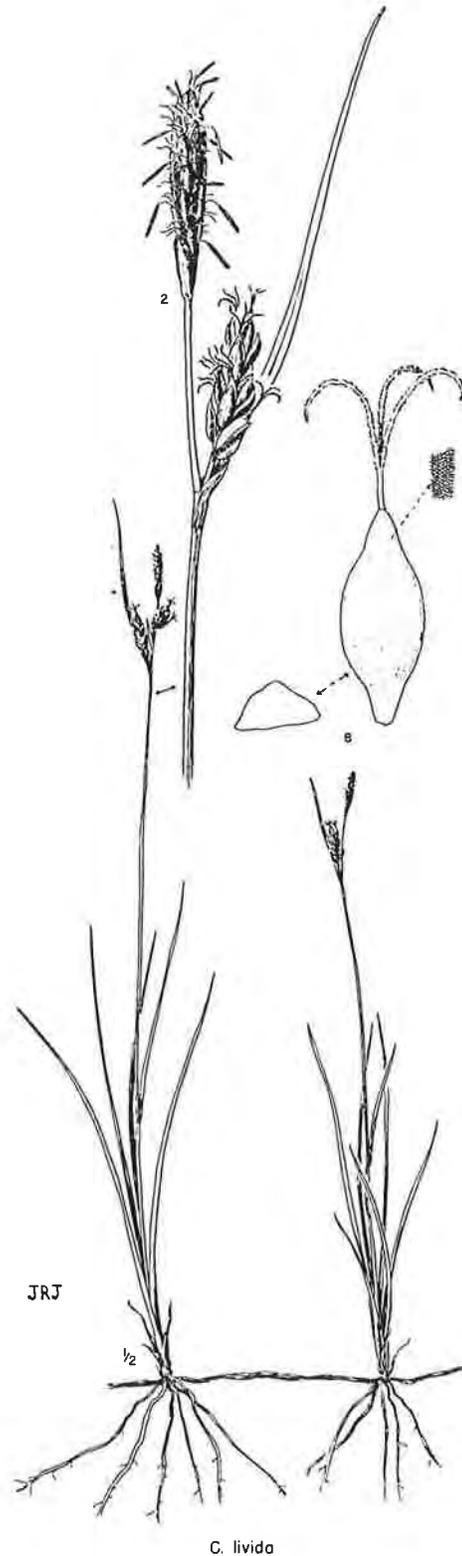
Pale Sedge Cyperaceae

A. Description

Grass-like perennial; stems arising in small clumps of few to several from long, slender rhizomes; 1-4dm tall; typically flowering stems 18-25cm tall. Leaves mostly clustered near base; new stems sometimes surrounded by basal sheaths from previous years. Leaves firm and narrow (<3.5mm), deeply channeled with a waxy blue-green color. The inflorescence consists of 2-3, or sometimes 4, loosely clustered spikes. Blooms June, with flowering heads well-formed by late July or early August. The narrow terminal spike is usually wholly staminate. The lateral spikes are pistillate and nearly sessile. Flowers have 3 stigmas, and the oval-shaped scales subtending the perigynia have a green midvein stripe, brown marginal stripes, and membranous edges. Perigynia are 2-4 mm long, pale green, elliptic or ovate in outline, with a minutely bumpy surface.

B. Technical Description

Cronquist 1977: Stems arising singly or few together from slender, creeping rhizomes, 1-4 dm tall, phyllopodic and with some old basal sheaths persistent; leaves mainly basal, firm, narrow, often channeled, 1-3.5 mm wide; terminal spike staminate, 1-2.5 cm long; lateral spikes 1-3, approximate or somewhat remote, slender, pistillate, 1-2.5 cm long, 5- to 15-flowered, erect, the short peduncle not much if at all exceeding the sheath; bract subtending the lowest spike with a fairly well-developed sheath mostly 5-15 mm long and a narrow setaceous but green blade seldom as much as 7 cm long; pistillate scales equaling or somewhat shorter than the perigynia, with a broad, pale green midstripe which seldom reaches the usually rather blunt tip, and with broad, hyaline-scarious, brown or dark brown margins;



perigynia elliptic or rather narrowly rhombic, short-stipitate, less than twice as long as wide, tapering to the beakless or very shortly (to 0.2 mm) beaked tip, 3.5-4.5 mm long, distended by the achene but empty distally, scarcely compressed, light green, densely papillate-glaucous, with 2 marginal nerves, otherwise obscurely few-nerved or nerveless; stigmas 3; achene trigonous 2.2-2.5 mm long, jointed to the style.

Other *Carex* species may occur with *C. livida*. *Carex aquatilis* has long-stalked lateral spikes and flowers with two stigmas. *Carex limosa* is rhizomatous and has three stigmas, but has drooping lateral spikes on slender stalks. *Carex buxbaumii* has 3 stigmas and bluish-green foliage, but differs in having pistillate flowers at the tip of the upper spike and long-awned scales

C. Distribution

Interruptedly circumboreal, south to western Washington and Oregon, southeastern Idaho, northwest Montana, Wyoming, Michigan and New Jersey. Disjunct in northwest California. In Idaho, known from Blaine, Bonner, Custer, Fremont and Lemhi Counties. In Lemhi County, pale sedge is known only from Texas Creek fen. Bob Moseley found this population in the early 1990s. I have been unable to relocate it, and Bob noted that he identified the species from only vegetative individuals. While not unlikely given the habitat of the fen, and its location between known populations, the Texas Creek population should be relocated and verified.

D. Habitat

Calcareous peatlands. 2800' to subalpine. Soils saturated, usually high in organic matter (portions of a few populations occur on mineral alluvium of granitic sands (Moseley 1994)). Associated species include several sedges (*Carex rostrata*, *C. oederi*, *C. saxatilis*, *C. luzulina*, *C. buxbaumii*, and *C. muricata*) *Swertia perennis*, *Deschampsia cespitosa*, *Ligusticum tenuifolium*, *Agrostis scabra*, *Caltha leptosepala*, *Pedicularis groenlandica*, *Senecio cymbalarioides*, *Spiranthes romanzoffiana*, *Gentiana calycosa*, *Eleocharis pauciflora*, *Scirpus rollandii* (CDC records; Moseley et al 1994; Caicco 1988).

E. Reproductive Ecology

Flowers are wind pollinated. Most reproduction appears to be vegetative. Moseley reported that at the Texas Creek population he found no reproductive plants (Bob Moseley, personal communication, early 1990s).

F. Issues

i) Population Trends

Nothing is known about the population trends of this species in the Texas Creek fen.

ii)

Threats

Weeds: While not based on any observation, weeds are likely not a serious issue; no known noxious weed species is suited for the extremely saturated habitat of pale sedge. *Elymus repens* may occur on slightly drier adjacent habitats.

Herbivory: It is likely that the Texas Creek site is grazed heavily, although grazing levels within the saturated habitat of pale sedge is likely to be much less than that on adjacent drier meadows.

Timber Management: Not applicable.

Other: Changes in water management is the most likely and serious threat at Texas Creek. An upstream diversion that dries the fen, or a change in irrigation that increases water levels may affect the species. It is not known if such changes are feasible, or if the landowners plan any irrigation changes.

iii)

Management Needs and Recommendations

The Texas Creek site should be revisited, the exact location noted, and the size, vigor and potential threats evaluated.

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Carex parryana ssp. *idaho* (Bailey) D.F. Murr.

Idaho Sedge Cyperaceae

A. Description

Arising in small clumps from short rhizomes; stems 20-35cm tall with most leaves near the base. Leaves flat, 2-4mm wide. Flowers clustered in 1-3 oblong-cylindrical spikes, 1-3cm long, with the uppermost larger than the others. Spikes with small leaf-like bracts at base. Male flowers absent, or scattered among the female flowers on the largest spikes. Scales narrowly oval, tapering to tip, 2-3 times longer than the perigynia, brown with membranous margins and a pale midstrip. Perigynia yellowish green, 0.3mm long, with a short beak; stigmas 3 and achenes triangular in cross-section. Flowering June through early July with mature fruit in mid July.



C. parryana

The long scales subtending the perigynia give the spikes a ragged appearance, and are quite distinctive. Subspecies *parryana* has a more cylindrical terminal spike, lateral spikes almost as long as the terminal one, and scales about as long as the perigynia. Lesica (1998) notes that the two subspecies sometimes occur together in Montana, although ssp. *parryana* seems to be more tolerant of salty

conditions, and where *Puccinellia* and *Distichlis* species occur, *ssp. parryana* occurs alone. In Birch Creek, however, both these species occur in the community containing *ssp. idaho*. Material at this site should be more carefully evaluated.

B. Technical Description

Hermann 1970: Plants loosely tufted and with short, scaly, creeping rhizomes, (1)2-6dm tall, phyllopodic, the principal leaves crowded near the base, firm, flat to sometimes channeled and revolute-margined, up to about 4mm wide, much shorter than the culms, seldom over 15(25)cm long; spikes 1-5, cylindric, the terminal one (1)1.5-3cm long, often longer than the lateral ones, which are sessile or stiffly short-pedunculate and erect or nearly so and neither closely crowded nor notably remote; spikes often all wholly pistillate, or the terminal one frequently staminate, or gynaeandrous, or with intermingled staminate and pistillate flowers; bract subtending the lowest spike relatively short, inconspicuous, and scarcely sheathing at the base, rarely as long as the inflorescence; pistillate scales stramineous to more often brown with pale, hyaline margins, narrower, acute, and surpassing the perigynia; perigynia more or less distinctly obovate, often broadly so, 1.9-3.0mm long, including the short (0.2-0.6mm) or obsolete beak, wholly glabrous, or often shortly strigose-hirtellous or inconspicuously scabrous distally, especially about the base of the beak; marginal nerves of the perigynium prominent, the faces nerveless or inconspicuously several-nerved; stigmas 3; achene trigonous, 1.4-1.8mm long, rather loosely filling the perigynium.

C. Distribution

High intermountain valleys of southwest Montana and adjacent southeast Idaho (Beaverhead, Gallatin, Madison, Powell and Silver Bow counties, Montana; Bannock, Clark and Lemhi counties, Idaho). It is likely that these species will be found in alkaline meadows in Custer County as well (Pahsimeroi, Summit Creek, Thousand Springs). The type locality is from Clark County.

D. Habitat

Populations in Idaho are found in calcareous fens, but a few of the Montana populations occur in non-calcareous wetlands (Lesica 1998). Common associated species include *Carex praegracilis*, *Juncus balticus*, *Muhlenbergia richardsonis*, *Aster occidentalis*, *Senecio debilis*, *Valeriana edulis*. At Birch Creek, *Carex parryana ssp. idaho* was usually found in the ecotone between wet streamside communities and drier riparian communities dominated by *Potentilla fruticosa*, *Sarcobatus vermiculatus*. Lesica (1998) noted that canopy cover of graminoids was always high (60-100%) and forbs moderate (5-50%) at all the sites he observed in Montana. I noted that vegetation in these ecotones at Birch Creek was variable, but often fairly sparse (total cover <60%). When observed, this site had not been grazed for two growing seasons.

Lesica states "habitat...mostly likely has silty soils with ample organic matter and little or no coarse fragments." (Lesica 1998). I noted at Birch Creek that soils on *C. parryana* sites were fine-textured, with low organic matter and few coarse fragments. This ecotonal region is fairly wet in the spring during snowmelt, but only moist at the surface by the middle of the growing season. At Birch Creek, these sites remain sub-irrigated by the relatively constant flow of the Birch Creek spring system, but are never flooded.

E. Reproductive Ecology

Carex parryana reproduces vegetatively by creeping rhizomes. Seed is also produced, but it is unclear if it is the result of sexual reproduction or by agamospermy. Several authors have noted the lack or paucity of male flowers. Plants are generally thought to be strictly dioecious (Murray 1969), although Hermann (1970) states plants are "often all pistillate," suggesting that sometimes male and female flowers occur on the same plant. Murray (1969) further states he has not seen any staminate plants.

Lesica (1998) noted that only a small proportion of the ramets (10-20%) may flower during a given growing season. In Birch Creek, the proportion was much higher (>50%) in 1999 (personal observations). Lesica also conducted a "quick and dirty" study of *C. parryana* ssp. *idaho* during his survey work in August 1997, in which he selected 14 sites that appeared to have not been recently grazed, estimated cover to the nearest 5% in a 0.01ha circularly plot, and counted the number of flowering stems in a 50x2m plot. He found that density of flowering stems was strongly correlated with total graminoid cover, most strongly with *Muhlenbergia richardsonis*. This contradicts my observation at Birch Creek that plants in denser graminoid growth appeared to have lower ratio of reproductive versus vegetative ramets.

F. Issues

i) Population Trends

Lesica (1998) notes that only one small colony could be located at the Kaufman Guard Station in 1997. Apparently, additional habitat throughout the Birch Creek Fen was not searched. I observed *Carex parryana* to be common throughout Birch Creek Fen above the guard station, but assumed all the material I observed to be *C. parryana* ssp. *idaho*. The possible presence of ssp. *parryana* should be evaluated.

ii) Threats

Weeds: Several weeds species are known to occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) or may possibly occur (*Potentilla recta*). *Cirsium canadensis* thistle occurs with some populations (noted at Birch Creek).

Herbivory: Although Lesica (1998) notes grazing as a threat, the effects of grazing are not known. The population at Birch Creek is largely protected from any grazing.

Timber Management: Not applicable.

Other: Recreational activities may have potential impacts at some sites. The Kaufman Guard Station, for example, receives fairly heavy fishing use, but most trampling occurs on existing footpaths. The hydrological requirements of *Carex parryana* are apparently fairly narrow, neither very wet nor dry. Thus changes in the hydrology of these areas, either making them wetter or drier, would seriously impact a population.

iii) Management Needs and Recommendations

The population at Birch Creek should be evaluated to determine if the entire population is *C. parryana* ssp. *idaho*. Other alkaline fen systems should be surveyed.

G. References

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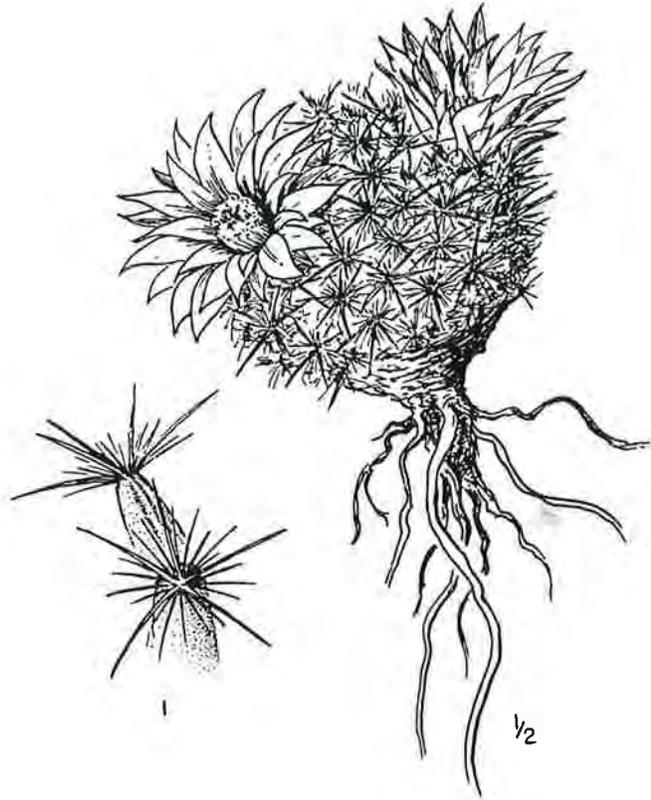
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***Coryphantha vivipara* (Nutt.) Britt. & Brown**

Cushion cactus Cactaceae

Escobaria vivipara (Nutt.)

Buxbaum Note: the Idaho CDC lists this species as *C. vivipara*, but the genus has undergone extensive revision and splitting into 9 varieties. The Plants database shows only variety *vivipara* as occurring in Idaho.



A. Description

CDC 2003: A low-growing cactus, 3-10 cm tall and about equally wide, with one to several stems that are more or less round to short-cylindric in outline and have a top-shaped base. Tubercles are spirally arranged, 5-15 mm long, and distinctly grooved on the upper side. Areoles (special cushions bearing the spines) have 3-5 main spines about 10 mm long, and 10-20 smaller, slender marginal spines. Flowers are showy, bright reddish-purple, and about 3-4 cm wide and long. Fruits are greenish, oblong, 1-2 cm long, and have brown seeds.

B. Technical Description

Great Plains Org 2002: Perennial, lacking leaves, but with fleshy green photosynthesizing stems. Stems green and prickly, 1-several, more or less globose to cylinder-shaped, turbinate at the base; up to 7 cm tall; occurring singly or in small clusters, and protrude partway through the native prairie sod. Numerous spine-bearing tubercles dot the plant. Most tubercles with a groove on the upper side; the spine-bearing area on the cactus with 3-4 central spines, one of them turned downward, and about 12-40 smaller radial spines. Central spines prominent among the radials; radial spines 12-20 per spine-bearing area, 9-12 mm long. Flowers 2.5-4 cm long, pink to reddish purple, in May or June. Mature fruit green to greenish-brown, oblong to thickened toward the top, 12-25 mm long; seeds brown, reticulo-punctate, 1.5-2 mm wide.

For many years, *C. missouriensis* was also maintained on the Idaho Native Plant Society list, primarily because of its similarity to *C. vivipara* and because it is somewhat rare on the west side of the Continental Divide and for many years the only recorded populations were in Butte and Clark Counties. It was found to be fairly common in Lemhi County at 4000-8000' in sagebrush. Greenish white flowers in June-July, fruit <1cm long.

C. Distribution

Alberta and Manitoba, south to Oregon, New Mexico, and Texas. In Idaho, known from Lemhi and Owyhee Counties. Only two records for Lemhi County, both by Bob Moseley in 1989, both in the Panther Creek drainage. Both Helen Ulmschneider and I have observed the species throughout the Lemhi Valley as well.

D. Habitat

Sagebrush/grassland slopes and flats, in the lower valleys. At the upper Panther Creek population (near Napias Creek), Moseley describes the habitat as: "Bouldery hillside, granitoid rocks: SW aspect; 8-35% slope; open, lower to upper slope, dry (xeric). Associated community: *Artemisia tripartita/Agropyron spicatum*. Associated species: *Cercocarpus ledifolius*, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Bromus tectorum*, *Antennaria microphylla*, *Balsamorhiza sagittata*, *Zigadenus* sp."

E. Reproductive Ecology

Plants are insect pollinated, producing flowers in May and June and mature fruit by August.

F. Issues

i) Population Trends

Nothing is known about the population trends of these species. Moseley observed several hundred plants at the upper Panther Creek population (01) in 1989, but only a few dozen at the Lower Panther Creek population (02) the same year.

ii) Threats

Weeds: The occurrence and potential effects of weeds on Salmon BLM populations of *C. vivipara* are not known.

Herbivory: The effects of livestock grazing are unknown. In North Dakota, it is speculated that *C. vivipara* appears to thrive under the dry, warm conditions caused by heavy grazing, but may be more abundant under light or moderate grazing in the more arid parts of its range (USGS 2002).

Timber Management: Not applicable.

Other: Potential impacts may arise from recreational use and mining activities. The restrictions on OHV travel and the lack of current mining activities in most of the Lemhi area suggest these threats are not major.

iii)

Management Needs and Recommendations

This species is probably more common in the Lemhi Valley and adjacent areas around Salmon than records suggest. Efforts should be made to note this species and send occurrence records to the Conservation Data Center.

G. References

CDC (Idaho Conservation Data Center). 2003. BLM special status plant field guide for Southeast Idaho. Boise, ID: Conservation Data Center, Idaho Department of Fish and Game. View online at:

<http://www2.state.id.us/fishgame/info/cdc/cdc.htm>

Great Plains Org. 2002. *Coryphantha vivipara*

<http://www.greatplains.org/resource/1999/ndmnrngp/coryvivi.htm>

USGS. 2002. Common Pincushion. In Native Wildflowers of the North Dakota Grassland; USGS, Northern Prairie Wildlife Research Center.

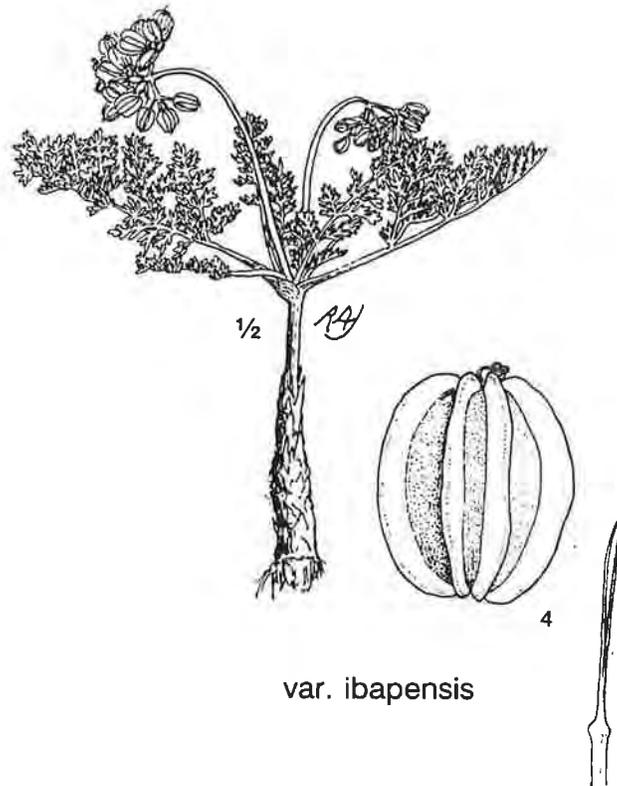
<http://www.npwrc.usgs.gov/resource/literatr/wildflwr/species/coryvivi.htm>

Cymopteris ibapensis M.E. Jones

Ibapah Wavewing Umbelliferae

A. Description

Moseley 1989: Small, herbaceous perennial with a long taproot, a pseudoscape (small, fragile stem above root, mostly below the ground surface in Idaho plants), a whorl of pinnately dissected leaves around a compound umbel of small white flowers, and fruits having prominent longitudinal ridges. Because they both have white flowers, *Cymopteris ibapensis* has a superficial resemblance to *Cymopterus bipinnatus*, with which it is sympatric. The leaves of Ibapah wavewing are in a whorl on the pseudoscape, originating from a relatively slender taproot. Leaves of *C. bipinnatus* are much more finely dissected, erect, and tufted from a thick root crown, which are covered with the persistent old leaf bases.



B. Technical Description

Welsh et al 1987: Plants 7-25 cm tall, glabrous or granular-scabrous, not or weakly aromatic, from a linear taproot, this hardly if at all swollen, with a simple or occasionally branched crown; pseudoscapes 1 or 2 (5) per root, the aerial portion 3.5-10 cm long, commonly enveloped at the base by scarious dilated bladeless sheaths; leaves whorled atop the pseudoscape, rarely some arising directly from the taproot, tripinnate, with 5-6 opposite or offset pairs of lateral primary leaflets; petioles (1) 1.5-3.5 cm long; blades (2.5) 4-11 cm long, ovate in outline, completely dissected so that the ultimate segments are the widest undivided portions of the blade; lowest pair of primary leaflets 1/2-3/4 as long as the leaf blade, sessile or on petiolules to 2 cm long, with 4-6 (8) opposite or offset pairs of secondary leaflets, the ultimate segments to 2 mm long, to ca 1 mm wide;

peduncles (2) 4-8 per pseudoscape, 2-15 cm long; umbels and peduncles occasionally nodding or recurved; involucre lacking; rays 10-18, 5-20 mm long; branchlets of the involucre to 4 mm long, to 0.5 mm wide, distinct or nearly so, green with a purple midrib and narrow scarious margins; pedicels 4-6 mm long; calyx teeth to 1 mm long, greenish; petals white; filaments white, the anthers purple; styles 1-2 mm long; carpophore divided to the base; body of fruit 5-8 mm long, the wings 6-9 mm long, to 2 mm wide, some of the dorsal ones sometimes reduced.

C. Distribution

Southeast Oregon, Nevada, Utah and east central Idaho in Butte, Custer, Lemhi counties.

Moseley 1989 notes: Welsh et al. (1987) report that *Cymopteris ibapensis* is distributed in greasewood, sagebrush, and pinyon-juniper communities from eastern Utah, Nevada, and southeastern Oregon. It was recently found to be disjunct in east-central Idaho, where, with one exception, it occurs on alpine scree slope. Prior to 1989, Ibabah wavewing was known in Idaho only from alpine sites in the Lost River Range, from about Leatherman Pass, north to about Grouse Creek Peak. During May 1989, I was surveying for rare plants in the Lemhi Valley, as part of a Challenge Cost-share project with the Salmon NF, and discovered a small population of Ibabah wavewing in carbonate scree near the mouth of Railroad Canyon. This low elevation site east of Leadore in the Beaverhead Mountains, was a range extension in Idaho of about 40 miles north of previously known populations.

I have observed the Railroad Canyon site. Additional habitat occurs from Leadore Hill south to Eighteenmile Creek on the abundant scree slopes found in that area. None of this area has ever been surveyed for *C. ibapensis*. Another population which may be on BLM is recorded about 4 miles south of Double Springs Pass.

D. Habitat

In Idaho, on dry gravelly slopes from valley bottoms to above timberline on calcareous substrates (limestone talus and scree). The Railroad Canyon population occurs on a south-facing, carbonate scree slope, between rock outcrops. *Cercocarpus ledifolius*, *Achnantherum hymenoides*, *Astragalus gilviflorus*, and *Petrophytum caespitosum* occur on the outcrops and at their base, but no associated species occur on the scree with Ibabah wavewing. (Moseley 1989)

E. Reproductive Ecology

Plants flower in late May to early July. Fruiting begins in July. Flowers are probably insect-pollinated. Sexual reproduction (from seed) appears to be the only mode of reproduction. Seeds are large, and may be cached by small rodents.

F. Issues

i) Population Trends

The Railroad Canyon site is very small. Moseley (1989) noted less than 200 plants in flower on May 21 1989. I observed less than 100 plants in fruit 1992. My lower numbers may be due to the greater difficulty in spotting non-blooming plants. The habitat area in the immediate vicinity is limiting. Nothing is known about the trend of the species at this site

Alpine and subalpine populations are generally much larger, some with several thousand individuals.

ii) Threats

Weeds: Cheatgrass is abundant in the Railroad Canyon area, although it was not prevalent on the population site itself in 1992. Other weedy species are likely, given the extensive disturbance from a material pit on the south side of the drainage, just across the drainage from the *C. ibapensis* population. Additional surface disturbance from a mining operation just downstream/hill from the population area may also be a source of weedy species.

Herbivory: The Railroad Canyon site has very low vegetative cover and fairly unstable footing; it is unattractive to livestock, although it may occasionally have livestock travel from adjacent vegetated slopes.

Timber Management: Not applicable.

Other: Historic mining activity areas occur several hundred feet from the site, and a material pit (no longer used) occurs across the drainage from the site.

iii) Management Needs and Recommendations

The only known BLM population is quite small and should be re-evaluated periodically (along with the co-occurring *Astragalus gilviflorus*). Additional habitat in the Railroad Canyon and adjacent areas should be surveyed for this species. This area has not received much survey attention, and additional Great Plains species (like *A. gilviflorus*) and other surprises are possible.

G. References

Moseley, R.K. 1989. Field investigations of seven rare alpine plant species in the southern Lemhi Range and Beaverhead Mountains, Dubois Ranger District, Targhee National Forest. Idaho Department of Fish and Game, Conservation Data Center, Boise.

Welsh, S.L., N.D. Atwood, L.C. Higgins, and S. Goodrich. 1987. A Utah flora. Great Basin Naturalist Memoir No. 9. Brigham Young University, Provo, UT.

***Draba globosa* Payson**

Beavertip Draba Cruciferae

Draba apiculata C.L. Hitchc.; *Draba densifolia* Nutt. var. *apiculata* (C.L. Hitchc.) Welsh

A. Description

Perennials forming thick cushions up to 5cm tall. Leaves tightly clustered at the base, fleshy, 3-6mm long and 1-2mm wide, the toothless margins with a few short stiff hairs. Flowering stems rising up to 3cm above the mat, lacking leaves, with 2-5 pale yellow flowers at the tip. Petals 4, each about 4mm long. Fruit a capsule (silicle), oval in outline, 3-8mm long and 2-4mm broad, lacking hairs.

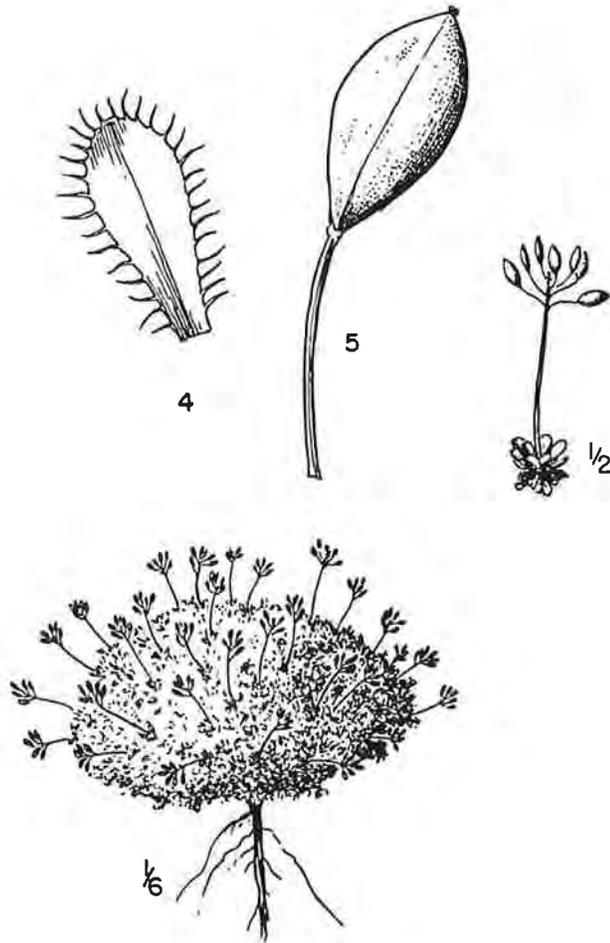
B. Technical Description

Hitchcock and Cronquist 1964:

Cespitose, matted, scapose perennial forming thick cushions as much as 2dm broad; leaves imbricate, fleshy, greenish, lanceolate to obovate or oblanceolate, 3-6mm long, 1-2mm broad, the margins with few to rather numerous short, stiff, simple hairs up to 0.5mm long and often bristly-apiculate, the plant otherwise glabrous; scapes 0.5-3cm tall; racemes 2-5-flowered, subcorymbose; pedicels 2-8mm long; petals rather pale yellow, about 4mm long; silicles ovate to oblong-ovate or oblong-elliptic, 3-8mm long, 2-4mm broad, glabrous, plane; style 0.2-0.5mm long; seeds 8-12, 1.2-1.5mm long.

Fox and Moseley (1991)

prepared the following key to be used to separate *Draba globosa* from other high-elevation species of the genus that may be found in east-central Idaho:



- 1A. Flowers white *D. lonchocarpa*
- 1B. Flowers yellow.
 - 2A. Style lacking or less than 0.1 mm *D. crassifolia*
 - 2B. Style 0.1 mm or longer
 - 3A. Leaf surfaces pubescent with trichomes which include doubly pectinate types.
 - 4A. Leaf surfaces pubescent with sessile, doubly pectinate trichomes often parallel to the leaf midvein ... *D. oligosperma*
 - 4B. Leaf surfaces pubescent with a mixture of stalked doubly pectinate and multibranched trichomes..... *D. incerta*
 - 3B. Leaf surfaces glabrous or lacking doubly pectinate trichomes.
 - 5A. Leaf surfaces glabrous, margins ciliate with short, stiff trichomes *D. globosa*
 - 5B. Leaf margins ciliate with relatively long, flexible simple or branched trichomes.
 - 6A. Leaves ciliate with simple, forked, or multibranched trichomes, leaf surfaces pubescent with tangled mixture of multibranched, forked and simple trichomes *D. paysonii* var. *treleasii*
 - 6B. Leaves ciliate with flexible, simple trichomes, leaf surfaces glabrous or pubescent with a few simple, forked or stellate trichomes; midribs of leaves prominent *D. densifolia*

C. Distribution

In Idaho, known from Custer and Lemhi counties. The only BLM location is on Jerry Peak in the Jerry Peak ACEC.

D. Habitat

Alpine fellfield, ridgecrests and talus slopes on shallow substrates derived from Challis volcanic bedrock at the Jerry Peak site; on granitic substrates at other sites.

E. Reproductive Ecology

Flowers in midsummer. Reproduces exclusively by seed.

F. Issues

i) Population Trends

Nothing is known about the population trends of the Jerry Peak population of *Draba globosa*.

ii)

Threats

ACEC status of the area containing the Jerry Peak population of *Draba globosa* provides protection from threats from most resource use activities.

Weeds: No information

Herbivory: It is unknown if the Jerry Peak population is grazed, or if so, the effects grazing has on the species. It is unlikely, given the cushion-like morphology, that *Draba globosa* plants are grazed, although elevated flowering and seed heads may be.

Timber Management: Not applicable

Other: Threats from mining or OHV use are not known.

G. References

Fox, L. and Moseley, R.K. 1991. Taxonomic investigation of the genus *Draba* (Brassicaceae) in the White Cloud Peaks and Boulder Mountains. Challenge Cost Share report prepared for the Challis and Sawtooth National Forests.

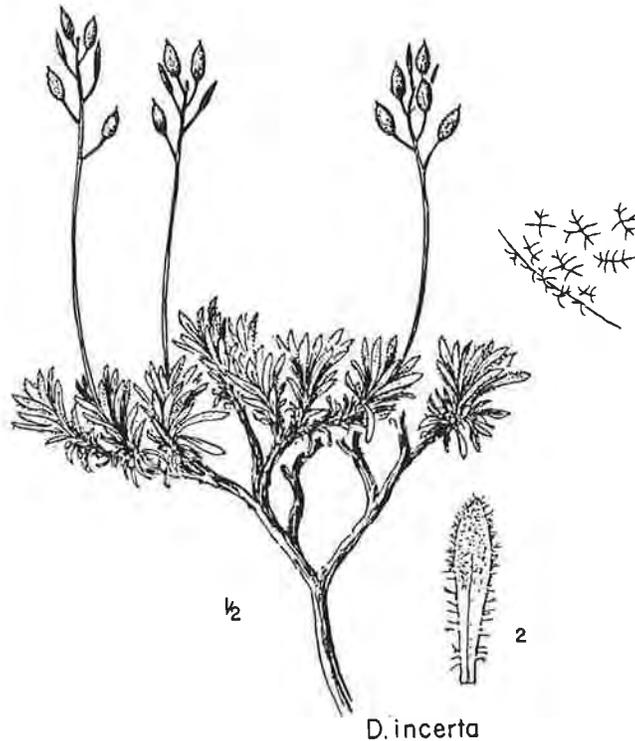
Hitchcock, C.L.; Cronquist, A. *Draba*. Pages 485-500 in Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.; Vascular Plants of the Pacific Northwest, Part 2. Seattle, WA: University of Washington Press.

***Draba incerta* Payson**

Yellowstone Draba
Cruciferae

A. Description

Perennials, forming loose cushions. Leaves clustered at base linear, 3-20mm long and 1.5-3.5mm wide, with snowflake-like, star-shaped, or multi-branched hairs. Flowering stems leafless, up to 20cm long, with star-shaped or multi-branched hairs; flowers yellow (drying whitish), 5-12 per stem. Petals 4, 4-5mm long. Fruit a capsule (silicle), oval in shape, 4-12mm by 1.5-3mm, with unbranched or forked hairs.



B. Technical Description

Hitchcock and Cronquist 1964: Cespitose perennial, very similar to *D. oligosperma*, but usually more loosely tufted, the leaves not so strongly imbricated, linear-oblongate, 7-13 (25)mm long, (1)1.5-3.5mm broad, ciliate with simple to pectinately branched hairs, the lower surfaces pubescent with less-appressed, more irregularly branched hairs but these im part usually doubly pectinate; scapes 1-20cm long, leafless or frequently with one reduced leaf or bract, pubescent with stellate and irregularly branched (some simple) hairs; pedicels about equaling the fruits; petals yellow, fading to white, 4-5mm long; silicles ovate or ovate-lanceolate to elliptic, plane, scarcely at all inflated, 6-10mm long, 2.5-3.75mm broad, commonly pubescent with coarse, short, stiff, simple or branched hairs, but sometimes glabrous; styles 0.4-1mm long; seeds 8-14, 1.2-1.5mm long.

Fox and Moseley (1991) prepared the following key to be used to separate *Draba incerta* from other high-elevation species of the genus that may be found in east-central Idaho:

- 1A. Flowers white *D. lonchocarpa*
- 1B. Flowers yellow.
 - 2A. Style lacking or less than 0.1 mm *D. crassifolia*
 - 2B. Style 0.1 mm or longer

- 3A. Leaf surfaces pubescent with trichomes which include doubly pectinate types.
 - 4A. Leaf surfaces pubescent with sessile, doubly pectinate trichomes often parallel to the leaf midvein ... *D. oligosperma*
 - 4B. Leaf surfaces pubescent with a mixture of stalked doubly pectinate and multibranched trichomes..... *D. incerta*
- 3B. Leaf surfaces glabrous or lacking doubly pectinate trichomes.
 - 5A. Leaf surfaces glabrous, margins ciliate with short, stiff trichomes *D. globosa*
 - 5B. Leaf margins ciliate with relatively long, flexible simple or branched trichomes.
 - 6A. Leaves ciliate with simple, forked, or multibranched trichomes, leaf surfaces pubescent with tangled mixture of multibranched, forked and simple trichomes *D. paysonii* var. *treleasii*
 - 6B. Leaves ciliate with flexible, simple trichomes, leaf surfaces glabrous or pubescent with a few simple, forked or stellate trichomes; midribs of leaves prominent *D. densifolia*

C. Distribution

Alaska south to the mountains of Washington, Idaho, Utah and Wyoming. A 1991 CDC report lists a record for Lemhi County in the Beaverhead Mountains 13 miles northeast of Leadore, and a location in each Fremont and Boundary counties. These have since been dropped from the CDC database (October 2000), presumably because they were found to be misidentifications. Confirmed records in Idaho are known from Blaine, Clark, Custer, and Idaho counties (CDC database 2000). Custer County location is in the Jerry Peak Lake Creek ACEC about 1 mile north of Jerry Peak.

D. Habitat

High mountain ridgecrests and talus slopes; on Challis volcanic substrate at Jerry Peak with *Artemisia tridentata* ssp. *vaseyana*/*Festuca idahoensis* habitat type, 50% northwest-facing slope, moderately deep, gravelly, moist soil. Associated with *Phlox pulvinata*, *Cymopterus bipinnatus*, *Sedum lanceolatum*, *Delphinium glaucescens*, and *Potentilla diversifolia*. Elevation 9,600 feet. (CDC Database 2002)

E. Reproductive Ecology

According to the Rock Garden Database (2002), *Draba incerta* can be propagated by seed in the spring and from rosette cuttings in the fall. Flowers are likely pollinated by insects. Sexual reproduction by seed appears to be the only mode of reproduction.

F. Issues

i) Population Trends

Nothing is known about the population trends of the Jerry Peak population of *Draba incerta*.

ii) Threats

ACEC status of the area containing the Jerry Peak population of *Draba incerta* provides protection from threats from most resource use activities.

Weeds: No information

Herbivory: It is unknown if the Jerry Peak population is grazed.

Timber Management: Not applicable

Other: Threats from mining or OHV use are not known.

G. References

Fox, L. and Moseley, R.K. 1991. Taxonomic investigation of the genus *Draba* (Brassicaceae) in the White Cloud Peaks and Boulder Mountains. Challenge Cost Share report prepared for the Challis and Sawtooth National Forests.

Hitchcock, C.L.; Cronquist, A. *Draba*. Pages 485-500 in Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.; Vascular Plants of the Pacific Northwest, Part 2. Seattle, WA: University of Washington Press.

Rock Garden Database. 2002. <http://web.kadel.cz/flora/kvSearch.html>

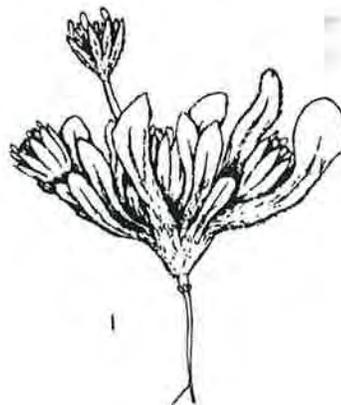
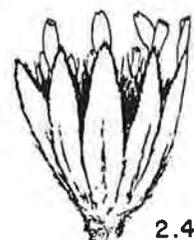
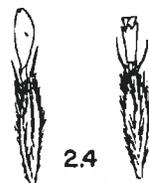
Welsh, S.L., N.D. Atwood, L.C. Higgins, and S. Goodrich. 1987. A Utah flora. Great Basin Naturalist Memoir No. 9.

***Eatonella nivea* (D.C. Eaton) A. Gray**

White Eatonella Asteraceae

A. Description

Depressed 1-2 cm tall white-woolly annual, branching from the base and often forming small tufts; receptacle flattish, naked; leaves basal (or alternate), numerous, crowded, linear-oblongate to spoonlike, up to 1.5cm long; heads sessile or on slender stalks up to 4cm long; involucre bell-shaped, about 5mm high; rays scarcely exceeding the disk, yellow or purplish; achenes flattened and hairless except for the long hairs on the margins; pappus of 2 irregular margined, shortly awn-tipped scales. (adapted from Washington Natural Heritage Program 2002)



B. Technical Description

Cronquist 1955: Depressed white-woolly annual, branching from the base and often forming small tufts; leaves numerous, linear-oblongate to spatulate, up to 1.5cm long; heads sessile or on filiform axillary peduncles up to 4cm long. Heads discoid or inconspicuously radiate, the rays when present pistillate and fertile, yellow or purplish, scarcely exceeding the disk; involucre campanulate, about 5mm high, of 5-13 essentially uniseriate bracts, reflexed in age; receptacle flattish, naked; disk flowers perfect and fertile, yellow; anthers sagittate at the base; style branches flattened, with introrsely marginal stigmatic lines and very short and blunt, externally minutely papillate-hairy appendages; achenes flattened parallel to the involucre bracts, nerveless except for the callous-thickened margins, which are densely long-villous-ciliate; pappus of 2-4 scales, sometimes shortly awn-tipped; small tomentose annuals with simple, mostly alternate (or all basal) leaves and small heads.

C. Distribution

Southeast Oregon, central and western Nevada and Inyo County, California. In Idaho, in Adams, Lemhi, Custer, Elmore and Owyhee counties. The central Idaho populations are

disjunct along the Salmon River. The CDC contains a single record for Lemhi County, but no information on habitat or condition. Five records are from Custer County.

D. Habitat

Dry desert areas in loose sandy or volcanic soils; 763-1900 m elevation. In Challis, found on volcanic ash beds derived from Challis volcanics. Common associates are *Atriplex confertifolia*, *Achnatherum hymenoides*, *Enceliopsis nudicaulis*, *Pseudoroegneria spicata*, *Elymus salmonensis* var. *ambiguus*.

E. Reproductive Ecology

Little is known. Flowers are probably pollinated by insects. The species does not appear to reproduce vegetatively.

F. Issues

i) Population Trends

No information. The most recent record in the CDC database is from 1984.

ii) Threats

Weeds: Nothing is known about the conditions within populations; the most common weed associated with these habitats is *Bromus tectorum*.

Herbivory: Steep unstable slopes are generally unattractive to livestock, although the habitat description given in CDC records and other state descriptions (e.g. Washington Natural Heritage Program) suggests the species sometimes occurs on more gentle slopes where livestock use may occur. The small stature of the species limits direct herbivory, but trampling damage may occur.

Timber Management: Not applicable.

Other: Mining may be a threat, but it is unknown if any activity historically occurred or is currently taking place within or adjacent to population areas.

iii) Management Needs and Recommendations

No population has been evaluated in over 17 years, and most have not been observed for far longer. This species is probably more common in the Challis area than current information suggests, and warrants a status survey to assess population condition and potential threats.

G. References

Cronquist, A. 1955. *Eatonella*. Pages 158-160 in In: Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W. Vascular Plants of the Pacific Northwest, Part 5; Seattle, WA: University of Washington Press.

Washington Natural Heritage Program. 2002. *Eatonella nivea*. In: Field Guide to Selected Rare Plants of Washington.

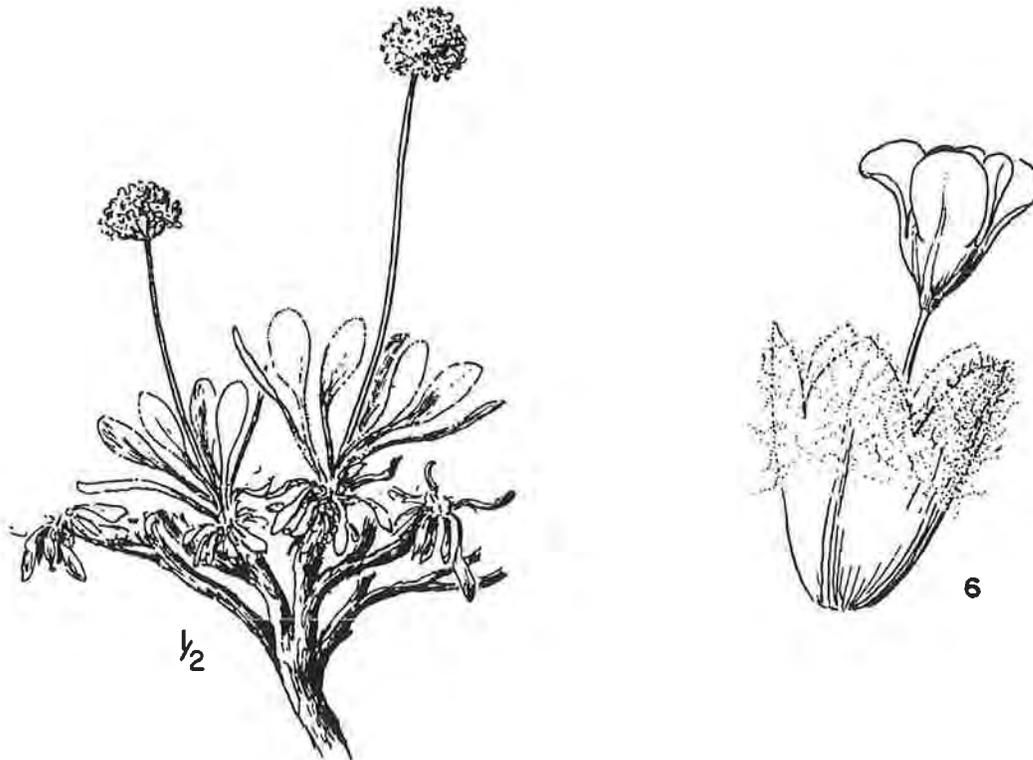
<http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fguide/htm/fgmain.htm>

Eriogonum capistratum var. *welshii* Reveal

Welsh's Buckwheat Polygonaceae

A. Description

Murphy 2002: Welsh's buckwheat is a low, mat-forming perennial buckwheat. Its blue-green leaves are covered with dense, soft, white-colored wooly hairs (tomentose) that are not glandular. The spatulate to elliptic shaped leaf blades are typically between 5 and 12 mm long on petioles 4 to 9 mm long. The erect flowering stems are 2 to 10 cm long and covered with dense, sometimes tufted or tangled, long wooly hairs (tomentose to floccose). The yellow to golden colored flowers are not hairy (glabrous), 2 to 3 mm long, and form a dense and tight, ball-like cluster terminating the flowering stem. The flowers have a greenish to reddish-brown mid-rib and become rosy-yellow upon maturity. The clusters of flowers are subtended by upward opening, bell-shaped bracts (an involucre) that is membrane-like in texture. It has 5 to 7 teeth and is covered with sparse to dense, soft, wooly hairs. The peak flowering period is from mid to late June lasting to early July.



B. Technical Description

Reveal 1989: *Eriogonum capistratum* var. *welshii* plants are low, herbaceous perennials forming caespitose mats up to 1.5 dm across; leaves basal, the leaf-blades spatulate to narrowly elliptic or elliptic, 5-12mm long, 2-7(11) mm wide, densely white-tomentose on both surfaces, sometimes slightly less so and greenish above, the tomentose petiole 4-9mm long, the tomentum not interspersed with glandular hairs; flowering stems scapose, +/- erect to erect, 2-8(10) cm long, tomentose to densely floccose; inflorescences capitulate, 0.7-1.2cm across; bracts scale-like, ternate, triangular to oblanceolate, 1-5-3mm long, 0.6-2mm wide, sparsely to densely tomentose or glandular without; involucre congested, 3-6 per head, turbinate-campanulate to campanulate, membranaceous, 2-4 mm long, 2-3.5mm wide, sparsely to densely tomentose, the 5-7 triangular teeth 0.3-1.2 mm long, the bractlets linear oblanceolate, 1-2.5mm long, minutely fringed with gland-tipped cells, the pedicels 2.5-4.5mm long, glabrous except for a few glands near the tip in some; flowers yellow with greenish-brown to reddish-brown midribs and bases, becoming rosy-yellow in fruit, 2-3mm long, glabrous to sparsely glandular, the tepals monomorphic, oblanceolate to oblong, those of the outer whorl slightly wider than those of the inner whorl, united about a quarter of their length; stamens mostly exerted, the filaments sparsely pilose basally, the anthers yellow, 0.3-0.4mm long, oblong; achenes brown, 2-3mm long, glabrous, the subglobose base tapering to a long, 3-angled beak.

Murphy (2002) notes that specimens from calcareous substrates in the upper Little Lost and upper Pahsimeroi River valley and foothills closely match Reveal's description, but those on ashy soils in Challis Volcanics (e.g., Lime Creek, lower Pahsimeroi) tend to have larger leaves and scapes. In these habitats, *E. verrucosum* is sympatric with Welsh's buckwheat (has glabrous to thinly tomentose scapes and pustulose flowers). Some integradation appears to occur.

Murphy supplies the following key for field use in Idaho:

1. Flowers cream to pink, not yellow or golden; leaves pale grayish-lanate.....*Eriogonum mancum*
1. Flowers yellow or golden (aging rosy-yellow); leaves white tomentose.....2
 2. Involucres 6-8 toothed, narrowly turbinate (3) 3.5-5mm long; scapes greater than 10cm tall.....*E. ochrocephalum*
 2. Involucres (4) 5-7 toothed, usually coampanulate to turbinate-campanulate, 2.5-3 (4.5)mm long; scapes usually 10cm tall or less (sometimes to 15cm).....3
 3. Involucres rigid or firm.....4
 4. Inflorescence capitulate or open; flowers eglandular, usually tomentose; widespread in southeastern Idaho and vicinity.....*Eriogonum brevicaulum* var. *laxifolium*
 4. Inflorescence capitulate; outer surface of the flowers not tomentose, but distinctly pustulose; endemic to Salmon River and tributary canyons and vicinity from Challis to Salmon.....*Eriogonum verrucosum*
 3. Involucres membranaceous.....5

- 5. Scapes thinly tomentose; flowers glabrous; endemic to Stanley Basin area.....*Eriogonum meledonum*
- 5. Scapes densely tomentose, glabrous, or glandular; flowers generally glandular; not known from the Stanley Basin area.....*Eriogonum capistratum*

Key to the varieties of *E. capistratum*

- 1. Scapes, involucre, and tomentum of leaves glandular; scapes 1-3cm tall; endemic to Bitterroot Range and high mountains of Montana to east (not known from Idaho).....var. *muhlickii*
- 1. Scapes usually glabrous, or glandular; tomentum of leaves not glandular; scapes usually 10cm or less tall; in central to east-central Idaho.....2
 - 2. Scapes glabrous or glandular (not tomentose); widespread, known from Salmon River, Sawtooth, White Cloud, and Pioneer Mountains and vicinity; typically upper montane to subalpine areas above 8000 feet elevation.....var. *capistratum*
 - 2. Scapes tomentose to densely floccose; endemic to upper basins of Big and Little Lost Rivers and Pahsimeroi River and vicinity; typically valley to foothill areas below 8000 feet.....var. *welshii*

C. Distribution

Endemic to the valleys and foothills of the upper Big Lost, Little Lost, and Pahsimeroi Rivers and immediate vicinity in east-central Idaho covering a roughly circular area with Mt Borah at the center (Murphy 2002). Murphy (2002) notes the largest concentration is on calcareous foothill flanks and surrounding alluvial fans of the Donkey Hills.

Locations of all 13 known occurrences are summarized in Murphy (2002, pages 8-9). Murphy further suggests that additional populations may exist in the Basin Creek area, Upper Lemhi River, and upper Birch Creek valleys.

D. Habitat

Murphy (2002): Plants were restricted to shallow, gravelly clay-loam soils on convex topographic positions. Such sites were unproductive and drought prone (due to their windswept nature, (usually supporting only sparse and low vegetation characterized by fringed sagebrush (*Artemisia frigida*), Sandberg’s bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), ricegrass (*Achnatherum* species), and cushion like forbs. Well-developed stands of big or low sagebrush-steppe vegetation occurred on adjacent areas of deeper, silt loam soil. Populations were located on both calcareous (usually limestone) and volcanic (i.e., ash and tuff of Challis volcanics) substrates that produce clay rich soils upon weathering. On calcareous substrates, Welsh’s buckwheat occurred on eroded bluffs (badlands). Welsh’s buckwheat was not found on rocky or sandy alluvial fan benches, or on talus or scree covered slopes (e.g., those often supporting black sagebrush (*Artemisia nova*)). Similarly, it was not found on quartzite or

marble substrates. Moreover, Welsh's buckwheat was discontinuously distributed within suitable habitat within its range.

E. Reproductive Ecology

Plants establish only by seed (no vegetative reproduction). Populations may contain as many as 80% large and/or flowering plants (Murphy 2002). In 2001, at the majority of the 10 populations visited, between 30-75% of the plants were reproductive (Murphy 2002).

F. Issues

i) Population Trends

Nothing is known about the trends of any of the recorded populations. Seven of the 10 populations evaluated by Murphy (2002) are over 1000 plants. The South of Mud Flats population contains over 300,000 individuals in 25+ subpopulations and the Barney Creek Foothills population contains 10,000-20,000 individuals in two large subpopulation areas.

ii) Threats

Weeds: Murphy (2002) concludes that the potential for invasion by *Bromus tectorum* is minimal, and further that "no known invasive plant species (native or exotic) are expected to significantly compete with Welsh's buckwheat on these [harsh, windswept] sites" (page 20). Other weeds observed by Murphy (2002) were *Halogeton glomeratus*, *Malcomia africana*, *Salsola tragus*, and the introduced *Agropyron cristatum*. Although I have not visited the populations, based on the speed at which I've seen these and other weed species invade east-central Idaho sagebrush communities, and the growth form of Welsh's buckwheat (low growing, low-competitive species), I would suggest that weeds may be a threat to this species, and should be one of the key threats assessed and monitored.

Herbivory: Of the 10 locations evaluated by Murphy (2002), 6 had light to no livestock use and another was described as having "light to locally moderate" use in the general area. The discussions of the remaining 3 (rated as moderate to heavy) focuses on the damage caused by developments and concentration areas (e.g., salting, water troughs). Livestock do not graze Welsh's buckwheat, although trampling damage may occur in extremely heavy use areas, especially during wet periods. Light to moderate grazing, combined with careful location of developments, appears to be compatible with conservation of Welsh's buckwheat.

OHV: Five of the populations observed by Murphy (2002) contained a single OHV track or road through the population, 3 contained no tracks and one had occasional use and at least 2 tracks. The South of Mud Flats (009) contained numerous tracks and evidence of

heavy use, however, this is the largest population (300,000+ individuals) and it was unclear from Murphy's report what percentage of the population was directly affected. While a single two-track through a population is not an imminent threat, these tracks can be conduits for weeds, and also encourage additional off-road forays through the population.

Mining: The only active mining activity noted by Murphy (2002) was at the southeast edge of the South of Mud Flats (009) population. This is a gravel pit for road material.

iii)

Management Needs and Recommendations

This species has only been considered a BLM sensitive species since 1996. Currently, the best information available is in Murphy (2002). He suggests the following:
Surveys: Surveys should be timed for late June. Additional inventory work should be focused in the Big Lost River Valley near Mackay, in the northwestern portion of the range (Warm Springs Drainage, Lime Creek, etc.) where attention should be paid to delineating the geographic distribution of *E. verrucosum* and Welsh's buckwheat. Unidentified specimens from the Basin Creek drainage (Lemhi River) resemble Welsh's buckwheat. Additional survey work should be done in that drainage as well as the upper Lemhi and upper Birch Creek Valley.

Re-visits and Monitoring: Murphy suggests all known populations be revisited within 2-4 years (2003-2005) to update population data and re-assess threats and to conduct vegetation sampling and photo-monitoring during these visits. Given the realities of time constraints, I suggest that vegetation sampling be avoided unless a specific question develops for which such information is required (and for which a study could be specifically designed). As an alternative, I would suggest a general qualitative assessment sheet be filled out during each visit that contains fields for evaluation of weed infestation, OHV impacts, and livestock trampling. This form should be accompanied by a large number of photographs.

G. References

Murphy, C. 2002. The status of Welsh's buckwheat (*Eriogonum capistratum* var. *welshii*) in Idaho. Boise Idaho: Idaho Conservation Data Center, Idaho Department of Fish and Game.

Reveal, J.L. 1989. New combinations and novelties in *Eriogonum* (Polygonaceae: Eriogonoideae). *Phytologia* 66(3):251-265.

Carex but open, with unsealed margins; stamens 3; stigmas 3. (Adapted from Hitchcock 1969)

Kobresia is very similar to sedges, and may be easily overlooked in the graminoid communities where it grows. The open peryginia (lacking sealed margins) differentiates it from other genera in Cyperaceae.

C. Distribution

Circumboreal, south to Newfoundland, Quebec, British Columbia and irregularly into Montana, Colorado, Oregon, Montana, Utah, northwest Wyoming. In Idaho known from Lemhi and Custer counties.

D. Habitat

In east-central Idaho, grows in calcerous fens on saturated soils with *Eleocharis pauciflora*, *Carex simulata*, *Scirpus rollandii*, *Triglochin palustre*, *T. maritimum*, and *Salix candida*.

E. Reproductive Ecology

Kobresia reproduces only by seed although transplants may be successfully used for restoration and introduction projects. Light is necessary for germination. In one study, full germination occurred at 65 degrees F (18 deg C) and 18-hour days (Arnold 1973). Division and replanting may encourage growth and remove weeds (Cranston and Vallentine 1983).

F. Issues

i) Population Trends

Nothing is known about trends of any of the currently known populations.

ii) Threats

Weeds: While several weeds species occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) or possible (*Potentilla recta*), few of these appear competitive in the highly saturated habitat of *Kobresia*.

Herbivory: Many of the sites containing *Kobresia* are grazed by cattle, but use appears limited due to the highly saturated substrates which are generally avoided by cattle. I have seen these sites used, however, in late fall when lack of feed on adjacent drier meadows forces cattle into the wetter sites that they would otherwise not use. Cattle use,

when it does occur, is probably limited to fall. These sites were probably used historically in winter as well, but I do not believe any of the sites are currently used for wintering cattle.

Timber Management: No marketable timber occurs on or adjacent to *Kobresia* sites.

Other: Recreational activities may have potential impacts at some sites. The Kaufman Guard Station, for example, receives fairly heavy fishing use, but most trampling occurs on existing footpaths.

iii)

Management Needs and Recommendations

The extent of the occurrences of *Kobresia* even at known sites is poorly documented. Survey work to assess extent and condition is recommended. Additional survey work should be done in areas where other alkaline species are known such as Eighteenmile Creek and Brazeau Springs.

G. References

Arnold, Sylvia M. 1973. Interactions of light and temperature on the germination of *Plantago maritima* L. *New Phytologist* 72:583-593.

Cranston, D. M.; Valentine, D. H. 1983. Transplant experiments on rare plant species from Upper Teesdale. *Biological Conservation*. 26:175-191.

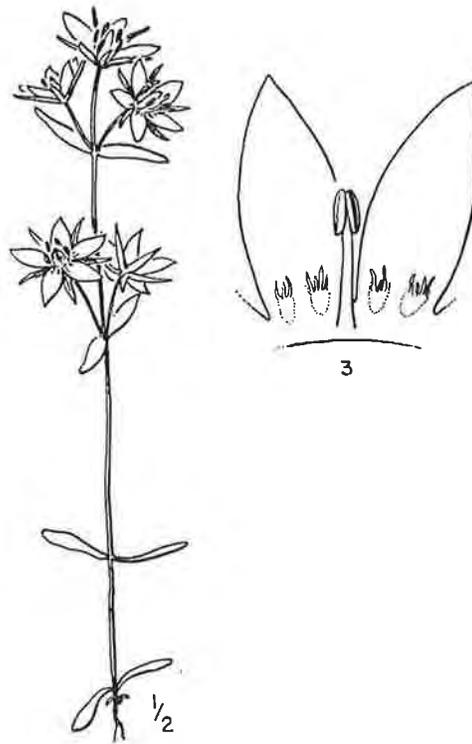
Hitchcock, C.L. 1969. *Kobresia*. Page 365-367 *In:* Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W. *Vascular Plants of the Pacific Northwest, Part 1*. Seattle, WA: University of Washington Press.

***Lomatogonium rotatum* (L.) Fries ex. Fernald**

Marsh felwort Mint family

A. Description

Moseley 1992: Marsh felwort is a small annual up to about 10 inches tall, with strongly ascending branches. The leaves are opposite, entire, and slightly fleshy. The lower leaves are spatulate, while the upper are linear-lanceolate, sharp-pointed and about 1 inch long. The flowers are borne near the tops of the branches in the leaf axils. The 2 to 5 sepals are similar to the upper leaves, nearly equaling or exceeding the corolla. These are conspicuous features both in flower and fruit. The corolla is spreading, porcelain-blue and conspicuous, approximately 1 inch wide. At Birch Creek, marsh felwort flowers in late July through September.



B. Technical Description

Famous and Campbell 1985: Erect, branched or unbranched stem, 0.3 to 2.5 dm tall, and strongly ascending capillary branches. The leaves are opposite entire, slightly fleshy; the lower ones spatulate and the middle and upper linear-lanceolate, sharp pointed, and 0.4 to 3 cm long. The flowers are borne singly at the tops of branches or the axils of leaves. The sepals number 2-5 and are similar to the median leaves, nearly equalling to much exceeding the corolla. They are conspicuous features both in flower and fruit. The corolla is rotate, porcelain-blue and relatively conspicuous. Each petal is sharp pointed, ranges between 0.5-1.5 cm long, and has at its base pairs of distinctive scale-like, fringed nectar producing appendages. The stamens are borne on the short corolla tube. The stigmatic surface is decurrent along the sides of the narrowly egg shaped ovary. The fruit is an oblong capsule (0.5 to 1.7 cm) somewhat acute, which contains numerous small seeds. This species flowers in Maine from mid-August to late September and early October.

Another annual member of the Gentian Family, northern gentian (*Gentiana amarella*), also occurs in wetland fen habitats of east-central Idaho, and also flowers late in the season. The two species are somewhat similar in size and stature, but the corolla of northern gentian is darker purple and a narrow tube with lobes at the end, instead of the larger, widely-spreading petals of marsh felwort with lobes longer than the tube (Moseley 1992).

C. Distribution

Circumboreal, Greenland to Alaska in North America, south in the Rocky Mountains to Colorado, and Maine in the east. Also known from northern Europe and northeastern Asia. In Idaho, occurs in Lemhi and Custer counties (Birch Creek, Summit Creek, Texas Creek, and to be expected in other alkaline fen systems).

D. Habitat

Alkaline, subirrigated fen systems. *Lomatogonium rotatum* appears to occur in several of the bands of communities that form along these spring-fed stream systems, probably responding opportunistically to annual germination conditions. Associated species includes those of the wet rich-fen communities with saturated soils (*Carex utriculata*, *Carex simulata*, *Eleocharis pauciflora*, *Primula alcalina*) and also on the slightly elevated hummocks with slightly drier soil surfaces (*Thermopsis montana*, *Salix candida*, *Dodecatheon pulchellum*, *Potentilla fruticosa*, *Juncus balticus*).

E. Reproductive Ecology

As an annual, *Lomatogonium rotatum* reproduces exclusively by seed. It is unknown if seed is stored in the soil.

F. Issues

i) Population Trends

While locally abundant, no estimates of population sizes have been made, nor have maps of the spatial distribution of the species at known sites been prepared.

ii) Threats

Weeds: Several weeds species are known to occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) or may possibly occur (*Potentilla recta*). All of these may be a potential threat on the drier habitat areas occupied by *Lomatogonium rotatum*. At one spot (the first bridge crossing from the Guard Station), *L. rotatum* grows among a patch of *Cirsium canadensis*.

Herbivory: Moseley (1992) notes that *L. rotatum* is locally abundant throughout the Birch Creek fen under various grazing regimes and intensities. Long-term trends under grazing are unknown. As an annual, grazing may benefit *L. rotatum* by creating small open microsites for germination and seedling establishment and reducing competition from taller graminoid perennials, but grazing may also reduce seed production if plants

are top-grazed before seed is disseminated. Most of the population at Birch Creek has been protected from grazing since 1997.

Timber Management: Not applicable.

Other: Recreational activities may have potential impacts at some sites. The Kaufman Guard Station, for example, receives fairly heavy fishing use, but most trampling occurs on existing footpaths.

iii)

Management Needs and Recommendations

Additional potential sites (Eighteenmile, Brazeau Springs, the Upper Lemhi area around Leadore, The Pines along the Pahsimeroi) should be surveyed. Extent and condition, as well as potential threats, should be assessed.

G. References

Famous, N. C., and C. S. Campbell. 1985. *Lomatogonium rotatum*. In: The Nature Conservancy Element Stewardship Abstract [Data base]. Boston, MA: The Nature Conservancy, Eastern Regional Office.

Moseley, R.K. 1992. Ecological and floristic inventory of Birch Creek Fen, Lemhi and Clark Counties, Idaho. Cooperative Challenge Cost-share Project, Targhee National Forest, Salmon District BLM, and Idaho Conservation Data Center, Idaho Department of Fish and Game.

Oxytropis besseyi (Rydb.)Blank. var. *salmonensis* Barneby

Challis Crazyweed Fabaceae

A. Description

Tufted perennial with flowering stems up to 20cm tall. Herbage silvery with white hairs pressed flat against the leaves and stems. Leaves all basal, 2-11cm long with 7-21 leaflets, each 5-20mm long. Inflorescences a crowded raceme of 5-30 deep reddish-purple flowers on leafless stems. Flowers 18-24mm long, the banner erect, both the keel and wings with abruptly pointed tips; calyx 10-15mm long, hairy. Pod 1-2cm long, with a 5mm long beak at the tip, densely hairy.

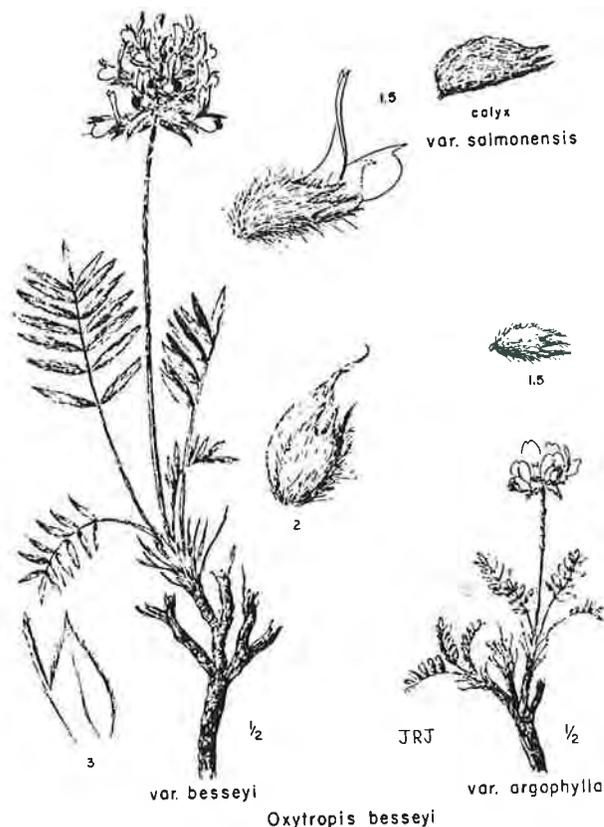
B. Technical Description

Hitchcock and Cronquist (1961): Cespitose perennial, silvery with appressed hairs throughout or (as generally) with spreading hairs on the calyx and pod; leaves 2-11cm long, the stipules membranous, adnate to the petiole over half their length, only slightly or not at all connate; leaflets (5)7-21, not verticillate, 5-20mm long; racemes closely 5-30-flowered, the peduncles erect, (3)8-20cm tall; bracts herbaceous, sparsely appressed pilose; flowers deep reddish-purple, fading to bluish, 18-24mm long; calyx 10-15mm long, sparsely to rather densely hispid-hirsute, distinctly appressed, usually investing the pod until near maturity (but not accrescent) and finally ruptured, the linear-lanceolate teeth $\frac{2}{3}$ as long as the tube; banner erect; wings usually bifid; beak of the keel 1-1.4mm long; pod 1-2cm long, the upper suture intruded about halfway, the beak about 5mm long.

Astragalus purshii resembles the Challis crazyweed, but differs in flowers that lack the long pointed tip of *O. besseyi* and pods that lack long beaks. Leaves of *O. besseyi* are longer and narrower than *A. purshii*.

C. Distribution

The variety *salmonensis* is a Challis endemic, relatively common in the Challis area, south to Warm Springs, along the East Fork and the Salmon River to Ellis.



D. Habitat

Full sun, often on dry south-facing, steep (30%) to more gentle slopes, but occasionally occurring on every slope location from ridge crest to bottom washes. Sandy to gravelly erosive substrates derived from Challis Volcanics. Usually dry, sparsely vegetated, open communities. *Achnantherum hymenoides*, *Pseudoroegneria spicata*, *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex confertifolia*, *Poa secunda*, *Sitatnion hystrix*, *Enceliopsis nudicaulis*, *Elymus ambiguous* var. *salmonensis*.

E. Reproductive Ecology

Flowers in June and July, pods form by August. Nothing is known about breeding system, seed set, germination requirements or seedling dynamics. The plant is perennial, and I have not observed many seedlings.

F. Issues

i) Population Trends

Many populations are quite large, recorded as numbering in the thousands in the late 1980s and early 1990s. No recording of population size has been done in the last decade, however, so the current size and the trends over the past 10 years is unknown.

ii) Threats

Weeds: Weeds are not known to be a current problem. *Bromus tectorum* would be the most likely weed that may infest these sites and its occurrence should be watched.

Herbivory: I have occasionally observed cattle trails across populations, but never any use by cattle. Dispersing pods sometimes pile up in a cattle trail.

Timber Management: No timber or trees occur on these sites.

Other: Mining exploration has impacted populations in the past. Road reconstruction and even simple grading can affect roadside populations. Often, however, these roadside populations are short-lived colonies arising from a nearby population on unaltered slopes. Source populations are often located above roadside colonies, which are initiated by pods rolling downslope and catching in roadside borrows.

iii) Management Needs and Recommendations

Populations should be revisited, especially those for which fairly good estimates of size in the past exist. Re-assessing size and condition could serve as a gross indicator of trends over the past decade.

G. References

Hitchcock, C.L.; Cronquist, A. 1961. *Oxytropis*. Pages 337-345 in: Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W. Vascular Plants of the Pacific Northwest, Part 3. Saxifragaceae to Ericaceae. Seattle, WA: University of Washington Press.

***Penstemon lemhiensis* (Keck) Keck & Cronq.**

Lemhi Penstemon Scrophulariaceae

A. Description

Elzinga 1997: *Penstemon lemhiensis* is a robust non-rhizomatous perennial plant. Plants have clusters of one to several rosettes arising from a base branched just below the ground surface. Some rosettes give rise to unbranched flowering stems 15-30" tall. Striking dark sky blue flowers are borne in a single spike up to 12" long. Flowers are tubular, flaring gradually to the mouth, with two lips on top and three on the bottom. Each flower can be up to 1.5" long. Flowers contain five stamens, four of which are fertile, and one of which is sterile (the staminode). In many species of *Penstemon*, the staminode is hairy (bearded), from which comes one of the common names in the genus - "beardtongue." In *Penstemon lemhiensis*, the staminode lacks hairs. Sepals are up to 0.5" long, with about half the length forming a long narrow tip, occasionally with a few irregular teeth. Stem leaves are untoothed, opposite on the stem, and clasping to sessile at the base. Basal leaves have petioles. Leaves either lack hairs, or have only short inconspicuous ones, most visible along the margins.



P. lemhiensis

J RJ

B. Technical Description

Perennial herb, 3-7dm tall, with 1-several stout stems from a branched caudex. Leaves often finely hirtellous-puberulent, but sometimes glabrous or merely cinereous along the margins; margins entire; basal leaves clustered, 3-20cm long and 1-2.5cm wide, petiolate; blade oblanceolate to narrowly elliptic; cauline leaves sessile, opposite, lanceolate, 2-12cm long and 0.5-2cm wide, generally becoming progressively smaller above. Inflorescence glabrous; verticillasters 3 to many, more or less secund. Calyx 7-11mm long, segments lanceolate to narrowly ovate, evidently but not strongly scarious-margined below, tapering to a long acuminate or subcaudate tip about as long as the body; corolla bright blue to purplish, 40-55mm long, about 1.5mm wide at the mouth; pollen sacs 1-3mm long, divaricate and sometimes sigmoidally twisted, evidently dentate-ciliolate along the sutures, pubescent near the connective

and on side opposite the dehiscence; staminode glabrous. Fruits are capsules 10-15mm long; seeds 2-3mm long. (Keck 1940; Hitchcock et al. 1959; Dorn 1984).

Cronquist (in Hitchcock et al. 1959) considered *P. lemhiensis* to be part of a geographic replacement series of closely related, but "technically well-marked," species that include *P. speciosus*, *P. payettensis*, *P. cyaneus* and *P. pennellianus* (Table 1). These are all members of the *Penstemon* Section *Glabri*, which as a group includes common perennials found throughout the Intermountain West (Meyer and Kitchen 1994). Elzinga (1997) notes that contrary to Keck and Cronquist's (1957) assertion that all of these species are geographically isolated, the ranges of *P. lemhiensis*, *P. payettensis* and *P. cyaneus* overlap slightly. At the southwestern edge of the range of *P. lemhiensis*, and in the Lemhi Mountains, some populations combine characters of these three species, suggesting that hybridization may occur.

Table 1. Technical characteristics of *P. cyaneus*, *P. lemhiensis*, *P. payettensis*, *P. pennellianus* and *P. speciosus* (based on Hitchcock et al. 1959). Leaf and calyx shape and hairiness of the staminode are the characters most commonly combined in potentially hybridizing populations.

Species	Vegetative Characteristics	Calyx	Corolla and Anthers	Staminode
<i>Penstemon cyaneus</i>	Basal leaves up to 16cm long and 2.5cm wide; blade petiolate, oblanceolate to narrowly elliptic; cauline leaves up to 11cm long and 3cm wide; glabrous to glaucous	4-7mm long, segments broad, with erose-scarious margins, inconspicuously or scarcely pointed	Corolla 25-35mm long, 1cm wide at mouth; pollen sacs 1.8-3.0mm long, divaricate, sigmoidally twisted downward, ciliolate along sutures and hispidulous on surface, proximal portion indehiscent	Sparsely to moderately short-bearded
<i>Penstemon lemhiensis</i>	Leaves similar to <i>P. cyaneus</i> , averaging a little narrower; often finely hirtellous - puberulent	7-11mm long, segments lanceolate to narrowly ovate, evidently but not strongly scarious-margined below, tapering to a long acuminate or subcaudate tip	Similar to <i>P. cyaneus</i> ; a single specimen with glabrous anthers	Glabrous
<i>Penstemon payettensis</i>	Basal leaves up to 15cm long and 5cm wide, petiolate, oblanceolate to broadly ovate; cauline leaves sessile, lance-ovate to ovate, clasping, 1.5-4cm wide; glabrous	5-8mm, scarcely to evidently scarious-margined, with a more or less elongate, acuminate to subcaudate tip	Corolla 18-28mm, 1cm wide at the mouth; pollen sacs 1.1-1.9mm long, oppositely divaricate, straight, setulose-dentate along the sutures	Short-bearded
<i>Penstemon pennellianus</i>	Basal leaves up to 27cm long and 4cm wide, petiolate, oblanceolate to narrowly elliptic; cauline leaves sessile, broad and clasping; 6-9cm long and 2.5-4cm wide (2-3x as long as wide), glabrous	6-9mm, scarious-margined, with an acuminate tip	Corolla 26-33mm long, 1cm wide at the mouth; pollen sacs 1.9-2.5mm long, oppositely divaricate, sigmoidally twisted, setose-dentate along sutures and hispidulous on surface toward the indehiscent proximal end	Short-bearded
<i>Penstemon speciosus</i>	Basal leaves to 9cm long and 2cm wide, petiolate, lanceolate to ovate; cauline leaves sessile, lanceolate, subcordate, 3.5-7cm long and 0.3-1.2cm wide; glabrous to puberulent	6-10mm, segments lanceolate to ovate, tips acuminate to acute; margins scarious and erose	Corolla 25-32mm long, 1cm wide at the mouth; pollen sacs 2-3mm long, oppositely divaricate and sigmoidally twisted; setulose-dentate along the sutures, glabrous to sparsely hairy	Glabrous to short-bearded

From these characters, the following short key provides for the separation of the two species similar to and occurring within the range of *P. lemhiensis* (adapted from Hitchcock et al. 1959, Dorn 1984 and Keck and Cronquist 1957).

Key to Similar Plants within the Range of *Penstemon lemhiensis*

1. Pollen sacs 1.1-1.9mm, straight or arcuate, becoming opposite or upwardly divaricate after dehiscence, glabrous except along the sutures, sometimes obscurely short-hairy toward the connective, wholly dehiscent; corolla 18-28mm.....*Penstemon payettensis*
 1. Pollen sacs 1.8-3.0mm, sigmoidally twisted, downwardly divaricate (sometimes opposite in *P. cyaneus*); proximal portions remaining indehiscent; corolla 25-38mm
 2. Calyx 4-7mm, the segments very broad and with prominently erose-scarious margins, inconspicuously or scarcely pointed; staminode bearded.....*Penstemon cyaneus*
 2. Calyx 7-11mm, segments long-acuminate or subcaudate, less prominently scarious, staminode glabrous.....*Penstemon lemhiensis*
-

Note that this key will not perform well on the southwestern edge of the range of Penstemon lemhiensis where apparent hybridization and blurring of characters occurs. Elzinga (1997) provides a map that illustrates areas in Idaho where problematic populations have been observed.

C. Distribution

In Idaho, it is found along the Continental Divide from Leadore north to Lost Trail Pass, west to Horse Creek Pass in the Bitterroot Mountains and south along the Salmon River Range approximately to Williams Creek. It is absent from the Lemhi Mountains. In Montana from just south of Darby, east to Butte, and south to Dillon -- in the Bitterroot, Highland, and Pioneer Mountains.

D. Habitat

Elzinga 1997: With an elevational range from 3200 to 8100 ft., *P. lemhiensis* can clearly occupy a range of sites. These elevational differences show no microsite pattern (such as drier and warmer aspects at higher elevations) or distributional pattern (higher sites at the southern edge of the range). Extreme elevational distributions are exhibited by populations located within the same drainage or within a few miles of each other. Slopes vary from 60% to nearly level, although most sites range from 10-30%. Aspect is generally south (southeast and southwest), but *P. lemhiensis* occurs on all aspects. Obviously, associated vegetation is also variable, ranging from ponderosa pine savannah along the lower Salmon River in Idaho to limber and lodgepole pine at some sites in Idaho and Montana. The most common habitat is mountain sagebrush/bluebunch wheatgrass openings in sparse Douglas-fir stands, but *P. lemhiensis* also occurs in sagebrush/grassland habitat (mostly mountain sagebrush sites). These types of habitats are widespread throughout the range of *P. lemhiensis*. Such lack of habitat specificity is unusual

in a rare species, and makes prediction of habitat and focused range-wide inventory efforts difficult.

Soils are derived from a number of parent materials including granitics, dolomite, limestone, and volcanics. Soil texture can be generally characterized as clay to sandy loams. A nearly constant feature of soils on all *P. lemhiensis* sites is a high percentage of coarse fragments ranging in size from 1cm to a few decimeters. Many sites have shallow soils, which results in natural slope slippage and low vegetative cover of associated species.

Elzinga (1997) identified 7 types of habitat in which *P. lemhiensis* had been found. Of these, 4 occur on lands administered by the BLM:

Deep-soil Rangeland (Type 1): Sagebrush/grassland dominated by *Artemisia tridentata vaseyana*, *Pseudoroegneria spicata*, and *Festuca idahoensis*. Soils are deep, usually sandy to clay loams, and often rocky or gravelly. Sites are usually benches or alluvial deposits. Slopes are often steep, creating the bare soil microsite inhabited by *Penstemon lemhiensis* through slope movement and erosion. Common associated species are *Balsamorhiza sagittata*, *Crepis modocensis*, *Sedum lanceolatum*, *Calochortus nuttallii*, *Eriogonum heracleoides*, *E. umbellatum*, *Potentilla glandulosa*, *Lupinus* spp., *Poa nevadensis*, *Stipa* spp., *Koeleria nitida*, *Castilleja pallescens*, and *Viola beckwithii*.

Shallow-soil Rangeland (Type 2): Near or in rocky outcrops. Vegetative cover is low, but is usually dominated by *A. tridentata* var. *vaseyana* and *Pseudoroegneria spicata*. Soils are shallow with large coarse fragments or outcrops. Soil texture is clay to sandy loam. Slopes are moderate to gentle, the bare soil microsite created by shallow harsh soils rather than the steepness of the slope. Common associates are *Artemisia frigida*, *Achillea millefolium*, *Antennaria microphylla*, *Chrysothamnus viscidiflorus*, *Sedum lanceolatum*, *Phacelia linearis*, *P. heterophylla*, *Gilia aggregata*, *Eriogonum ovalifolium*, *Astragalus miser*, *Stipa comata*, and *Poa secunda*.

Deep-soil Douglas-fir Openings (Type 3): Similar to Type 1 in vegetative structure but found small openings in sparse Douglas-fir stands. Douglas-fir regeneration is common and sites may be lost to canopy closure. Often the occurrence of *P. lemhiensis* in these openings appears to be related to human disturbance such as old mining roads, skid trails, and mining pits. Vegetation is similar to Type 1 except for the addition of Douglas-fir and a few additional species such as *Heuchera grossulariifolia*, *Antennaria racemosa*, *Physocarpus malvaceus*, *Spiraea betulifolia*, and *Symphoricarpos* spp. Occasionally these sites may also contain some *Populus tremuloides*, especially if they are near the bottom of a slope.

Shallow-soil Douglas-fir Openings (Type 4): Similar in vegetative structure to Type 2 but found small openings in sparse Douglas-fir stands. Soils appear to be too shallow and hot to support Douglas-fir, and regenerating trees are rare in the openings. These sites occur from the Douglas-fir/sagebrush ecotone, up to the Douglas-fir/lodgepole ecotone, although occupied openings are rarely in pure lodgepole pine stands.

E. Reproductive Ecology

(This information is primarily from Elzinga 1997.)

Plants overwinter as semi-evergreen rosettes, and previous year's seedheads are often visible into the next year. Plants begin producing new leaves in the early spring (March to April, depending on elevation). Flowering stalks begin forming in early May, and bloom from late May to late June. Plants form fruit from June to August, and by late August fruits are mature and begin to dehisce and disseminate seed. These general phenological dates are highly variable depending on aspect, elevation, and annual weather patterns. Flowering period, for example, can vary by as much as four weeks at the same site between years.

Penstemon lemhiensis only reproduces by seed, although individual plants may become quite large, with several rosettes arising from a branched caudex and taproot. Observations suggest that a larger percentage of plants in disturbed habitats such as roadcuts are reproductive and produce more inflorescences per plant compared to those in native habitats. Data from 13 populations observed in 1994 showed 70% of the individuals in roadcut populations were reproductive compared to 41% in native habitat (difference significant at the $P < .05$ level). Of the plants observed along roadcuts, 10% (9 individuals) supported more than four inflorescences (three of which had nine or more inflorescences); no plants in native habitat supported more than four inflorescences. Approximately 71% of the reproductive individuals in native populations only supported one inflorescence, compared to 53% in the roadcut populations (Elzinga, unpublished data.)

Ramstetter (1983) observed that the flowers of *Penstemon lemhiensis* are protandrous, which means the anthers shed their pollen before the stigma within the same flower becomes sticky and receptive to pollen. She also found that flowers pollinated by hand from pollen from the same plant (which required using different flowers since the pollen matures before the stigma) achieved a seed set rate of only 2.1%, while open-pollinated flowers with the anthers removed had an average of 17.3% (similar to controls). These observations suggest that *Penstemon lemhiensis* is a nearly obligate outcrosser requiring cross-fertilization from different plants. This has important implications for small populations in which only one or two individuals bloom, and may explain the high number of aborted flowers observed at some populations.

Ramstetter (1983) observed 13 insect species visiting *Penstemon lemhiensis* flowers. Of these, seven were seen actually entering flowers and contacting stigmas or anthers. These include, in order of importance, a vespid wasp (*Pseudomasaris vespoides*) and several bees: *Osmia brevis* (mason bee), *Lasioglossum trizonatus*, *Osmia bruneri*, *Osmia bucephala*, *Bombus centralis* (bumblebee) and *Anthophora ursina* (digger bee). Of these, *P. vespoides* appears to be the most important. At three sites it was the only species observed visiting *Penstemon lemhiensis*. These wasps were not observed visiting flowers of any other species during the period of *Penstemon lemhiensis* blooming. Additional observations by other investigators found that the vespid wasp was the most frequently encountered insect visitor to *Penstemon lemhiensis* (Shelly 1987; Watson 1976).

Seed production may be somewhat pollinator-limited. Ramstetter (1983) found that flowers cross-pollinated by hand had a seed initiation rate of 29.6%, significantly higher than the control value of 18.6% ($p < .05$). Watson (1976) observed that pollinators were only found in large populations, and speculated that small populations (less than 30 plants) were not located by pollinators. Most small roadside populations, however, appear to produce fruit successfully at least on some years (Elzinga, personal observations).

Natural seed set (seed matured) of plants observed by Ramstetter (1983) averaged 17.8% of ovules. Plants cross-pollinated by hand showed slightly higher success (22.5%). These values are slightly lower than the seed initiation rate (18.6% in controls and 29.6% in hand cross-pollinations), suggesting that plants may not have the resources to mature all initiated seeds, or that seed predation or disease reduces seed production before maturity.

Fertilization and fruit formation appears highly variable from year to year. Average number of fruits per inflorescence on monitored plants was mostly less than 20 at the Montana sites, and averaged 7-12 at the Idaho sites (Elzinga 1997). The failed flower rate was generally over 50%, and often over 70%, perhaps partially a result of lack of pollinators, but also possibly due to a lack of resources required to grow fruit to maturity. Observations suggest that seed set is especially poor during drought years, a function of either reduced pollinator visits due to suppressed pollinator populations, or reduced moisture resources for the plant to funnel into fruit and seed production. Complete failure to set seed has also been observed on cold, wet summers (Ramstetter 1983).

Seed production per capsule is variable by year and by site (Table 2), ranging from 20-40 seeds per capsule (Ramstetter 1983; Shelly and Heidel 1993). Potential seed production per plant can be 500 or more seeds, although actual average production is usually much lower.

Table 2. Seed production per capsule, Forest Service Monitoring Transects (from Shelly and Heidel 1993). Values are mean number of seeds per fruit (standard deviation). Data were not recorded at the French Creek sites in 1991 because of lack of fruit production.

	YEAR		
	1989	1990	1991
French Creek Park Mine	32.7 (11.2)	33.8 (8.9)	NR
French Creek Discovery Mine	34.0 (10.3)	31.4 (8.4)	NR
Badger Pass North	36.0 (12.1)	35.6 (12.4)	28.2 (12.4)

Penstemon lemhiensis has no physical structures that may aid in long-distance dispersal. It is likely that most seeds fall from dehisced capsules within a meter from the parent plant (Ramstetter 1983). Some short-distance dispersal may result from ant collecting and caching. It is possible that long-distance dispersal vectors include birds and mammals that eat the seed or inflorescences. Inflorescences are routinely browsed by ungulates, although this usually takes place during the flowering period rather than after fruit and seed production.

Human dispersal appears common. *Penstemon lemhiensis* has been observed in small populations along road cuts and fills. Usually these are near a larger population in undisturbed habitat that has been bisected by road construction. Seeds are moved by heavy equipment during construction and maintenance activities. Isolated roadside populations may be explained by transportation of seeds retained in caked-on mud on the construction equipment which are then released during operation in a distant area.

No seed viability studies have been published on *P. lemhiensis*. A study of two closely related species, *P. speciosus* and *P. cyaneus*, found 90% or higher viability (Meyer and Kitchen 1994).

According to monitoring data collected in Montana, germination conditions appear to have been best in the year with the lowest mean maximum temperature and highest summer precipitation. Seedling establishment is variable. At one site only 3% of a flush of 66 seedlings survived, while at another in the same time period more than 50% of the seedlings survived.

Penstemon lemhiensis seed requires dormancy-breaking conditions, which in the wild are provided during winter by moist chilling. In the lab, *P. lemhiensis* will only germinate after treatment with moist chilling or gibberellic acid (Ramstetter 1983; Meyer, personal communication), but even after treatment, some portion of the viable seed will remain dormant and not germinate, suggesting the formation of a seedbank.

In a study of thirty-eight species of *Penstemon*, Meyer et al. (1994) found that most exhibited laboratory germination patterns that suggested retention of a dormant fraction in a seedbank under natural conditions. Germination patterns from mid-elevation species (similar habitats as *P. lemhiensis*) exhibited an average chill-responsive fraction of less than 75% of the viable seeds. This fraction responded to chilling as a germination cue, providing for spring germination. The other fraction, however, was non-responsive to any length of chilling. This fraction, ranging up to 70% of the viable seeds for some species, potentially provides for carryover of a persistent seedbank.

Two species closely related to *P. lemhiensis* were tested by Meyer et al. (1994). Germination of viable seeds of *P. cyaneus* after 24 weeks of chilling was only 35%, suggesting the remainder is banked in the soil, while that of *P. speciosus* was 90% (Meyer and Kitchen 1994). A small lot (a few hundred seeds collected in 1990) of *P. lemhiensis* showed only 23% germination of viable seeds after 24 weeks of chilling, suggesting that the formation of a seedbank is likely (Meyer, personal communication). Ramstetter succeeded in germinating only 4% of the seed after pre-treatment. Longer chilling may have resulted in more germination (Meyer et al. 1994).

Additional evidence for the formation of a seedbank comes from the five years of monitoring data collected in Montana in which a lack of seed production for two years was followed by the appearance of seedlings on the third year.

Established plants can survive at least six years, and in some populations many of the original plants measured when the monitoring transects were established remained alive throughout the monitoring period. For example, of the 38 plants marked at Badger Pass Microwave in Montana in 1991, 35 were still alive in 1995. At another site, however, (Badger Pass North) only one of the 105 plants alive in 1989 survived to 1994.

F. Issues

i) Population Trends

Penstemon lemhiensis populations vary in size from year to year, sometimes dramatically. Observational monitoring at the Ramsey Mountain population found several hundred flowering plants in 1995 (July 26), 11 flowering and 1 vegetative in 1998 (7 August), 32 flowering and 27 vegetative in 2000 (July 19) and 28 flowering and 43 vegetative in 2001 (July 23) (Ulmschneider, pers. comm.). Similar declines were observed at many monitored populations in Montana and Idaho in the early 1990's.

These trends are alarming, but may be a natural pattern of decline and resurgence. Most *Penstemon* species are short-lived (Meyer and Kitchen 1994; Meyer et al. 1994) and populations have typically been observed to fluctuate dramatically (Meyer, personal communication). If seedling establishment conditions are not met for several years, populations may appear to "crash," but it is likely that during favorable years, or perhaps after disturbances such as fire, populations may re-establish.

One piece of evidence suggesting that populations exhibit large fluctuations naturally is the series of observations at the Badger Pass Microwave site in Montana. Watson (1976) noted only five plants at the site. In 1986, 190 plants were counted, 75 of which were in the exclosure. The record for 1989 reads: "very few plants observed and none found inside the exclosure." In 1990, 44 plants were marked with rebar in the exclosure, and in 1991, additional plants were included in transects.

ii) Threats

Weeds:

Application of herbicide to control roadside weed infestations has been noted as a threat in past conservation evaluations (Shelly 1987). Roadside weed spraying is commonly done on all county-administered roads in Idaho and Montana. Cooperative programs with counties may also

give the counties responsibilities for roadside weed spraying along FS and BLM roads. Roadside spraying under these agreements is particularly difficult for agency specialists to manage. Communication of areas to avoid often passes through several layers of bureaucracy, and is often misinterpreted or ignored at the county field crew level. In the absence of cooperative agreements with the county, agency crews may be responsible for herbicide application along agency roadways, but since these crews are usually a part of a different administrative division than the resource specialist, communication remains difficult. At least one roadside population is thought to have been eradicated by roadside herbicide spraying by BLM crews in Montana (Heinze, personal communication) and another on the Salmon NF (Henderson 1981). Approximately 70% of the known populations are at risk from this activity due to their roadside location.

Conversely, infestation by noxious weeds is a more serious threat to overall species viability than the occasional roadside population threatened or eradicated by roadside herbicide application. Spotted knapweed (*Centaurea maculosa*) is the most important threat. None of the populations visited in 1994 lacked spotted knapweed (Elzinga, personal observation), and at some, most notably the populations along Panther Creek and the Salmon River, knapweed was abundant and *P. lemhiensis* absent or declined from earlier population counts (Elzinga, personal observations). A biologist with the Salmon NF noted that at sites along Panther Creek, knapweed had dramatically increased over amounts observed 2-3 years previous (Schuldt, personal communication). Knapweed infestation is also severe at some of the lower elevation sites in Ravalli County.

Spotted knapweed is a direct threat to *P. lemhiensis* populations. Observations suggest that *P. lemhiensis* and spotted knapweed occupy the same bare soil microsites (Elzinga, personal observations). A strongly competitive species, knapweed can possibly displace adult *P. lemhiensis*, perhaps through allelopathic mechanisms (Locken and Kelsay 1987). It likely also competes for germination openings with *P. lemhiensis*. Spotted knapweed is a prolific seed producer, up to 30,000 seeds/m² (Schirmann 1981). These can germinate in the fall, given suitable conditions (Eddleman and Romo 1988), and thus usurp potential germination sites from *P. lemhiensis*, which germinates in the spring. The observation of loss or severe declines of *P. lemhiensis* in communities where knapweed infestations have increased, and the observation of the apparent robustness and high fecundity of roadside *P. lemhiensis* (which are often not subject to competition), provide strong anecdotal evidence of the current and potential severity of the problem.

At the Ramsey Mountain population, spraying of knapweed has been done annually since 1999 on the road from just below the last switchback to down to the flat. Within the population area knapweed has been pulled by hand since 1998 (Ulmschnieder, pers. comm.).

Herbivory:

Ramstetter (1983) noted browse loss of flowering stems of 90% measured at Argenta (MT001) took place almost exclusively between 6 July and 27 August, the period of flowering and early

fruit set. Crofts (1990) noted complete herbivory by deer of a small population over a nine-day period in mid July, before fruit had matured. Deer especially appear to preferentially use flowering stems of *P. lemhiensis*. Apparently, once seed has matured and the stalks dried, they are no longer palatable, although some occasional use may occur. Because most use takes place before seeds are mature, there is no benefit from grazing in terms of seed dispersal.

Impacts of livestock grazing on *P. lemhiensis* are uncertain. The key mechanisms of impact are browsing of inflorescences and associated reduction in reproductive output, trampling damage, and indirect impacts through effects on community structure. It is unlikely that herbivory of leaves is common, since the low growth of the basal rosettes is mostly out of reach of the grazing animal. Unlike deer, cattle do not seem to exhibit a preference for *Penstemon lemhiensis* inflorescences. In some populations, however, use levels may compromise reproductive output so severely that the seed crop is inadequate to maintain the stand. *Penstemon lemhiensis* requires periodic reproduction by seed, since it does not reproduce vegetatively and is likely relatively short-lived. And unlike some perennial species, once grazed, *P. lemhiensis* does not produce another inflorescence or branch from the inflorescence stub (Ramstetter 1983).

The effects of trampling on *P. lemhiensis* are similarly uncertain. Ramstetter speculated that trampling and grazing, combined with the reduced reproductive output, may be responsible for the lack of *P. lemhiensis* outside the fenced Big Hole Battlefield Monument boundary compared to the large numbers of plants on similar habitat just inside the fence.

In general, low levels of livestock grazing do not appear to significantly compromise or negatively impact *P. lemhiensis*. Moderate to heavy levels, especially when occurring during the flowering season, may be damaging due to dramatic reduction in seed production. Use levels on *P. lemhiensis* sites can sometimes be very heavy, especially on small openings in timbered sites. This was observed at the Butte Highlands (Montana) populations in 1994, when the small meadow openings were heavily used by cattle (Elzinga, personal observations).

Timber Management:

Timber harvest activities may directly impact *P. lemhiensis* populations through mortality caused by substrate alteration during the construction of roads and skid trails and from heavy equipment travel in the sale area. Plants may be damaged or killed by being dug up or driven over. The overall impact of these activities on a population depends on several factors, including intensity of activity, soil moisture, and slope. It is likely that even minimal traffic and substrate disturbance will result in plant mortality because of the shallow root system of *P. lemhiensis*.

In most cases, populations are not found within timber stands, but rather at the edges of stands and in forest openings. These populations should be avoidable during harvest activities if populations are located during project planning. There is potential for impact in populations that are not located, either because surveyors overlook inconspicuous plants (non-blooming populations) or because the population is at a low point in population density cycles, and residing primarily below ground in the seedbank.

Other:

Roadside populations (94% of the Idaho) are vulnerable to impacts or even extirpation from standard road maintenance activities of grading, fill slope recontouring, and widening. These activities often take place on federally owned land with little internal discussion or review by botanical specialists. Populations along roads maintained by the state or county receive no protection.

iii)

Management Needs and Recommendations

In the 1997 Conservation Strategy, a single Class A (high priority) population was identified on the Salmon BLM. This is the Ramsey Mountain population, a site in habitat of relatively good condition, little knapweed within the boundaries of the population, and occurring on native range (as well as roadcut). The knapweed at the Ramsey Mountain population should continue to be sprayed and handpulled annually, and counts at the population should continue.

The Strategy identified two Class B populations: Wimpy Creek (ID010) and Warm Springs (ID012). These populations have not been revisited for several years. Knapweed was a significant issue in the mid 1990's, and certainly remains so. These population areas should be targeted for assessment and weed control activities as needed. In

addition, the Warm Springs population should be carefully monitored during road reconstruction of the Warm Springs Wood Road by the Forest Service in 2003 and 2004.

All known populations on BLM should be revisited periodically and conservation concerns noted (e.g., weeds, disturbance, other threats).

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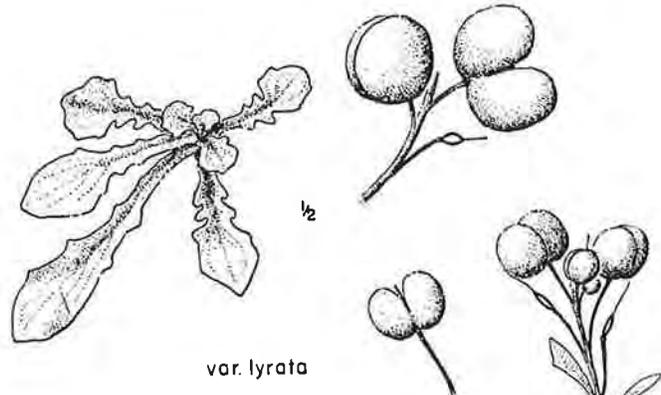
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Physaria didymocarpa var. *lyrata*

Salmon Twin Bladderpod Brassicaceae

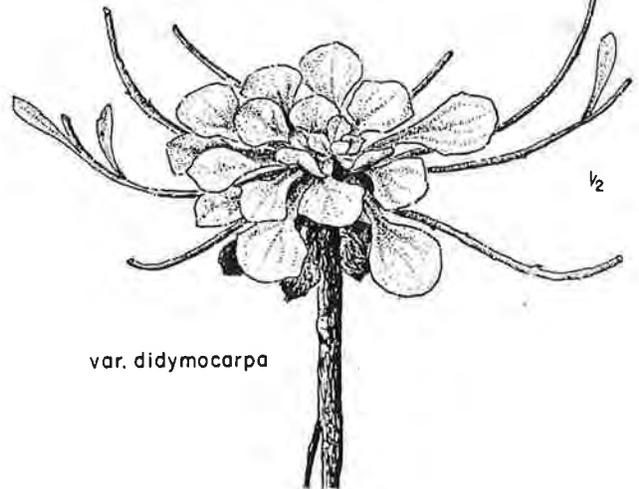
A. Description

Perennial with a large thick taproot topped by a tight rosette of silvery-hairy 2-8cm long leaves. Leaves spoon-shaped, usually with winged petiole that has lobes and the largest lobe at the tip forming the "spoon." Inflorescences of several yellow flowers at the tip of curved 7-18cm long stalks. Petals 4, 9-12mm long. Pods two chambered, inflated, up to 2cm long and as broad.



B. Technical Description

Hitchcock et al. 1964: Heavy-rooted perennial, often with a branched caudex, silvery-stellate, the hairs not closely appressed; stems usually many, somewhat decumbent-based, 2-17 cm long; basal leaves numerous, rosulate, marcescent, 2-8 cm long, the blades obovate or broadly oblanceolate to somewhat rhombic or even ovate, mostly obtuse, usually with a few inconspicuous to prominent teeth or entire, narrowed rather gradually to broad, winged, mostly lyrate, petiole-like bases about as long as the blades; cauline leaves several, reduced, mostly oblanceolate and entire; racemes somewhat closely flowered; pedicels slender to rather stout, 7-18 mm long, ascending, straight or somewhat curved but not sigmoid; lateral sepals not saccate at the base; petals yellow, broadly spatulate-obovate, 9-12 mm long; silicles much-inflated, 15-20 mm long and at least as broad, didymous, the base very slightly cordate, the apical sinus narrow, nearly closed, 2-4 mm deep; replum obovate to oblanceolate, more nearly obtuse than acute at the apex, 3-6 mm long, 2-3 mm broad; style 6-9 mm long; seeds 2-3 per locule.



Physaria didymocarpa var. *lyrata* is most likely to be confused with species of *Lesquerella*, at least when not in fruit. *Lesquerella* species generally have smaller leaves and pods and do not have the two-sided pods. Two other *Physaria* species may be found

in east-central Idaho, although not occurring with *P. didymocarpa* var. *lyrata*. *Physaria geyeri* occurs as two varieties, the widespread var. *geyeri*, and var. *purpurea*, which is endemic to Lemhi and Custer counties. Var. *purpurea* was considered of conservation concern in the 1980s, until surveys conducted by botanists from the University of Idaho Herbarium demonstrated it was relatively common within its narrow range (CDC website 2002). It can be distinguished from *P. didymocarpa* by its smaller, strongly compressed, only slightly inflated fruits. *Physaria didymocarpa* var. *didymocarpa* also occurs in Lemhi County (primarily in the southern Beaverheads and the east side of the southern Lemhi Mountains (CDC Website 2002)). The key distinguishing feature is the mature fruit size: var. *didymocarpa* has valves 8–12 (15) mm long as compared with var. *lyrata* with valves (12) 15–20 mm long (Rosentreter 1982). Mulligan (1967) found that *P. didymocarpa* var. *didymocarpa* plants collected in Montana were tetraploid ($2n=16$) while those collected in Lemhi County (apparently at the Williams Creek site) were hexaploid ($2n=24$); larger size is typical in plants of higher ploidy numbers.

C. Distribution

Endemic to the Salmon, Idaho area, with populations known from the following drainages: Basin Creek, Bear Valley Creek, Agency Creek, Pattee Creek (all in the Lemhi Valley) and Williams Creek (tributary to the Salmon River south of Salmon). In the early 1980s, potential habitat (based primarily on the known Williams Creek site) was delineated on aerial photos. Many of these polygons around Salmon were surveyed.

D. Habitat

Rocky, sparsely vegetated, generally south-facing slopes; substrate coarse-textured, often 3-7cm in diameter, loose to relatively stable, but probably periodically experiencing down-slope movement; elevation 4500-6800. Descriptions for each site follow (based on CDC records, Mancuso 2001, Craig and Craig 1996 and personal observations).

Pattee Creek (CDC01) Steep south-facing shale slopes along and above road and along ridge. Plants occurring over a few miles in 16 subpopulations on isolated areas of suitable natural habitat, and along roads, in abandoned exploration pits, and within the bed of a primitive road. Volcanic-derived talus, mostly 1-3" diameter, loose material; slopes mostly 30-45'. 5240-6000 feet. Associated with *Oenothera caespitosa*, *Phacelia hastata*, *Phenstemon humilis*, *Mentzelia albicaulis*, *Artemisia tridentata*.

Williams Creek (CDC02) Large steep southwest-facing slope of loose, pinkish to brown volcanic talus/scree/rock substrate. Most plants occur in smaller diameter substrate; most of steep face without *Physaria*. Low plant cover; stable sections of slope with *Artemisia tridentata*/*Pseudoroegneria spicatum*. 4500 feet. The pit has been used as a source of shale since the 1930's. In 1961 it was officially declared a community shale pit. A portion of the pit was closed in 1978 to protect approximately 1000 bladderpod plants. In early 1990 the entire site was closed to material removal. Subpopulation areas

were mapped in 1990. A monitoring photoseries was taken for several years in the late 1980s and early 1990s.

Agency Creek (CDC03) Steep southfacing slope and associated roadcut of whitish, gray and pinkish-colored, loose to semi-stable rhyolitic talus/scoria. Open *Artemisia tridentata*/*Pseudoroegneria spicata* community; also *Prunus virginiana*, *Phacelia hastata*, *Chaenactis douglasii*, *Oenothera caespitosa* and *Bromus tectorum*. 5600 feet. Agency Creek road and livestock/game trails are the only disturbance.

Basin Creek (CDC04). Colorful, erosive and dissected volcanic exposure; loose scree, talus, gravels and fine-textured sands; *Physaria* seems to be most common on pinkish-brown-colored substrates. Steep, southerly-facing slopes with some interspersed gentle sections and spur ridges. Open mixed desert shrub/*Pseudoroegneria spicata* community, with *Phacelia hastata*, *Artemisia frigida*, *Eriogonum sp.* 6000-6400 feet. Population occurs in 16 small subpopulations totaling about 1000 plants in 1996 (Craig and Craig 1996). Disturbance is limited to game and cattle trails and one old road crossing.

Bear Valley Creek (CDC05). Southeast to southwest aspect, 15-45° slope; dry open mid to upper slope areas. Volcanic substrate with hoodoo outcrops; *Physaria* most common on loose, reddish-brown colored gravels with intermixed fine soil and on darker scree materials; least common on grayish-colored substrate that has eroded to sand. Open *Artemisia tridentata*/*Pseudoroegneria spicata* community; associated with *Phacelia hastata*, *Eriogonum microthecum*, *Chaenactis douglasii*, *Mentzelia laevicaulis* and *Penstemon sp.*; *Bromus tectorum* widespread at low density except locally common in deeper soil pockets. 6400-7000 feet.

Dry Creek (CDC06). First observed in 1994; 2 plants. No other information.

Lake Creek (CDC07). First observed in 1994. Moderately steep spur ridge, 20° slope, north to northwest aspect; 80-90% bare red and gray rocks 1-3cm diameter. Associated species include *Pseudoroegneria spicata*, *Haplopappus acualis*, *Eriogonum umbellatum*, *Geum triflorum*, *Festuca idahoensis*, *Artemisia frigida*.

E. Reproductive Ecology

Reproduction is by seed. *Physaria didymocarpa* requires cross-pollination (Mulligan 1968). It is pollinated by non-specific insect vectors; these species do not cover great distances in search of specific flowers thus it is likely the known occurrences are reproductively isolated (Rosentreter 1982). The seeds disperse almost entirely by gravity, although wind sometimes rolls the fruits on the ground for a limited distance (Craig 1992). Seedling establishment does not appear to be limiting. Craig and Craig (1996) observed seedlings on nearly every year and at all sites during their study. Low seedling numbers were observed during the two drought years of the study, but the percentage of the total population comprised by seedlings was over 50% on most years at most sites (Craig and Craig 1996). Seedling survival, however, may be limiting. Seedlings experienced the highest mortality of all stage classes observed (often 100%,

and nearly 90% averaged over all study sites and years and consistently above 69% on all sites and all years) (Craig and Craig 1996). Once established, however, mortality rates ranged as low as 4% up to 75% (for large reproductive plants) and from 15% up to 100% (small non-reproductive plants). Mortality appeared to be related to disturbance (slumping of slopes) and weather (drought).

Plants are suspected to be fairly long-lived. Rosentreter (1982) counted 8 swellings on a 2dm long root and assumed the swellings corresponded with years. Craig and Craig (1996) found some plants lived throughout their study (a minimum then of 6 years old). They noted that the average age was about 3 years old, but it is unclear from their report if plants established at the time their study began were included in that average, and if so, how old they were assumed to be. (Craig and Craig 1996).

F. Issues

i) Population Trends

Populations appear to have declined during the 1980s and 1990s. Michael Mancuso revisited several of the occurrences in 2000 and summarized the population size information for all occurrences (Mancuso 2001):

- Pattee Creek: 3000 plants in 1986, 75 in 1990, 65 in 2000
- Williams Creek: 100 in 1986, 26 in 2000
- Agency Creek: 100-200 in 1988, 150-200 in 1989, 150 in 2000
- Basin Creek: 500-1000 in 1986, 250 in 2000
- Bear Valley Creek: 100-1000 in 1992, 500-700 in 2000
- Dry Creek: 2 in 1994; no visit in 2000
- Lake creek: 120 in 1994; no visit in 2000

Populations appear to have declined dramatically at Pattee Creek, Basin Creek, and Williams Creek. Data are inconclusive for Agency and Bear Valley sites, but suggest that they may be stable.

During the 5 years density counts were made by Craig and Craig (1996), populations fluctuated in size corresponding to drought years (Table 1).

Table 1. Density (plants per m²) in permanent study plots at four monitored sites. Data from Craig and Craig (1996). 1992 and 1994 were drought years, whereas 1991, 1993 and 1995 were years of average to high precipitation.

	1991	1992	1993	1994	1995
Basin Creek	3.6	1.3			
Agency Creek	4.0	1.3	3.4	2.2	1.2
Pattee Creek	8.0	5.4	7.7	5.9	6.7
Williams Creek	2.1	1.3	3.4	2.4	0.4*

*Attributed to a major slump that occurred during heavy rains in 1995.

ii)

Threats

The conservation of *P. didymocarpa* var. *lyrata* was initially addressed by two Conservation Agreements between the U. S. Fish and Wildlife Service and the BLM. The initial Conservation Agreement was signed in 1984 (U. S. Fish and Wildlife Service 1984). A second Conservation Agreement was signed in 1990 (Elzinga 1990). This expired in 1995, and has not been renewed.

Weeds: *Centaurea maculosa* occurs within the Williams Creek and Agency Creek populations and occurs near the Bear Valley Creek populations. *Bromus tectorum* occurs on or near all sites. Research by Craig and Craig (1996) suggests it is presently not a major competitor.

Herbivory: Livestock grazing does not appear to be a threat at Williams Creek or Pattee Creek. Livestock/game trails have been noted at Agency Creek, Basin Creek, and Bear Valley Creek, and some use occurs on more gentle slopes, but livestock impacts appear to be minor. Direct herbivory has never been observed; any impacts would involve physical damage (trampling, substrate loosening) or indirect effects on the community. Mancuso (2001) noted in his report (occurrence record appendix) that "BLM specialists have also observed heavy utilization of *P. didymocarpa* var. *lyrata*" at Agency Creek. This statement may be in error. I observe that population several times a year and have never noted heavy livestock use. Craig and Craig (1996) noted that livestock use was minimal. Finally, the occurrence record entry itself notes at the end "a few old cowpies within occurrence, but livestock use does not appear to be more than light." Overall, livestock appear to be a minimal threat to *Physaria didymocarpa* var. *lyrata*.

Timber Management: No timber occurs on or adjacent to population areas.

Other: Most sites have experienced some impacts from road building and maintenance and mining, but none of the sites are experiencing current surface disturbance except for Agency Creek where the bottom of the slope is sometimes scraped by road grading activities.

iii)

Management Needs and Recommendations

Inventory needs for *Physaria didymocarpa* var. *lyrata* are minimal. The range of *Physaria didymocarpa* var. *lyrata* was thoroughly surveyed between 1985 and 2000 by botanists from the University of Idaho Herbarium, Conservation Data Center (see Moseley et al. 1990), and especially the BLM. In the late 1980s, the BLM identified potential habitat on aerial photographs (primarily in the Salmon River drainage) and inventoried these polygons with no new populations found. Additionally, personnel associated with the Salmon National Forest have also searched for this species. Not all areas, however, with potential habitat have been searched, especially where access is difficult, and along some private lands. New populations may continue to be periodically discovered, but most likely these will not be much outside the currently known restricted range. The Dry Creek and Lake Creek populations should be relocated and re-evaluated when mature fruit are available. Both are approximate to a nearby location reported as *P.*

didymocarpa var. *lyrata*, but determined as var. *didymocarpa* by Doug Henderson in 1995.

Monitoring. Craig and Craig (1996) represent the most extensive monitoring effort for this species, but many questions remain unanswered as far as trend and impacts of threats (especially weeds). Mancuso (2001) found that populations have apparently declined compared to estimates in the late 1980s, especially at Williams Creek. While declines at Williams Creek can be attributed to slope slumping resulting from unstable conditions caused by material removal in the past, declines at other populations, especially the Pattee site, are more troubling because no apparent change has occurred in habitat conditions (Mancuso 2001).

Craig and Craig's study point out the difficulty of physically sampling plants that grow on unstable slopes. While they tried to minimize observer impacts by using remote means (e.g., survey instruments, sampling frames on extended poles) some impacts as well as loss of data quality (seedling counts especially) occurred. Because of these limitations, and because currently the suggested declines can be attributed to different observers and methods, a monitoring method that limits physical impacts, yet provides a more quantitative tracking of population numbers is needed.

Mancuso (2001) established photomonitoring at Williams Creek, Agency Creek, and Bear Valley Creek. Additional photomonitoring should be established at Pattee Creek and Basin Creek. Populations should be revisited at least every other year and count estimates made, perhaps using size classes.

Photomonitoring was established at the Williams Creek site in 1986, and photos were re-taken through 1990. These photos should be in the files at the Salmon BLM office. Although retaking the exact series may be difficult, comparing the photos to current conditions would provide valuable documentation of the amount of slope changes that have taken place at the site in the past 17 years.

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***Primula alcalina* Cholewa & Henderson**

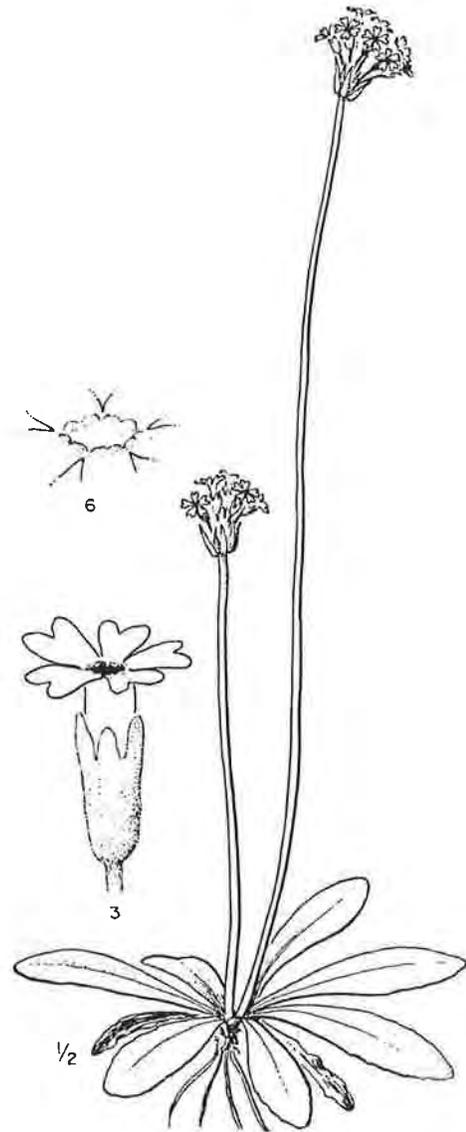
Alkaline Primrose Primulaceae

A. General Description

Elzinga 1997: Alkali primrose has a basal rosette of light green crinkly leaves, each about an inch long. When young, the leaf blades are "farinose" with a white mealy coating. Leaf blades are elliptical, narrowing at the base gradually to a winged petiole. Flowering stems lack leaves and range from 2.5-12 inches long. The flower cluster at the tip of the stem has 3-10 (2-15) white flowers with yellow centers. Flower petals are fused into a tube for their lower half, then flare into 5 spread lobes, each about 0.4-0.6 inches long. Parts of the flower (the involucral bracts at the base of the flower cluster and the cup-like structure that holds the petals- the calyx) are farinose.

B. Technical Description

Elzinga 1997: Plants farinose only when young, efarinose in age. Scapose perennials up to 24cm tall. Roots fibrous. Leaves 1-4cm long, elliptic-oblongate, narrowed gradually to a winged petiole. Margins creunlate or denticulate, sometimes entire. Venation revolute. Leaf surfaces crenulated. Rosettes 37mm (± 4 mm) in diameter and comprised of 12 (± 4) leaves. Scape 6.5-24cm long, erect to arched, medium green proximally and darkened distally, elongating in fruit. Inflorescence an umbel, 3-10 flowered, pedicels erect to 0.5cm long, farinose, purplish green. Involucral bracts plane at base, 0.4-0.7cm long, lanceolate, apex obtuse or acute. Flowers 6 (± 4) per inflorescences. Dystylous. Calyx campanulate, somewhat farinose, obscurely ribbed, 0.4-0.6cm long, green or with purple striations, lobed about 1/3 of its length, teeth with capitate glands. Corolla white, throat yellow; tube 0.4-0.7 cm long, 2mm in diameter; limb 0.6-1cm wide, lobes deeply cordate. Stamens about 1.5mm long, anthers located toward the middle of the corolla tube. Pollen 3-syncolpate. Stigma capitate, in pin plants located in upper third of corolla tube, in thrum in the lower third. Ovary with free central placentation, approximately 50 seeds per capsule, 1mm long, surface



reticulate. (Description based on personal observations, measurements of 359 individuals in Fitts [1995], and the species description in Cholewa and Henderson [1984]).

C. Distribution

Alkali primrose is known from alkaline spring-fed stream systems in east-central Idaho in Custer and Lemhi Counties: The Pines along the Pahsimeroi, Summit Creek, Moffett Creek (all in Custer County) Birch Creek, Texas Creek, Eighteenmile Creek (two separated spots) and Brazeau Springs (all in Lemhi County). An exhaustive search of potential habitat on public land, and some privately own parcels, was made by Elzinga in 1998.

An historical collection was made in 1936 by Frank Rose from meadows near Monida, Montana (Rose 471; MONTU), and was annotated as alkali primrose by Dr. Douglass Henderson from University of Idaho Herbarium, the coauthor of *P. alcalina*. This location was reported as a new record for Montana's flora (Lesica et al. 1986). Identification of the Rose specimen as alkali primrose was confirmed by Dr. Tass Kelso, Colorado College, in 1989. She noted that individuals with thrum and pin floral morphology occur on the collection sheet (Moseley 1989).

Thorough searches of over 20 alkaline meadows in southwest Montana, including meadows at Monida, by Peter Lesica in 1985 and 1986, yielded only negative results. He did, however, find two populations of the more common *P. incana* in the area, one at Monida (Lesica 1986b). Searches by Bob Moseley near Monida in August of 1988 also yielded no *P. alcalina*. He further concluded that current habitat does not appear suitable, since all the meadows that he examined were dry by late summer (Moseley 1989). Alkali primrose seems restricted to constantly subirrigated areas. Based on these surveys, Moseley (1989) concluded that the Monida collection is from a population now extirpated. There does appear to be some suitable habitat along the Red Rock Lakes Road (to Lakeview), just east of Monida (Elzinga, personal observation) and it is unknown if these areas were search by either Lesica or Moseley.

D. Habitat

Much of the following information is from Elzinga (1997).

Alkali primrose occurs close to the stream channel of spring-fed creeks. The local microclimate created by the relatively constant flow and temperature has not been measured, but it is expected that it would ameliorate winter and spring temperatures to some degree. Water temperature measurements on Summit Creek, two miles below its headwater spring, fluctuated between 49°F to 60°F from mid-January to mid-May in 1978 (Keller et al. 1979).

Wetlands associated with alkali primrose are unique due to the relatively stable spring-fed hydrology and the strongly alkaline chemistry. They are treeless, although some willow (*S. candida*, *S. boothii*, *S. planifolia*, *S. brachycarpa*, *S. psuedomonticola*) and occasional birch (*B.*

occidentalis) occur within the wetlands. Most understory and meadow areas are dominated by various graminoids, primarily *Carex* spp. Muir and Moseley (1994) identified three geomorphic surfaces occupied by primrose: bench, hummocks surrounded by muck or graminoids, and hummocks surrounded with water. Fitts (1995) identified just two types: bench and hummocks. Mansfield and Miyasaki (1993) identified eight habitat types at Texas Creek and Birch Creek: 1) shrubby bench -- low lying flat areas next to streams with shrubs; 2) low bench -- similar geomorphology as shrubby bench, but lacking shrub vegetation; 3) shrubby hummocks -- hummock area with shrubs; 4) fen hummocks -- hummock surface, but due to high water table the surface is unstable and "bouncy;" 5) low islands -- relatively flat low-lying islands in the streams; 6) dry hummocks -- hummocks lacking standing water or a high water table; 7) wet hummocks -- hummocks with standing water but no fen-like qualities; 8) oily water hummocks -- hummocks with standing water; water surfaces with oily appearance.

Wetlands containing the alkali primrose are fed by groundwater, and are not influenced by surface flows or run-off. Hydrology is thus fairly constant, with primrose sites remaining moist to saturated throughout the year. Some fluctuations do occur, however. Groundwater levels can fluctuate as much as 30cm (as measured in piezometer tubes) (Mansfield and Miyasaki 1993), and short-term flooding has been observed at Summit Creek and Texas Creek sites (Fitts 1993; Elzinga, personal observation). Texas Creek seems more responsive to precipitation events than the other sites, because rapid rises in standing water have been noted shortly after precipitation. Since no surface flows enter the Texas Creek wetland, precipitation must move rapidly through subsurface channels. Fluctuations at the other sites may take several days to a few weeks after a precipitation event to express, depending on the location and quantity of the precipitation (Elzinga, personal observations; Mansfield and Miyasaki 1993). These fluctuations differ from those of streams fed primarily by surface runoff in that they are moderated by subsurface flow, and that they are never extreme enough to cause erosive / depositional conditions.

Mansfield and Miyasaki (1993; 1996) found no direct significant relationship between primrose density and water table parameters (mean, seasonal minimum and seasonal maximum). Water table levels varied from 5 to 30cm below the surface (Mansfield and Miyasaki 1993). Multivariate analysis (non-metric multidimensional scaling -- NMDS) of the vegetation, which separated the plots into four groups, found that *P. alcalina* densities did vary with water table, but the relationship was not linear. The highest densities were found in the moderately wet sites, the two middle groups, with decreased densities in drier and wetter sites (Miyasaki and Mansfield 1996). Similar multivariate analysis of *P. alcalina* cover by Muir and Moseley (1994) found the same response. This unimodal non-linear response explains the lack of simple correlation between water level and *P. alcalina* density, and also suggests the narrow range of hydrologic conditions that *P. alcalina* can occupy.

This distribution may be partially regulated by competition. Density of reproductive individuals was highest in the wettest group defined by NMDS, although overall *P. alcalina* density was lowest in this group. Miyasaki and Mansfield (1996) suggest that this higher percentage of reproductive individuals can be interpreted to mean that wetter sites are actually the most favorable. Since these sites, however, are usually vegetated with aggressively rhizomatous

species such as *Carex nebrascensis*, *C. simulata* and *Eleocharis* sp, Miyasaki and Mansfield hypothesized that overall primrose densities may be lower because of intense competition.

Alkali primrose does not tolerate prolonged flooding. Moseley (1995) observed flooding caused by an apparent increase in flow from a spring at Birch Creek produce complete mortality of primrose in permanent monitoring plots. While roots may tolerate saturated conditions, leaves apparently must be exposed to the air. How the alkali primrose adapts to wet anoxic soil conditions is unknown. Fitts (1992a) noted that plants in wetter areas had larger thinner leaves and fewer roots. Whale (1983 and 1984) found that some *Primula* species withstand waterlogging better than others and suggested looking for aerenchyma in those species.

All members of the *Primula* section *Aleuritia* show a strong affinity for alkaline soils (Kelso 1991) derived from carbonate parent material (Kelso 1987). Soils at *P. alcalina* sites are strongly alkaline with pH values ranging from 8.0-9.3 (Moseley 1989; Mansfield and Miyasaki, unpublished results) and are formed from the alluvium derived from outwash from the predominantly carbonate Beaverhead Mountains and Lemhi Range (Moseley 1989).

Mansfield and Miyasaki (1993 raw data) found little variation in nitrate, nitrite and ammonium nitrogen concentrations among the 60 patches of *P. alcalina* habitat. Nitrate levels were less than 5 ppm, nitrite less than 1 ppm, and ammonium nitrogen less than 5 ppm. Levels of pH and ferric iron varied among patches but was not significantly correlated with primrose densities. Levels of ferric iron varied from 2.5 to 7.5 ppm, pH from only 8-8.2. Organic content was significantly but weakly positively correlated with total primrose density, and varied from 22 to 80%.

Alkali primrose density varies from widely scattered to dense (over 200 individuals /m²) within appropriate habitats depending on the amount of bare soil patches. In stands dominated by densely tufted or rhizomatous graminoids, primrose density is low. On sites with more bare soil, alkali primrose occurs in higher densities. Because of its low stature, in no community was it observed to be a dominant.

Miyasaki and Mansfield (1996) examined the relationship of *P. alcalina* density with both cover and frequency of associated species. They found that density of primrose was positively and significantly correlated with frequencies of *Carex scirpoidea*, *Erigeron lonchophyllus*, *Salix candida*, *Senecio debilis*, and *Sisyrinchium idahoense*. Negative correlations of reproductive primrose density with cover of *Carex nebrascensis* and *C. simulata*, and a positive correlation with *Triglochin palustre* were also significant. In multivariate analysis, overall *P. alcalina* densities were lowest in wet areas with *Eleocharis palustre* and *Carex simulata*, although the density of reproductive individuals was highest in these areas. The density of seedlings was lowest in the drier areas. Mansfield and Miyasaki (1993) also found that alkali primrose density was positively correlated with bare ground and cover of litter.

Alkali primrose appears restricted to the stable habitats existing along spring-fed creeks that have a relatively constant flow of water, causing little fluctuation in the water table of adjacent

meadows. It is never found in meadows along creeks that have any seasonal fluctuations and channel scouring, such as that caused by flooding during spring and early summer snow-melt and runoff. Geomorphic processes that take place along streams of this type appear to preclude *P. alcalina* habitat. Within the meadows containing *P. alcalina*, however, it appears that a certain degree of small-scale disturbance is necessary to support viable primrose populations. *Primula alcalina* often occurs on patches of bare soil within relatively dense graminoid communities, although portions of populations at all sites occur in dense vegetation, and all of the Eighteenmile site is densely vegetated. Frost heaving and small mammal activity appears to have been the primary process that historically created this small-scale disturbance. Grazing by native ungulates probably also contributed to this process. This corresponds well with Kelso's (1987) investigations of all North American species of *Primula*, which show a preference for cool, moist, open habitats, often with small-scale disturbance, including frost action.

In the past, these stream systems were likely disturbed by beavers. It is possible that while flooding created by beaver dams caused high localized mortality, the mosaic of successional stages resulting from building, abandonment and breaching presented a shifting habitat for *P. alcalina* throughout the stream system, not just restricted to the spring head area. Because the current populations are so localized, they are susceptible to extirpation from beaver activity, but current small dam complexes that exist at all four sites do not appear to be threatening.

E. Reproductive Ecology

Alkali primrose may begin flowering as early as late April (Fitts 1995) and can continue into the first week of July. Because the plants bloom soon after snowmelt, their leaves are not fully expanded at anthesis. The leaves and scape enlarge over the growing season, and by the time the capsules are ripe the scapes may be up to several times their length at early anthesis (Kelso 1987). The early bud leaves, soon over-topped by larger, thinner leaves, turn black and wither. Even withered they remain covered with silvery farina. Fruits develop through June, July, and August and seed dissemination generally takes place in August or September.

The basal rosettes of both fertile and vegetative plants remain green at least to the end of October. The leaves forming the rosette are distinctively crenulate, allowing alkali primrose to be easily identified in late summer. In the late fall, a glaucous bud is formed in the center of the rosette. This protects the unexpanded scape and flowers throughout the winter. These arise from a leaf axil at the base of the plant, rather than from the terminal bud.

The amount of resources a plant partitions or allocates to different functions can provide insight into its ecology. Plants that allocate large amounts of resource to large flowers, for example, likely depend on attracting pollinators. Fitts (1995) found the mean allocation in *P. alcalina* by dry weight to be: leaves = 0.042gm, scape = 0.044gm and roots and stem = 0.022gm. *Primula alcalina* allocates no resources to vegetative reproduction. All reproduction is through seed formation.

Fitts also found that larger plants produced significantly more flowers and heavier seeds (Fitts, unpublished data). Taller flowering scapes were also associated with higher seed set per flower, perhaps the result of greater success at attracting pollinators or the availability of more resources to allocate to seed production (Fitts, unpublished data).

Fitts observed 15 pollinator species visiting *P. alcalina* during 1992 and 1993. In 1992, pollinators seemed rare, but included two bees, *Bombus* and *Anthophora*, and several butterflies - mostly Lycaenid (blue) and *Vanessa cardua* (painted lady) (Fitts 1992a). In 1993, syrphid flies (*Erastilis* spp. and *Heliophilus* spp.) were a common pollinator (Fitts 1995). Bees were the most abundant pollinator at all sites, but appeared to prefer other flowers. Syrphid flies were more faithful to *P. alcalina*. Fitts noted that syrphid flies have vision sensitive to ultraviolet radiation, and that a closely related species, *P. laurentiana*, has five ultraviolet reflecting bands on the corolla limb. He speculated that the alkali primrose may have a similar reflectance pattern. Moths were seen visiting nearby *Phlox kelsyii* at dusk and dawn, but were not on the primrose. These other flowers may be competitors for pollinators. Based on bagging experiments, pollination only occurs during the day (Fitts 1995). No seed was produced by plants bagged continuously to exclude pollinators, showing that *P. alcalina* is an obligate outcrosser, requiring insect pollination. Travel distance by pollinators is unknown, although Fitts (1995) found one marked butterfly that traveled 1.2 miles overnight.

Complete failure of the inflorescence to set seed occurs in about 1-5% of the plants, and is evidenced by a twisting and breaking off of the withering flower cluster (Fitts 1995). On one plot at Birch Creek, Fitts found 27% of the reproductive plants aborted in this manner, but gave no hypotheses for the high percentage (Fitts 1995). Even on successful inflorescences, the last flowers to develop often do not set seed (Fitts 1992a). Fitts speculates that resources may be partitioned into fruits already developing (1992a).

The specific mechanism of dispersal is unknown for alkali primrose. Elongation of the flowering scape and individual flower pedicels as the fruit ripens may provide for dispersal of seeds up to 20cm from the parent plant. Scapes can be several times as tall at fruiting compared to their length at flowering. Kelso (1987, 1991) found that as capsules ripen and elongation of the scape slows and eventually ceases, elongation and stiffening of the pedicels begins. This process of pedicel elongation is very rapid and can result in pedicels that are three to four times longer in fruit than in flower (Moseley 1995). In fruit, after much elongation and stiffening, the fruiting umbel looks very different from the blooming umbel. Kelso speculated that these changes relate to seed dispersal; seeds are shaken out of the capsules by wind or passing animals, and erect elongated pedicels may increase dispersal distance from the parent plant.

Fitts (1995) pretreated *P. alcalina* seed with moist chilling at 2°C for five weeks. Of a total of 150 seeds tested at 6 temperature levels (4-24°C), only four seeds germinated, three at 20°C and one at 24°C. Varying temperatures every 12 hours improved germination, with the best treatment (alternating 4°C and 16°C) resulting in about 10% germination. The short pre-chilling treatment of this study (2-3 weeks) and the temperature (2°C) may not have been effective at breaking dormancy. Treatment with gibberellic acid (GA₃) can replace moist chilling

pretreatment, and often results in even higher germination. Many primrose species are known to be responsive to GA₃ (Miller and Holcomb 1982). Seeds of *P. alcalina* watered with GA₃ at concentrations of 50-500ppm increased germination 2-4 times over that of moist chilling (Fitts 1993). Germination response occurred within a few days of initiating treatment (Fitts, personal communication). With GA₃ treatment, germination ranged from 37-80% (Fitts 1995).

Studies on the seedbank and seed ecology completed to date strongly suggest that *P. alcalina* does not form a seedbank. Elzinga (1995) found no germination from collected soil cores, even after moist chilling and gibberellic acid (GA) treatments. It is likely that seeds overwinter and either germinate or die the following spring. Fitts (1995) observed that seeds do not have a hard seed coat, and once they imbibe water, the testa slips from the seed, leaving the endosperm unprotected. High losses to fungus occurred in the lab if equipment was not carefully sterilized. In addition, he noted that tetrazolium viability tests showed that germinability declined over time for seeds kept in moist (2°C) storage. This pattern is opposite that expected from a species with a seedbank.

The seedbank study and Fitt's observations are strong but not conclusive evidence of the lack of a seedbank. Cores may have contained viable seeds that were unresponsive to the germination conditions of the experiment, even though the chilling and GA₃ treatments had been shown effective in laboratory germination trials. Buried seed, however, may have dormancy mechanisms that protect the seed from inhibition and rotting, and dormancy-breaking requirements that were unmet by the treatments given.

F. Issues

i) Population Trends

In spite of several years of data collection and research, the population trends of *Primula alcalina* are poorly known. Moseley (1995) found some evidence based on demographic modeling that *P. alcalina* was declining. This model, however, was based on plots with the lowest densities of *P. alcalina*. High-density plots had to be removed from the analysis because matching individuals from year to year proved to be impossible. These plots, however, are apparently where *P. alcalina* is most successful, thus the predictions of the model are suspect.

ii) Threats

Weeds: While several weeds species occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) or possible (*Potentilla recta*), few of these appear competitive in the highly saturated habitat of *Primula alcalina*.

Herbivory:

Herbivory affects primarily the elevated flowering scape. Native ungulate use is minimal -- primarily deer and occasionally antelope in the summer, rarely elk in the winter. The highest loss of flowering stalks to native fauna is probably from small mammals. Moseley (1995) noted that a large number of stalks had apparently been cut near the surface, and attributed it to voles and mice possibly toppling the stalk to reach the seed. It is impossible to separate the clipping of small mammals from that of ungulate grazers, thus grazed fractions represent use by both native and domestic ungulates and small mammals. Herbivory rate under natural conditions is probably less than 10%. Miyasaki and Mansfield (1996) found 6% use on the Targhee administrative site, which is used only in the winter for horse grazing.

Livestock is the most significant current anthropogenic threat, but its effects are difficult to determine. Grazing by livestock may negatively affect the alkali primrose in three ways: direct herbivory of flowering stalks (causing lower reproductive output), direct injury through trampling, and indirect impacts to habitat. Positive effects may result from a reduction in competition from associated species, provision of germination sites by trampling, and a reduction in seed herbivory by reducing cover for small mammals.

It is clear that livestock grazing can dramatically reduce reproduction if it occurs before seeds are disseminated; up to 98% of the scapes have been observed to be grazed (Fitts 1993; Moseley 1995). Even the exclosed Summit Creek had inflorescence removal rates of 49% in 1992 due to trespass cattle (Fitts 1995). Such heavy losses have important ramifications for a species that is relatively short-lived and forms no seedbank (Elzinga 1995a). In the continued absence of reproduction, populations will be eventually extirpated.

Trampling injury is highest in the spring when soils are saturated, but can occur throughout the growing season because substrates supporting *P. alcalina* usually remain moist. Plants along the sides of hummocks that are shaved off by hoof action usually die, but those that are simply stepped on after soils have somewhat dried are usually not mortally injured (Fitts 1993 and personal communication).

Positive effects hypothesized by investigators are weakly supported by data that suggest primrose densities are higher in areas of greater bare ground and on grazed sites. Such conclusions are confounded by grazing and habitat interactions which leave the causal mechanism in doubt. It is likely that moderate (use levels of 50% or less on habitats preferred by grazers) fall or winter grazing (after seed fall) has no significant negative impacts on alkali primrose. Early spring use is likely detrimental due to trampling damage and compaction of wet soils. Late spring and early summer use is likely detrimental due to the reduced reproduction caused by loss of flowering stems. Overall heavy use, no matter what the season, is likely detrimental because of the negative impacts on the stream ecosystem

Timber Management: Not applicable.

Other:

Work by Mansfield and Miyasaki (1993, 1996) shows that *P. alcalina* occupies a narrow range of hydrologic conditions. Significant surface water diversion above population areas would likely result in extirpation from a site, or at minimum a reduction in population size and habitat area. Moseley (1989) noted a recently excavated ditch on private land at Summit Creek. No water was being diverted in August of 1988. A ditch is also visible on USGS topographic maps below the springs at the head of Texas Creek, above the alkali primrose population.

Primula alcalina habitat is also uniquely susceptible to groundwater use. Water that surfaces at Summit Creek, Birch Creek, and Texas Creek is completely the result of groundwater flow. Pumping of any significant quantity of groundwater in the watershed above these sites may diminish stream and spring flow in these systems and adversely impact *P. alcalina*.

The site at Eighteenmile Creek may present a different situation. Although the site has not been completely evaluated, initial observations suggest that the saturation of the meadow containing *P. alcalina* may be partially due to flood irrigation on the bench above the creek bottom. Changes in the use of irrigation water, either a change in point of use or a change in application method (flood switched to sprinkle) may have an adverse effect on *P. alcalina*.

Flooding also has adverse effects on *P. alcalina*. The Summit Creek population is actually split (upper Summit Creek and Mud Flats) by the outline of an old dam (Moseley 1989). The lower limit of the Upper Summit Creek population coincides with the upper limit of the area affected by water retained by the dam. The dam has since been breached and no longer impounds water. During the period that the dam was functional, the valley bottom silted in and widened. After the dam was breached, open water and marsh vegetation remained, dominated by *Carex utriculata*, *C. aquatilis*, and other wetland species (Moseley 1989). Moseley (1989) concludes that flooding negatively impacted alkali primrose by replacing the complex fen communities with relatively simple graminoid communities.

Smaller scale evidence of the adverse effects of flooding can be found in the monitoring work reported by Moseley (1995). *Primula alcalina* was eliminated from plots that were flooded. The cause of flooding is unknown.

The Birch Creek and Summit Creek sites contain campgrounds. At Summit Creek, picnic tables and campsites are immediately adjacent to the creek (within 4-10m), and trampling damage to streamside vegetation is common. The *P. alcalina* population is discontinued throughout the length of the campground, except for a few small patches, mostly found on the side of the creek away from the campground. Habitat appears suitable, and similar to the extensive population areas found above and below the campground area. Use at Birch Creek extends from the lower end of the *P. alcalina* population at the Fish and Game Access site, downstream along the creek. Use in 1989 of the several mile stretch containing public land (mostly Idaho Falls BLM) was in excess of 10,000 user days (Big Butte Resource Area Recreation Inventory 1990). In spite of the occurrence of suitable habitat, *P. alcalina* is found only on the opposite side of Birch Creek away from the access site (Moseley 1989).

The distribution of *P. alcalina* at these two sites suggests that recreational use can impact *P. alcalina*, primarily through trampling. Impacts are most severe at the campgrounds, but less intensive use occurs throughout the Summit Creek enclosure and in the parcel administered by Targhee National Forest at Birch Creek. Travel at the latter was encouraged by the Forest Service with the construction of footbridges over the meandering spring system to improve fishing access.

Roads have been constructed through alkali primrose populations at Birch Creek, Summit Creek and Texas Creek. In addition to eliminating individuals and habitat area in the immediate construction area, roads can impact the plant by altering the hydrology. Construction of Interstate 15 through Monida, Montana, may have been responsible for the extirpation of alkali primrose there (Moseley 1989).

iii) Management Needs and Recommendations

As detailed above, grazing is the key human use that may be currently impacting the alkali primrose. Although data on the effects of grazing demonstrates some potentially positive as well as negative effects, the overall relationships are poorly understood. Available data suggest, however, that light grazing after seedfall has no obvious negative impacts on the alkali primrose. Several questions remain, however. Does *P. alcalina* require grazing at some level for optimal growth? What levels of fall and winter grazing are compatible? Is grazing during the blooming period one year out of three (as is done at Moffet Creek) compatible? What is the effect of grazing overall on habitat and other rare species? While answers to some of these questions may be suggested by additional analysis of existing data, it is clear that additional research will be needed.

Trampling associated with recreation at the Summit and Birch Creek sites has apparently reduced primrose populations. Short-term conservation actions should be aimed at reducing trampling at current impact sites, and preventing trampling at others. Over the long term, it is likely that these sites will continue to increase in popularity as camping and fishing sites. With the transfer of the Birch Creek area to public ownership, decisions about the level, location and type of recreational activity will need to be made.

It is likely that some recreational use, if well-planned, would be compatible with conservation of *P. alcalina* as well as other natural values. The Birch Creek site also lends itself well to a self-guided interpretive display/ trail system, which would increase people's understanding and appreciation for the rare system they are recreating in. An interpretative effort may also be implemented at Summit Creek, although the number of user days there is much less than that at Birch Creek.

Management of the Birch Creek site is compromised by its distance from the Salmon Field office and a lack of monitoring. Cattle trespass during the 2002 grazing season in the exclosed area (especially the area west of Highway 28) was common, and use levels at the end of the grazing season were quite high. Fences on both sides of the wetland are in need of repair.

Changes in retention of water (by dams), or reduction in groundwater flow (by groundwater pumping) could have devastating effects on the primrose and on the unique wetland systems that support it. Research has clearly shown that alkali primrose occupies a narrow range of hydrological conditions. Sites that are flooded and sites that dry seasonally are not occupied. The key to maintaining this hydrology is protection of the groundwater flow into the system. Federal agencies have adequate control over these factors on federal lands, which comprise much of the watershed for each wetland, but limited control on diversions and groundwater pumping on private lands. At Summit Creek, Birch Creek, and Texas Creek, there is private land in the headwaters area where such developments would have significant effect. The federal agencies should monitor applications to the Idaho Department of Water Resources.

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***Salix candida* Fluegge ex Willd.**

Hoary Willow Salicaceae

A. Description

A freely-branched, low- to medium-sized shrub, 0.2-1.5 m tall. Twigs of the season thinly to moderately hairy on early season growth, becoming very dense on late season growth.

Some of the hairs usually persist into the second year. Leaves narrowly oblong, the larger ones about 5-8 cm long and 0.7-1.5 cm wide, and with entire and inrolled margins. The lower leaf surfaces are covered with dense, white, felt-like, tangled hairs; the upper surface dark shiny green, hairless or only thinly hairy. Catkins sessile or nearly so, emerging before or with the leaves, the staminate ones about 1-2 cm long, and the pistillate ones mostly 1-3(6) cm long and densely flowered. Capsules 4-

10mm, covered with dense white woolly hairs, lacking a beak; stipes less than 1mm long, scales brown or yellowish, rarely black with long, straight hairs, persistent. Stamens distinctly reddish-purple (Elzinga et al *in press*; Brunfield and Johnson 1985).



Salix candida

B. Technical Description

Cronquist 1964: Freely branched low shrub (0.6) 5-12 (15) dm tall; twigs densely and closely white-tomentose when young, some of the tomentum generally persistent into the second year; stipules usually small and caducous, or larger and more persistent on vigorous young shoots; petioles mostly 5-10 mm long; leaves narrow, mostly oblanceolate to narrowly oblong or less often lanceolate, the better-developed ones mostly 4.5-8.5 (15) cm long and 0.7-1.5 (2.3) cm wide, 3.5-10 times as long as wide, the margins revolute and entire, the lower surface densely and usually permanently white-tomentose with very fine, tangled hairs, the upper surface rugose and glabrate or only thinly tomentose, dark green under the tomentum; aments coetaneous, nearly sessile, but the short peduncle generally with some leafy-textured bracts 5-15 mm long; scales brown, persistent, woolly-villous; staminate catkins (1) 1.5-2.5 cm long, about 1 cm thick or a little less; stamens 2, with purple anthers and glabrous, free filaments; pistillate catkins (2) 3-5 (6) cm long at maturity, the fruits often rather loosely arranged, though the pedicel is very short (up to about 1 mm long); ovaries and capsules tomentose, the

capsule 5-7.5 mm long; style and stigmas red or reddish, the style 0.8-1.7 mm long, sometimes divided; stigmas bifid, 0.2-0.5 mm long.

Salix brachycarpa is similar in stature, floral morphology, and habitat to *S. candida*, especially early in the season before the hairs strongly develop on *Salix candida* leaves. *Salix candida* has longer and narrower leaves that are more densely woolly-white beneath and have revolute margins. Another similar species, *Salix wolfii*, has shorter leaves with silvery hairs that lie tightly against both top and bottom surfaces.

C. Distribution

From Alaska to Labrador, south to New Jersey, Iowa, North and South Dakota, Washington, Idaho, Montana, Wyoming, and Colorado. In Idaho, known from Boundary, Bonner, Butte, Custer, Lemhi, Fremont, Teton and Caribou counties.

D. Habitat

Throughout its range, *Salix candida* grows in peatland wet meadows and swamps. In east-central Idaho, *S. candida* occurs in subirrigated alkaline meadows with *Eleocharis pauciflora*, *Carex simulata*, *Muhlenbergia richardsonis*, *Triglochin* spp., *Senecio cymbalarioides*, *Senecio debilis*, *Juncus balticus*, *Salix planifolia*, *Salix geyeriana*, *Salix boothii*. *Salix candida* grows in the alkaline meadows in moist to wet microsites, often where substrates were unstable due to upwelling groundwater. It is rarely found immediately on the banks of the spring-fed streams.

E. Reproductive Ecology

Aments are produced in early summer, and dehisce by July. *Salix candida* does not reproduce by vegetative means, although individual plants can form fairly large basal clumps.

F. Issues

i) Population Trends

Unknown.

ii) Threats

Weeds: While several weeds species occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) or are possible (*Potentilla recta*), few of these appear competitive in the highly saturated habitat of *Salix candida*.

Herbivory: Moseley (1992) suggested that *Salix candida* appeared to be more common on the Forest Service and Fish and Game sections of Birch Creek Fen, and less common in the heavily grazed upper portion of the fen, but admitted this needed to be tested further. In my observations of the upper Birch Creek system, it appeared that distribution

was habitat-related; less of the flat wet sites favored by *S. candida* occur on the upper portion of the meadow, but where suitable habitat occurred, it was occupied. The communities in which it occurs are generally not used much by cattle because of the very unstable nature of the substrate and general unpalatability of the vegetation. No herbivory of hoary willow was observed at Birch Creek, although it has been observed elsewhere. Since 1997, most of the Birch Creek fen has been protected from grazing.

Timber Management: Not applicable.

Other: Recreational activities may have potential impacts at some sites. The Kaufman Guard Station, for example, receives fairly heavy fishing use, but most trampling occurs on existing footpaths.

iii)

Management Needs and Recommendations

Known populations should be assessed for size and condition. Additional populations are likely in the Eighteenmile area, upper Lemhi around Leadore, Brazeau Springs, and other alkaline wetland areas in east-central Idaho. These should be noted when found, and occurrence records sent to the Conservation Data Center.

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***Salix pseudomonticola* Ball**

False mountain willow Salicaceae

A. Description

Shrubs to 5m tall. First year twigs sparsely to densely spreading hairy, yellowish green to reddish yellow or chestnut; older twigs dark red to brown, hairy to hairless. Leaves 2-5(10)cm long, 1-3.5(5)cm wide, 1.8-3x as long as wide, often widest above the middle, base rounded, margins usually toothed. Petioles 3-10mm long and often reddish. Upper leaf surfaces with dense appressed hairs when young, usually hairless when mature except along the midrib, dark green, smooth and shiny; lower leaf surfaces glaucous (with a bluish covering that can be rubbed off), hairy when young, hairless when mature, the midrib reddish. Aments sessile or on short leafy stems up to 8(12)mm, emerging before the leaves fully develop. Pistillate aments 1-5(9)cm long. Capsules 4-8mm long, lacking hairs; stipes 0.5-2.5mm long; scales brown to black, sparsely to densely long hairy, persistent. (Description adapted from Elzinga et al *in press*.)



B. Technical Description

Brunsfeld and Johnson 1985: Rounded shrub up to 5 (6) m tall; twigs of the season very sparsely to densely spreading hairy, sometimes partly persistent on the dark red to brown second year twigs; mature leaf blades rather thick and leathery, green and generally shiny above, glaucous beneath, margins coarsely to finely toothed; first leaves of the season essentially glabrous above and pubescent beneath with long, straight, silky, deciduous hairs; later leaves red-tinged and pubescent while expanding, the fine appressed hairs dense above; glabrous at maturity, generally except for the puberulent upper midrib; petioles up to 1 cm long, hairy like the stem, or at least puberulent on the upper surface;

stipules well developed on most shoots, generally larger than 2mm and up to 1 cm on vigorous shoots; staminate aments 1-3 (4) cm long, expanding before the leaves, sessile; stamens 2; pistillate aments 1-5 (9) cm long, expanding before the leaves, sessile or on short flowering branchlets up to 5 mm long, without, or only occasionally with, small green bracts; capsules glabrous, borne on stipes .5-2.0 (2.5) mm long; styles .5-.9 (1-8) mm long; floral bracts brown to black, sparsely to densely long hairy on both surfaces, persistent.

Salix lutea strongly resembles this species but differs in having glabrous twigs becoming pale gray with age, smaller stipules, expanding leaves not red-tinged, pistillate aments on short leafy flowering branchlets, longer stipes, shorter styles, and in growing on warmer better drained sites. *Salix barclayi* differs in having smaller stipules, aments on long leafy flowering branchlets, longer styles (on the average) and in occurring in different, generally higher elevation habitat. *Salix bebbiana* has red-tinged expanding leaves but differs, along with *S. scouleriana* in having entire, pubescent leaves of a different shape and pubescent capsules.

C. Distribution

Alaska east to western Quebec, south to Idaho (Clark, Custer, Lemhi, Fremont counties), northern Wyoming, South Dakota and Ontario. Known from Birch Creek, Texas Creek, Eighteenmile Creek, Pahsimeroi River, and Summit Creek.

D. Habitat

Moist to wet bottomland in broad intermountain valleys, generally where subirrigated with fairly constant flow, and slightly to highly alkaline. It grows from highly saturated quaking, hummocky peat sites to slightly drier sites with mineral substrates. On wetter sites, plants are dwarfed (1-2m), growing with *Carex utriculata*, *Muhlenbergia richardsonis*, *Eriophorum polystachion*, *Eleocharis pauciflora*, *Betula glandulosa*, *Carex lanuginosa*, *Salix planifolia*, *S. candida*, and *Potentilla fruticosa*. On drier sites, plants are generally taller (up to 5m) associated with *Juncus balticus*, *Carex nebrascensis*, *Polygonum bistortoides*, *Pedicularis groenlandica*, *Triglochin maritime*, *S. geyeriana*, *S. bebbiana*, and *S. boothii* (Jankovsky-Jones 1998; Moseley 1992).

E. Reproductive Ecology

No information.

F. Issues

i) Population Trends

Unknown. Abundant at Texas Creek (several hundred individuals observed in 1997). Less so at the other sites, but the habitat not thoroughly inventoried. Whether populations are increasing or declining is not known.

ii)

Threats

Weeds: Several weeds species occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) and *Potentilla recta* has been found sporadically in Lemhi County. Few of these are likely in the saturated habitat of *S. pseudomonticola*, but all of them but *H. niger* could occur on the drier sites occupied by *S. pseudomonticola*. It is unknown if any of these weeds occur at occupied sites.

Herbivory: Some sites are heavily grazed by cattle, but most use takes place during the summer when grazing of woody species is generally minimal as long as herbaceous forage remains. Records at Eighteenmile in 1995 noted that plants were well-browsed (this area receives heavy elk use in the winter as well as some use by moose). The actual levels of use by domestic livestock and the effects of grazing are unknown.

Timber Management:Not applicable.

Other: Recreational use at Birch Creek and Summit Creek may cause trampling damage, and harvesting of stems for fires. The Eighteenmile site is partially maintained by irrigation.

iii)

Management Needs and Recommendations

Inventory and recording of located sites has been minimal. It is likely that *S. pseudomonticola* occurs in wetlands throughout the upper Lemhi Basin because it is not as specific to alkaline highly organic soils as other sensitive fen species (e.g., *Primula alcalina*, *Scirpus rolandii*, *Carex livida*). The extent and condition of this species should be determined; it may not be as rare as currently appears.

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***Scirpus rollandii* Fern**

Rolland's bulrush; Dwarf bulrush; Small clubrush; Pygmy bulrush Cyperaceae
(Sedge family)

Scirpus pumilus Vahl.; *Scirpus pumilus* Vahl. ssp. *rollandii* (Fern.) Raymond;
Trichophorum rollandii (Fern.) Hultn.; *Trichophorum pumilum* (Vahl.) Schinz &
Thellung

A. Description

Low-growing, tufted perennial with slender rhizomes. Stems 3-17cm tall, round in cross-section, green. Upper leaves with slender blades up to 15mm long; lower leaves bladeless sheaths. Inflorescence a single oval spikelet 3-5mm long, of 3-6 flowers borne at the tip of the stem and subtended by a brown, blunt-tipped bract. Scales brown with thin whitish margins, subtending 3 stamens and an ovary with 3 stigmas. Achenes smooth, black to dark brown, 1-2mm long. Flowers July; fruits in August and early September.

B. Technical Description

Perennial 3-17 cm; rhizome long, stems erect, tufted, generally less than 1.5 mm wide, subcylindric, more or less grooved, leaves more or less basal; sheaths short, not prominent; blades much greater than the sheaths, more or less flat, thick and glabrous; spikelet 1, 3-5 mm, 1-3 mm wide, 3-6 flowered; bract 1, 1.5-3 mm, erect, stiff, more or less stem like, tip abruptly pointed; lower bract 2-3 mm, glabrous, orange-brown, midrib thick, margin translucent, tip rounded to abruptly pointed; perianth bristles 0; stigmas 3, fruit 1.5-2 mm, compressed, 2-3 angled, smooth (Hickman 1993).

Eleocharis species (spike-rushes) are very similar, they can be distinguished by the lack of leaf blades and technical differences in the flower such as thickened style bases which appear as a cap-like feature on the achenes. *Kobresia simpliciuscula* has multiple terminal spikelets and is commonly taller and leafier than *Scirpus rollandii*.

C. Distribution

Circumboreal; disjunct in Wyoming, Idaho, Colorado, Montana, and California. Known from Birch Creek and Summit Creek; likely also in Eighteenmile, Moffett, Chillly Slough/Thousand Springs, wetlands around Leadore, and Texas Creek.

D. Habitat

Calcareous fens on permanently saturated unstable (quaking) soils, often marl-gray and highly alkaline. May occur on low islands or hummocks in pools of standing water or on highly saturated flats. Associated species include *Carex simulata*, *Eleocharis pauciflora*,

Triglochin maritima, *Deschampsia cespitosa*, *Thalictrum alpinum*, and the rare species *Primula alcalina*, *Kobresia simpliciuscula*, and *Salix candida*.

E. Reproductive Ecology

Plants appear to reproduce vegetatively through rhizome expansion. Although seed production is common, seed viability is unknown, and it is unknown how common seedling establishment is.

F. Issues

i) Population Trends

Unknown.

ii) Threats

Weeds: While several weeds species occur in alkaline fen sites in east-central Idaho (*Cirsium canadensis*, *Elymus repens*, *Alopecurus arundinaceus*, and *Hyoscyamus niger*) or possible (*Potentilla recta*), few of these appear competitive in the highly saturated habitat of *Scirpus rollandii*.

Herbivory: Many of the sites containing *S. rollandii* are grazed by cattle, but use appears limited due to the highly saturated substrates which are generally avoided by cattle. I have seen these sites used, however, in late fall when lack of feed on adjacent drier meadows forces cattle into the wetter sites that they would otherwise not use. Cattle use, when it does occur, is probably limited to fall. These sites were probably used historically in winter as well, but I do not believe any of the sites are currently used for wintering cattle. Much of the Birch Creek site has been protected from grazing since 1997.

Timber Management: No marketable timber occurs on or adjacent to *S. rollandii* sites.

Other: Recreational activities may have potential impacts at some sites. The Kaufman Guard Station, for example, receives fairly heavy fishing use, but most trampling occurs on existing footpaths.

iii) Management Needs and Recommendations

Additional inventory in likely areas, as well as assessment of population size and condition, is needed.

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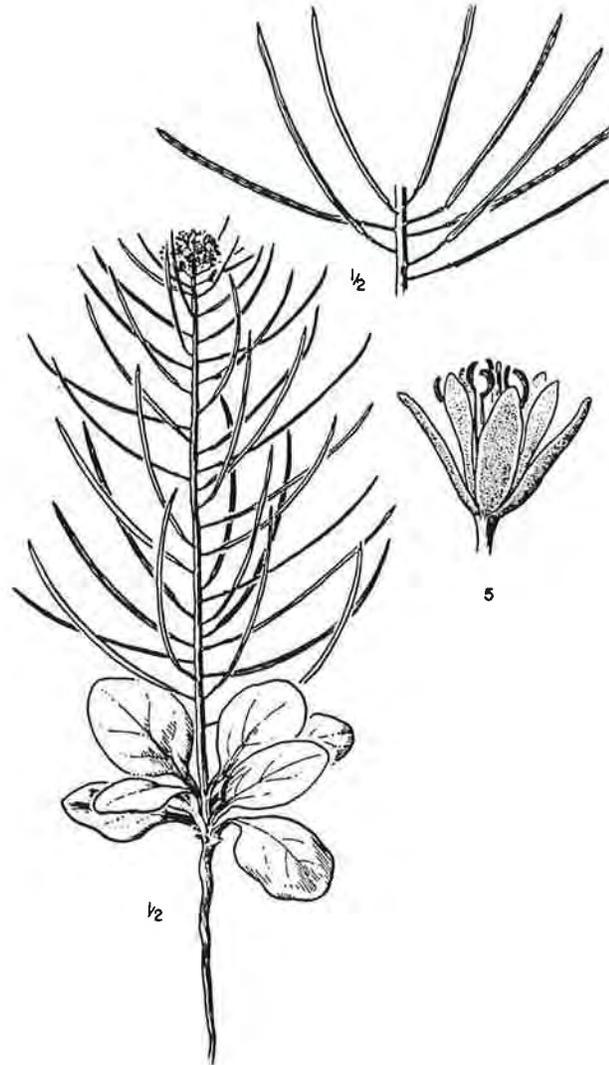
Thelypodium repandum Rollins

Wavy Leaf Thelypody

Cruciferae

A. Description

Short-lived biennial or winter annual with a single taproot ranging from 8–24 inches tall. Leaves are hairless, bluish-green in color, and somewhat fleshy. Most leaves are basal and petiolate with an oblong blade and wavy margins. Stem leaves are alternate, narrow, untoothed, less than 3 inches long and 0.75 inches wide, lacking petioles, and even somewhat clasping the stem. The inflorescence arises from the center of the basal rosette as a single stem. It may remain unbranched, forming a single-stemmed flowering head, or be branched just above the base. Flowers are light purple to occasionally white, with one to several spike-like (dense racemes) inflorescences. Fruits are spreading to ascending, 1–3 inches long, narrow, and slightly flattened. Fruits are technically described as "stipate", an important characteristic in keying plants in the Mustard family. The stipe is the narrowed stalk-like portion of the fruit between the expanded seed-holding portion and the fruit petiole (Elzinga 1996).



Thelypodium repandum

B. Technical Description

Hitchcock et al 1964: Glabrous, glaucous biennial or annual with a simple to rather freely branched, thick stem (but not fistulose), stem (1) 2–6 dm tall; leaves all petiolate and not auriculate at the base, rather fleshy, mostly basal or suprabasal the blades 1.5–8 cm long, ovate-lanceolate to obovate, sinuate-repand to (the basal) often somewhat lyrate; racemes very densely flowered, typically 2/3–4/5 the total height of the plant; ebracteate; pedicels divaricate, 5–15 mm long; calyx and corolla lavender-purplish, the sepals

narrow, spreading, not saccate at the base, 2.5–3.5 mm long; petals narrowly spatulate, barely exceeding the sepals; stamens subequal to the petals, the anthers purple, about 1 mm long; siliques spreading to arcuate–ascending, strongly 1–nerved, 4–7 cm long, about 1.5 mm broad, the stipe about 0.5 mm long; style 0.5–1 (1.5) mm long; stigma small, not lobed; cotyledons obliquely accumbent.

The only other species of *Thelypodium* that may occur within the same range and habitat as *T. repandum* is *T. laciniatum*. It has white flowers and basal leaves that are narrow and usually subpinnatifid. This species occurs in similar habitats along the Salmon River below Ellis, but has never been seen growing on *T. repandum* sites. *Thelypodium sagittatum*, a species found in moist alkaline meadows, has been collected in the headwaters of Thousand Springs. Species of *Stanleya* (*S. pinnata*, *S. tomentosa*, *S. viridiflora*) may be confused with *T. repandum*. A key technical difference between the two genera is the length of the stipe, usually >6mm in *Stanleya* (and often as much as 20mm long), usually <5mm in *Thelypodium*. *Stanleya tomentosa* has been found growing with *T. repandum*, and on sites that appear to be suitable for *T. repandum*. The hairy, pinnatifid leaves of *S. tomentosa* are very different than *T. repandum*. *Stanleya pinnata* also has pinnatifid basal leaves; *S. viridiflora* has entire leaves, but they are much longer and narrower than those of *T. repandum*. All of the *Stanleya* species found in the Challis area are robust plants, sometimes reaching a meter or more in height. The basal leaves of the Composite *Enceliopsis nudicaulis*, which often occurs with *T. repandum*, may be mistaken for it in the absence of inflorescences. (Elzinga 1996)

C. Distribution

Endemic to east-central Idaho, occurring in Custer County and a small portion of Lemhi County. Populations are found along the Salmon River and the lower elevations of its tributaries from Ellis to Clayton, Idaho; along the lower East Fork of the Salmon River (from just above Herd Creek confluence to the mouth of the East Fork) and its tributaries; and south of Challis along the Lost River Range approximately 15 miles. Total population area is approximately 60x20 miles.

D. Habitat

Thelypodium repandum is found on moderate to steep, generally south-facing slopes with unstable substrate. Elevation ranges from 4900 to 7000 feet; two thirds of the populations are found below 6000' elevation.

Substrate is derived from Challis volcanic and metamorphosed sedimentary rock including volcanic shales, welded tuffs and rhyolitic scree. *Thelypodium repandum* is most often found on scree slopes of shale weathered from bedrock of Tertiary sedimentary and volcanoclastic rocks. Occasionally it is found on weatherings of Paleozoic Ramshorn Slate. Soils can be described generally as coarse-textured, with low water holding capacity. Coarse fragments range from sites with 0.5-3cm material forming up to 85% substrate, to soils with a finer, almost clay-like base overlain with >8cm diameter material. Substrate color ranges from dark gray and tan to pink and rusty

red, depending primarily on iron content. On the darker soils, soil temperature is elevated due to greater absorption of solar energy. It is unknown if occupied habitat shifts to less direct exposures (southeast) or higher elevations to compensate. Slopes occupied by *T. repandum* are generally steep (mostly over 25%), and sparsely vegetated. The coarse textured substrates are thus unstable, and easily moved by animal passage. Erosion trails associated with frost heaving and bedrock breakage are common, and *T. repandum* is more often found in recently disturbed substrate than in adjacent more stable substrate. It is not, however, found often on slopes that are still actively moving. (Elzinga 1996)

Thelypodium repandum is found in areas with limited vegetative cover (5-20%) on steep erosive slopes. Species most often found associated with *T. repandum* are *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex confertifolia*, *Hymenopappus filifolius*, *Achnantherum hymenoides* and *Enceliopsis nudicaulis*. A complete list of species recorded from *T. repandum* sites is given in Elzinga (1996).

E. Reproductive Ecology

Germination occurs between July and November. These seedlings overwinter as rosettes 2-30cm in diameter, and initiate reproduction in May of the following year. Reproduction is strictly sexual (seed). Seed ripe initiates by mid to late July, and by late August most of the seed capsules have split and released seed. The life cycle often exceeds 12 months, technically making *T. repandum* a biennial, but because it germinates in the fall, it more closely resembles a winter annual. Most of the seed crop is released after the main germination period, but it is possible that some of the seed germinates late in the fall and produces seed the following year, a true annual life-cycle. It is likely, however, that some after-ripening or dormancy breaking mechanism keeps seeds from germinating the year they are produced. This conclusion is supported by germination experiments which showed an increase in germination by seeds stored for a year compared to those stored for four months (Hardegree et al 1992).

Most populations are small; 47 of the 78 (about 60%) have been recorded as a population size of less than 10 individuals. Only nine populations have been recorded as 50 or more individuals. Populations, however, vary dramatically from year to year, and non-blooming individuals are often overlooked. Because *T. repandum* is a winter annual / biennial, population sizes are largest in the late summer to early fall, when blooming individuals from the current year, and new plants that will flower the following year are both present. In addition, growing conditions from 1989 through 1993 were favorable, and some populations previously reported as fairly small contained hundreds of plants. At the Lime Creek Exclosure site, for example, 10-15 individuals were noted on the slope opposite the exclosure in 1988, but monitoring initiated in 1989 found 41 plants in September of that year and 298 the following. A population growing in a road cut (Road Creek) increased from 13 plants in 1988 to 85 in 1989 and 95 in 1990.

Thelypodium repandum is found on slopes that naturally experience disturbance due to steepness of slopes and low vegetative cover. Two observations suggest that the species requires some surface disturbance in order to expose buried seeds. The first is related to an exclosure constructed at Lime Creek in 1985, designed to eliminate cattle use from a population. The exclosure location was chosen based on the high density of *T. repandum* seen on that slope in 1984. Construction of the fence after placement of the posts was delayed a few months, and the posts became attractions as cattle rubs. The fence was constructed in the mid-summer. Fall germination patterns showed concentrations around the posts. The following year, germination was heaviest around the outside periphery of the fence, and was especially concentrated near an unfilled soil pit just outside of the exclosure. For the next four years, germination inside the exclosure was none or very little, and much higher outside of the exclosure, especially around the soil pit, which continued to be excavated by animals.

The second observation is that of microsite habitat differences at *T. repandum* sites. Consistently, *T. repandum* is found in erosion trails most often caused by breakage of bedrock outcrops and slope slippage. *T. repandum* also has shown a flush of germinants after road maintenance caused minor slope movement on a roadcut.

Extreme erosion, however, appears to be detrimental. *T. repandum* is not found on actively moving slopes, and significant reshaping of road cuts slopes has resulted in an apparent loss of the plant from the site. At one monitored site (Dry Gulch-McDaniel Spring) slope movement caused by removal of material at the base resulted in nearly complete eradication of potentially reproductive individuals.

In summary, it is likely that slope movement or trampling that exhumes buried seeds is a positive disturbance, while larger or more significant slope movement that removes the top substrate layers (and the buried seeds) or causes direct mortality is detrimental.

Monitoring of marked individuals at five sites shows that mortality of established plants can occur at any time during the year but is highest over the winter, thus primarily affecting the rosette class. At two monitored sites, about 37% of established rosettes died between September and May (average over the two sites and the two years). Once rosettes have survived winter, they usually become reproductive by early summer. Of plants that are not reproductive in May, 50-73% will die before reproducing, suggesting that resources (likely moisture) may not be sufficient through the summer to initiate flowering. Overall, the monitoring suggests that only about half of the rosettes established in the fall reproduce, but this can vary annually from near zero to as much as 75%.

It is unknown if *T. repandum* requires a pollinator under natural conditions. Manipulative experiments suggest that *T. repandum* is self-compatible (Al-Shehbaz 1972), but the morphology of the flowers do not appear to be conducive to selfing. The showy flowers of *T. repandum* also suggest an insect pollinator. Bees have been observed visiting the flowers (Elzinga personal observation) and Lesica (1989) noted a butterfly (*Euphydryas* sp.) visiting *T. repandum* flowers. In some populations, ants have been noted to occur abundantly on plants throughout the flowering season (Lesica 1989;

Elzinga personal observation), but ants have also been observed in the fall after fruit formation (Elzinga, personal observation). Aborted flowers have not been observed in *T. repandum*. Seed production can be prolific, over 20,000 seeds per plant (Elzinga personal observation).

Germination trials were conducted under laboratory conditions at the Agricultural Research Station in Boise (Hardegee et al 1992). Collections were classed in the field by relative plant size ("x-small" to "xx-large," nine classes in all). Germination in the January tests ranged from 1.6 to 14.6% averaged over all sites. Germination after seed matured for a year averaged between 1.1 to 37.7%. Germination was highest at 30 C, consistently lowest at 5 C, but germination did occur over the entire range of temperatures tested. *T. repandum* also exhibited the ability to germinate under extremely dry conditions, up to -1 MPa, but highest germination was under moist conditions (0 MPa). No relationship was found between plant size and percent germination or days to germination, either within sites, or when data was combined for all sites.

The ecological implication of these germination trials is that *T. repandum* can respond to moist warm (25-30 C) conditions very rapidly (within four days). These conditions are most likely to be met in the late summer or fall after a ground-soaking rain shower. Such weather conditions occur erratically in the Challis area, both temporally and spatially, with most of the precipitation coming in localized cloudbursts.

It is clear that *T. repandum* forms a seedbank, because it has been observed to reappear at a site after several years of absence. In germination trials, no pre-treatment was required to germinate seed after 5 months of storage, but germination percentages increased over an additional six month period, suggesting an after-ripening requirement (Hardegee et al 1992).

F. Issues

i) Population Trends

In spite of years of inventory and sporadic observations, assessing the trends of this species is hampered by a lack of regular observation and ordered reporting and assessing. In addition, most populations have not been revisited in over a decade, and no recording of population size or condition has been made for any population since 1996.

ii) Threats

Weeds:

Roadside weed spraying is commonly done on all county-administered roads in Custer County. Approximately 20% of the known populations may be at risk from this activity. The level of risk, however, is unknown. The sensitivity of *T. repandum* to herbicides is unknown, but even if highly susceptible, only the year's cohort and potential seed crop would be lost. Conversely, infestation by noxious weeds may be a more serious threat. *Centaurea maculosa* and *Bromus tectorum* occur at some sites. Surveys in the fall of

1996 found severe *Halogeton glomerata* infestations severe at population areas in the Spar Canyon area and along the Salmon River (Elzinga 1996).

Herbivory:

Livestock and ungulate grazing may occur in some *T. repandum* sites with more stable substrate. Observations of trampling and browse damage have been made at the Lower Spar Canyon population over several years (Elzinga 1996). Observations at this site in September of 1996 suggest that use by cattle can be very high on associated vegetation. Use on some sites by horses can also be extreme. The effects of such use on *T. repandum* populations is unknown. Occasional use of inflorescences is common at many populations, especially those adjacent to stable footing, such as along roadways, but *T. repandum* does not appear to be used preferentially. In most populations, use by either domestic or native ungulates likely is not of great significance to the population because the unstable substrate discourages use.

Herbivory by an unknown lepidopteran larvae can be extreme. One population was observed to be nearly completely stripped of foliage in 1988 (Elzinga, personal observation). Stewart (1992) observed heavy herbivory on several populations, and attributed it to grasshoppers.

Timber Management:

Not applicable

Other:

Thelypodium repandum is often found in historic hardrock mining districts that may become revitalized as new technology allows the extraction of remaining mineralization. The severity of the threat from mining activity is difficult to assess. One population was reported to have been deliberately eliminated from a mining exploration site by bulldozing in the mid-1980's (Bartholome, personal communication), but generally operators are willing to reroute activity to avoid populations. The severity of the threat also varies depending on the level of mining activity, which is volatile and difficult to predict. The scree and gravel slopes that support *T. repandum* are attractive sites for fill material for road building. Usually, material is removed from the base of slopes containing *T. repandum*. This activity has direct impact on portions of the population at the base of the slope, and may affect those higher on the slope as slope angle, and rate of rate of slope movement, increases. Pits are abundant on private lands. Elzinga (1996) found fourteen sites were threatened by material removal, seven of which were BLM populations with existing material pits. Remaining populations on public land can probably be considered fairly secure from this threat, since many of them are inaccessible. In addition, the development of a new site requires an environmental assessment, including a botanical evaluation. If that evaluation includes an assessment of habitat as well as actual observed plants, (since plants may not always be apparent on site), and these habitat are protected, potential impacts can be considered minimal on federal lands.

Roadside populations are vulnerable to extirpation from standard road maintenance activities of grading, fill slope recontouring and widening. Sixteen of the 78 populations assessed in 1996 (Elzinga 1996) were located immediately adjacent to a road or within the actual road cut and fill area.

Impacts from OHVs such as FWD trucks, dirt bikes and four wheelers are localized, but could be severe for a small population. Actual impacts to population, however, have not been observed, and it is unknown if this activity is a significant problem. Most of the use occurs near the town of Challis, and has been especially noticeable in the Pennal Gulch area and behind the Challis Hot Springs.

iii)

Management Needs and Recommendations

Inventory: Populations are localized and often small, and it is unlikely that the current known population number represents all that occur. Approximately 70% of the known populations occur on slopes visible from roads. While habitat is concentrated along major drainages such as the Salmon River, the East Fork, Road Creek, Herd Creek and Spar Canyon, little of the habitat associated with the many smaller draws and gulches has been inventoried. During 1988, a fairly intensive period of survey work was initiated by both BLM and CDC; approximately 20 populations were located. In another intensive effort, approximately 700 polygons of potential habitat on BLM lands were located on aerial photographs and transferred to topographic maps. Field checks were completed on a 20% random sample of these. Based on this sample, approximately 100-150 populations are predicted to occur (Stewart 1992). The survey season in 1992 was not the best for *T. repandum*; some known sites that were revisited showed no evidence of plants. Thus it is likely that the number of the 700 polygons actually occupied by *T. repandum* is much higher than the 100-150 predicted by the sample, perhaps as many as 300 populations. These 1992 maps represent a significant effort and should be carefully archived and used as the basis for any additional inventory work

Monitoring: The 1996 Conservation Strategy recognized the limited value of monitoring population size of a winter annual with widely fluctuating annual populations due to weather (Elzinga 1996). The Strategy recommended visiting a sample of populations periodically to determine changes in threats. This recommendation remains appropriate, although given that most populations have not been evaluated for over a decade, a more concentrated initial effort is recommended.

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***Xanthoparmelia idahoensis* Hale**

Idaho range lichen Parmeliaceae

A. Description

Free-growing on substrate, firm, brittle, breaking apart when collected, 2-4cm broad; light yellowish green; lobes narrow, 1.5-4mm wide, twisted, the tips subdivided into roundish branches about 0.5mm wide, the edges on many branches appearing as though they have folded over and sealed so that the black underside only shows at the pointed black tips (Ulmschneider, personal communication).

Two other species of *Xanthoparmelia*, *X. wyomingensis* and *X. norchlorochroa* may grow in association with *X. idahoensis*. These have a less yellow appearance, and lay flatter to the ground or with a more drooping appearance. The terminal lobes of these two species have more rounded tips.

B. Technical Description

Thallus vagrant, free growing on soil, firm, breaking apart when collected, 2-4cm broad, light yellowish green; lobes sublinear, 1.5-4mm wide, contorted and twisted, the tips irregularly dilated and divided into subterete black-tipped laciniae, about 0.5mm wide, separate; upper surface strongly white-maculate, shiny, soredia and isidia lacking; medulla white; lower surface irregularly canaliculated with a raised rim, pale yellowish brown or turning brown toward the tips, foveolate-rugose, very sparsely rhizinate, the rhizines brown, coarse, 0.2-0.3mm long, simple. Pycnidia and apothecia lacking. Chemistry: Sallazinic, consalizinic, protocetraric (trace), and usnic acids. (Hale 1990)

C. Distribution

Endemic to the "Salmon Badlands" around Salmon, Idaho, and south in the Lemhi Valley to approximately Lemhi, Idaho.

D. Habitat

Lower slopes on open, sparsely vegetated calcareous lacustrine ash (bentonite) whitish soil with not much rock and little or no associated vegetation. Associated species include *Atriplex confertifolia*, *Monolepis*, *Cleomella macbrideana*, *Xanthoparmelia norchlorochroa*, *Xanthoparmelia wyomingensis*.

E. Reproductive Ecology

Unknown.

F. Issues

i) Population Trends

Most patches are small—most only several meters in diameter, and very few more than a hundred square meters. The largest population is just off Barracks Lane. Nothing is known about the trends of populations or patches, although in observations over several years no obvious changes occurred except in patches that were impacted by OHVs (Ulmschneider, personal communication).

ii) Threats

Weeds: *Monolepis* grows with *X. idahoensis* on some sites but the effects are unknown; *Bromus tectorum* does not appear to colonize the bare clay substrates supporting *X. idahoensis* although it is often abundant immediately adjacent to populations.

Herbivory: Incidental trampling from cattle and native ungulates occasionally has been observed, but does not appear to be a significant threat. The nearly unvegetated slopes are unattractive to grazing animals, and are relatively unstable for traversing. Animals crossing these slopes generally remain on existing trails.

Timber Management: Not applicable.

Other: OHV motorcycle traffic is the most serious threat. The loose clay slopes are ideal for hill-climbing. The original type location has apparently been eradicated by motorcycle traffic, and portions of others. The largest population near Barracks Lane seems to be protected by a good fence and cliffy topography. Fences built at the new landfill to discourage motorcycle traffic also appear to be effective.

iii) Management Needs and Recommendations

Additional inventory should focus on the east side of the Lemhi Valley south from the town of Salmon. Monitoring should continue to focus on habitat condition, especially evaluating motorcycle use. Photomonitoring of slopes is recommended (Ulmschneider, personal communication).

G. References

Hale, M.E. 1990. A Synopsis of the lichen genus *Xanthoparmelia* (Vainio) Hale (Ascomycotina, Parmeliaceae). Smithsonian Institution Press, Washington, D.C. Smithsonian Contributions to Botany: 74.

Ulmschneider, Helen. 2002. Personal communication. Ecologist, Salmon Field Office, Salmon, Idaho.

***Xanthoparmelia idahoensis* Hale**

Idaho range lichen **Parmeliaceae**

A. Description

Free-growing on substrate, firm, brittle, breaking apart when collected, 2-4cm broad; light yellowish green; lobes narrow, 1.5-4mm wide, twisted, the tips subdivided into roundish branches about 0.5mm wide, the edges on many branches appearing as though they have folded over and sealed so that the black underside only shows at the pointed black tips (Ulmschneider, personal communication).

Two other species of *Xanthoparmelia*, *X. wyomingensis* and *X. norchlorochroa* may grow in association with *X. idahoensis*. These have a less yellow appearance, and lay flatter to the ground or with a more drooping appearance. The terminal lobes of these two species have more rounded tips.

B. Technical Description

Thallus vagrant, free growing on soil, firm, breaking apart when collected, 2-4cm broad, light yellowish green; lobes sublinear, 1.5-4mm wide, contorted and twisted, the tips irregularly dilated and divided into subterete black-tipped laciniae, about 0.5mm wide, separate; upper surface strongly white-maculate, shiny, soredia and isidia lacking; medulla white; lower surface irregularly canaliculated with a raised rim, pale yellowish brown or turning brown toward the tips, foveolate-rugose, very sparsely rhizinate, the rhizines brown, coarse, 0.2-0.3mm long, simple. Pycnidia and apothecia lacking. Chemistry: Sallazinic, consalizinic, protocetraric (trace), and usnic acids. (Hale 1990)

C. Distribution

Endemic to the "Salmon Badlands" around Salmon, Idaho, and south in the Lemhi Valley to approximately Lemhi, Idaho.

D. Habitat

Lower slopes on open, sparsely vegetated calcareous lacustrine ash (bentonite) whitish soil with not much rock and little or no associated vegetation. Associated species include *Atriplex confertifolia*, *Monolepis*, *Cleomella macbrideana*, *Xanthoparmelia norchlorochroa*, *Xanthoparmelia wyomingensis*.

E. Reproductive Ecology

Unknown.

F. Issues

i) Population Trends

Most patches are small—most only several meters in diameter, and very few more than a hundred square meters. The largest population is just off Barracks Lane. Nothing is known about the trends of populations or patches, although in observations over several years no obvious changes occurred except in patches that were impacted by OHVs (Ulmschneider, personal communication).

ii) Threats

Weeds: *Monolepis* grows with *X. idahoensis* on some sites but the effects are unknown; *Bromus tectorum* does not appear to colonize the bare clay substrates supporting *X. idahoensis* although it is often abundant immediately adjacent to populations.

Herbivory: Incidental trampling from cattle and native ungulates occasionally has been observed, but does not appear to be a significant threat. The nearly unvegetated slopes are unattractive to grazing animals, and are relatively unstable for traversing. Animals crossing these slopes generally remain on existing trails.

Timber Management: Not applicable.

Other: OHV motorcycle traffic is the most serious threat. The loose clay slopes are ideal for hill-climbing. The original type location has apparently been eradicated by motorcycle traffic, and portions of others. The largest population near Barracks Lane seems to be protected by a good fence and cliffy topography. Fences built at the new landfill to discourage motorcycle traffic also appear to be effective.

iii) Management Needs and Recommendations

Additional inventory should focus on the east side of the Lemhi Valley south from the town of Salmon. Monitoring should continue to focus on habitat condition, especially evaluating motorcycle use. Photomonitoring of slopes is recommended (Ulmschneider, personal communication).

G. References

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