

**THE STATUS OF
MALHEUR PRINCE'S PLUME (*STANLEYA CONFERTIFLORA*)
IN IDAHO**

By

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December 1997

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**Challenge Cost-Share Project
Lower Snake River District, BLM
Idaho Department of Fish and Game
Order No. 1422-D010-P97-0111**

ABSTRACT

Malheur prince's plume (*Stanleya confertiflora*) is a stunning annual or biennial member of the mustard family endemic to eastern Oregon and adjacent southwestern Idaho. It has been poorly collected over the years, especially in Idaho. Malheur prince's plume is an Idaho Bureau of Land Management (BLM) Sensitive Species. It is also on the Idaho Native Plant Society's globally rare plant list. However, little information is known regarding its abundance, habitat specifics, life history, and threats. To rectify this paucity of information and to help assess the conservation status of Malheur prince's plume in Idaho, the Lower Snake River District BLM and the Idaho Department of Fish and Game's Conservation Data Center entered into a cooperative project to conduct field inventories in 1997.

During May and June, 1997, I conducted a field investigation of numerous clay and other barren outcrops within the known range of Malheur prince's plume in Idaho. Searches concentrated on, but were not restricted to lands managed by the BLM's Lower Snake River District. Six occurrences of Malheur prince's plume have been documented for Idaho. All are believed to be extant, even though no plants were observed at two populations in 1997. Three of the occurrences are located on BLM land, and three on private land. Weed invasion is the most widespread potential threat to Idaho populations, and already appears to be impacting two populations. Off-road vehicle recreation has impacted portions of one population on BLM land. Most populations occur in areas open to livestock grazing, although livestock use and related direct threats on Malheur prince's plume habitat are negligible.

This report summarizes our knowledge of Malheur prince's plume in Idaho, including information on taxonomy, distribution, abundance, habitat, conservation status, and management recommendations. Sections listing areas surveyed in 1997, and areas that would benefit from additional survey work are also contained in the report.

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Note: The Appendices are not available for versions of this report generated for the CDC homepage.

INTRODUCTION

Malheur prince's plume (*Stanleya confertiflora*) is a stunning annual/biennial member of the mustard family endemic to eastern Oregon and adjacent southwestern Idaho. In Idaho, it is found on barren to sparsely vegetated clay soils to which few other plant species are adapted. It is presently known from six occurrences in Idaho, most of which are small. Malheur prince's plume has been recognized as a conservation concern in Idaho only since 1995. It is interesting that such a showy plant was overlooked for so long. Its apparent rarity in the state is complicated by its apparent capability of prolonged seed dormancy. This results in few or no above-ground plants during certain years or periods of years. A best guess is that this is related to late winter and spring precipitation patterns.

Malheur prince's plume is an Idaho Bureau of Land Management (BLM) Sensitive Species. Two of the six known Idaho occurrences are located on land managed by the BLM's Lower Snake River District, Owyhee Resource Area. One occurrence is found on land managed by the BLM's Upper Snake River Districts, Shoshone Resource Area. The other three occurrences are located on private land in close proximity to BLM land. The 1997 field survey represents the first systematic inventory for Malheur prince's plume in either Idaho or Oregon. The conservation status of Malheur prince's plume still needs to be determined for Oregon, where almost nothing is known about the species, even though it represents the bulk of the species' range. To rectify the paucity of information about Malheur prince's plume in Idaho, the Lower Snake River District of the BLM and the Idaho Department of Fish and Game's Conservation Data Center entered into a cooperative project to conduct a field inventory in 1997. The primary objectives of this cooperative investigation are:

- 1) Survey and delineate known populations of Malheur prince's plume in Idaho, and search suitable habitat for additional populations.
- 2) Characterize habitat conditions for each occurrence.
- 3) Assess population data on and threats to the Idaho populations and make management recommendations to the BLM's Lower Snake River District based on these assessments. This information will assist the BLM in the conservation of Malheur prince's plume populations on lands they administer.

RESULTS

Between May 14 and June 13, 1997, I conducted a field investigation of numerous clay and other barren outcrops within the known range of Malheur prince's plume in Idaho. Searches concentrated on, but were not restricted to lands managed by the BLM's Lower Snake River District. No new populations were discovered, although I did clarify the location and significantly expand the extent of one population. No plants were found at two population sites on private land. The combination of intact habitat and the species' apparent capability of prolonged seed dormancy makes calling these populations extirpated unwarranted at this time. There remains an element of doubt regarding the precise location of these two populations as well. All told, approximately 1,000 flowering plants, covering less than 15 acres, were observed in 1997. The status of Malheur prince's plume in Oregon still needs to be determined.

This report synthesizes our knowledge of Malheur prince's plume in Idaho, including information on taxonomy, distribution, abundance, habitat, conservation status, and management recommendations. Sections listing areas surveyed in 1997, and areas that would benefit from additional survey work are also contained in

the report.

TAXONOMY

Scientific name: *Stanleya confertiflora* (Robinson) Howell.

Full bibliographic citation: Howell, 1897. Flora of Northwest America 59.

Type specimen: Oregon, probably Harney County, “base of Stein’s (sic) Mountain”; T. Howell, May 25, 1885. The isotype at OSC (Oregon State University herbarium) is labeled as *Stanleya viridiflora* var. *confertiflora*.

Pertinent synonyms: *Stanleya viridiflora* Nutt. ex Torrey & Gray var. *confertiflora* Robinson, in A. Gray, Synopsis of the Flora of North America. I: 178. 1895. *Stanleya rara* A. Nels., Botanical Gazette. 52:262. 1911. *Stanleya annua* M.E. Jones, Contributions in Western Botany. 17:25. 1930.

Common name: Biennial prince’s plume; biennial princesplume; biennial stanleya. Various reference sources list different common names for this little studied species. The most common moniker involves the word “biennial”. This name does little justice to this stunning plant. I propose the common name Malheur prince’s plume, recognizing the apparent distribution center of the species. Malheur prince’s plume is the common name used in this report.

Size of genus: Six species of the desert and semidesert areas of western North America.

Family name: Brassicaceae; Cruciferae.

Common name for family: Mustard.

History of knowledge of taxon in Idaho: The first collection of Malheur prince’s plume in Idaho was made by the wide-ranging and intrepid early western botanist Marcus E. Jones in 1900, near Weiser, Washington County. The next collection in the state was not until 1964, by Bratz, near Reynolds in Owyhee County. Barbara Ertter made a collection in the Mount Bennett Hills (Gooding County) in 1976. A new population was discovered by Pat Packard and Jim Grimes in 1980, about five miles north of Oreana in Owyhee County. Bob Moseley found another population in Owyhee County during his 1994 rare plant survey for *Chaenactis cusickii*. A new Washington County site was discovered in 1996 by BLM botanist Ann DeBolt. During 1997, I conducted the first systematic surveys for Malheur prince’s plume in Idaho.

Malheur prince’s plume was not reviewed by the Rare and Endangered Plants Technical Committee during their early evaluations of Idaho’s rare flora (Henderson et al. 1977; Steele et al. 1981). Malheur prince’s plume was initially recognized (by Jean Findley, botanist with the Vale District, Oregon BLM) as a possible conservation concern in Idaho at the 1995 Idaho Rare Plant Conference. At this time the Idaho Native Plant Society (INPS) added it to their federal candidate species list category and recommended the species for federal candidate status. During the 1996 Idaho Rare Plant Conference this species was placed in the INPS globally rare category.

Alternative taxonomic treatments: None.

LEGAL OR OTHER FORMAL STATUS

National

U.S. Fish and Wildlife Service: None.

Bureau of Land Management: Malheur prince's plume is an Idaho BLM Sensitive Species (Bureau of Land Management 1996). Currently, it is not on the Oregon BLM Sensitive species list (Jean Findley, Vale District BLM; pers. comm.)

Other current formal status recommendations: Because of its limited distribution and small number of known populations, Malheur prince's plume is given a global rank of G1 by The Nature Conservancy and the network of Natural Heritage Programs and Conservation Data Centers (Conservation Data Center 1997). The G4/5 global rank noted for Oregon (Oregon Natural Heritage Program 1995) is a mistake.

State

Idaho

Idaho Native Plant Society: Malheur prince's plume is on the INPS Globally rare list (Idaho Native Plant Society 1997).

Conservation Data Center: Because of its rarity in Idaho, it is given a state conservation rank of S1 by the Idaho Conservation Data Center (Conservation Data Center 1997).

Oregon

Oregon Natural Heritage Program: Malheur prince's plume is on the Heritage Program's List 3. This list contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range (Oregon Natural Heritage Program 1995).

DESCRIPTION

General nontechnical description: This is a stunning plant. It is a taprooted annual or biennial, ranging from about 20 to 80 cm tall. The plant is glabrous (without hairs) and glaucous (a whitish to bluish waxy coating), with a single erect stem that is sometimes branched in the inflorescence. The basal leaves are sessile or nearly so, while the stem leaves are sessile and have auricled leaf bases. All the leaves have entire margins. The flower stalk is a dense, elongated raceme. The petals are slightly larger than the sepals. Flowers are dull yellow to cream-colored (in contrast to published information which lists only yellow) in color. The fruits (siliques) are nearly round and between 2-4 cm long. They are attached to slender, widely spreading and ascending pedicels.

Technical description: Annual or biennial, glabrous throughout except on lower petioles of young plants, usually glaucous; stems single, erect, simple or rarely branched above, leafy, 3-8 dm high; basal leaves obovate, obtuse, entire, shortly petiolate; cauline leaves all sessile except the lowermost, crowded, sagittate, glabrous, lanceolate, acute, entire, 4-16 cm long, 1-4 cm wide; inflorescences densely racemose, 1-4 dm long; sepals linear-oblong, glabrous, lemon yellow, spreading or reflexed at anthesis, slightly dilated at base, 8-12

mm long, ca. 2 mm wide; petals linear, lemon yellow, glabrous, not markedly differentiated into blade and claw, very slender toward base, 1.5-2.5 cm long, ca. 1 mm wide; stamens exceeded by petals, filaments glabrous, nectar glands poorly developed, merely subtending all the filaments; fruiting pedicels divaricately ascending, glabrous, rather slender, 1-2 cm long; siliques nearly terete, glabrous, erect, nearly straight, nerved from base to apex, 2-4 cm long; gynophores slender, glabrous, 1-2 cm long; styles evident, 1-2 mm long; seeds numerous, brown, wingless, oblong, plump, ca. 2 mm long, ca. 1 mm broad; cotyledons incumbent to obliquely accumbent (Rollins 1993).

Local field characters: *Stanleya* is a distinctive genus within our range. Malheur prince's plume has an erect, single stem habit. Its relatively large size, glaucous and glabrous appearance, stem leaves that are sessile, clasping and entire-margined, and profusion of yellowish flowers along an elongated raceme are useful field characteristics. It is not likely to be confused with anything beside other *Stanleya* species. The range of Malheur prince's plume overlaps the distribution of two other congeners. They are *Stanleya viridiflora* (perennial prince's plume) and *Stanleya pinnata* var. *pinnata* (bushy prince's plume). Malheur prince's plume is most closely related to perennial prince's plume, but there are several marked differences. Malheur prince's plume is an annual/biennial with sessile lower leaves, evident styles, and long, slender petals that are very reduced in width toward the base. In contrast, perennial prince's plume is a perennial with petiolate basal leaves, sessile stigmas, and relatively short petals that are broad toward the base (Rollins 1939).

The three species of *Stanleya* can be separated by the following key (adapted from Hitchcock and Cronquist 1973, and Rollins 1993). In addition, the flowers of bushy prince's plume tend to be a more vibrant yellow color than found in Malheur prince's plume.

- 1. Stem leaves with petioles and often pinnate; basal leaves lobed to bipinnatifid *Stanleya pinnata*
- 1. Stem leaves sessile, auriculate-clasping, and mostly entire 2
 - 2. Plants perennial; basal leaves with evident petioles; pedicels stout, 4-7 mm long; siliques arcuate *S. viridiflora*
 - 2. Plants annual or biennial; basal leaves nearly sessile; pedicels slender, 1-2 cm long; siliques nearly straight, ascending *S. confertiflora*

During certain years, populations of Malheur prince's plume apparently contain few if any flowering individuals. However, old skeletons may be present. Be aware that skeletons of *Caulanthus crassicaulis* (thick-stemmed wild cabbage) look superficially similar. This other mustard species is widespread and locally common in southwestern Idaho.

Photos and line drawings: Line drawings of Malheur prince's plume appear in Abrams (1944), Hitchcock (1964), and in Appendix 1 of this report. The Conservation Data Center has a collection of slides showing the habit and habitat of Malheur prince's plume. Several have been reproduced in Appendix 2.

DISTRIBUTION

Global distribution: Malheur prince's plume is endemic to eastern Oregon and adjacent southwestern Idaho (Figure 1). Details regarding its extent within this range have not yet been fully clarified. The

Figure 1. Rangewide distribution map for *Stanleya confertiflora*.

Note: This map is not available for versions of the report generated for the CDC homepage.

southwestern extent of the species appears to be east of the Steen Mountain massif in Harney County, Oregon. Scattered populations extend north to near Unity, in Baker County, Oregon, to form the known northwestern limit for the species. Most known populations are concentrated along an axis stretching from the Ontario, Oregon/Weiser, Idaho area, southeast to near Oreana, Idaho. There is one outlying population known from about 90 miles east of the southern end of this axis, in Gooding County, Idaho. The total known range of Malheur prince's plume is approximately 120 miles north to south, and 230 miles west to east. Within this range there are large gaps where no Malheur prince's plume populations have been documented. For instance, populations are known from the Malheur and Snake river drainages, but I know of no populations in the intervening Owyhee River drainage.

Idaho distribution: Six occurrences have been documented from Idaho. Two are known from the Weiser vicinity in Washington County, three from northwestern Owyhee County, and one from the Mount Bennett Hills in Gooding County (Figure 2). I consider all Idaho occurrences to be extant even though no plants were observed at two sites on private land during 1997. The combination of intact habitat, and the species apparent capability of prolonged seed dormancy makes calling these two occurrences extirpated unwarranted at this time.

Idaho occurrences: The three digit code labelling each occurrence corresponds to the reference number used by the Conservation Data Center data base. Precise occurrence locations have been mapped (Appendix 3). Additional population, location, habitat, threat, and other data for the six occurrences are contained in the appropriate Occurrence Record (Appendix 4).

001 Buttermilk Slough - Located east of Buttermilk Slough, about 5 miles southeast of Weiser, Washington County. I did not observe any plants in the area where I believe this population occurs. It may be very local. Pinpointing this population will require additional field work during a good flowering year.

002 Macks Creek - Located along the eastern slope of the Owyhee Mountains near lower Macks Creek, about three miles northwest of Reynolds, Owyhee County. I did not observe any plants in the area where I believe this population occurs. It may be very local. Pinpointing this population will require additional field work during a good flowering year.

003 Rye Patch North - Located north of Rye Patch and Fossil Creek, about 5 miles north of Oreana, Owyhee County, in the Snake River Birds of Prey Area.

004 Dead Horse Creek - Located west of Highway 95 near Dead Horse Creek, about 15 miles southwest of Marsing, Owyhee County.

005 Cherry Gulch NE - Located in the dissected hills near the upper end of Cherry Gulch about nine miles southeast of Weiser, Washington County.

006 East of Little City of Rocks - Located on the plateau east of Little City of Rocks along the south face of the Mount Bennett Hills, about 16 miles south of Fairfield, in Gooding County.

Figure 2. Distribution map for *Stanleya confertiflora* in Idaho.

Note: This map is not available for versions of the report generated for the CDC homepage.

Unverified/undocumented reports: There is a Malheur prince's plume collection at the Snake River Plains Herbarium (Boise State University) with insufficient label information to be able to relocate the collection site. The only information provided on the label is a date (May 1932) and vague location comments ("all over Idaho"; and "foothills in Idaho"). Although it is a marginal specimen, this collection appears to be Malheur prince's plume.

Arthur Cronquist made a collection of Malheur prince's plume in 1959, from 23 miles southwest of Marsing. This collection (A. Cronquist #8380) is at the New York Botanical Garden Herbarium (NY). Twenty-three miles southwest of Marsing puts the location near the Idaho-Oregon state line, but no more precise information is known at this time. I became aware of this collection in December, 1997, six months after completing field work for this species. It has not been entered into the CDC data base, although it will be at a later date, after an attempt to find more information about it.

Hitchcock (1964) cites a 1925 Macbride collection (Macbride 217) from Big Willow, Canyon County, Idaho. There is a Willow Creek in Canyon County, but I was unable to find reference to a "Big Willow". I wonder if this location is not actually from further north in Big Willow Creek Canyon, Payette County.

Synopsis of past and needed inventories: Prior to 1997, there have been a number of general and species specific rare plant inventories in areas that overlap with the distribution of Malheur prince's plume in southwestern Idaho. Most have concentrated on lands managed by the BLM's Lower Snake River District, involving BLM or other botanists working cooperatively with this agency. The first coarse-level rare plant inventories were conducted by Roger Rosentreter starting in 1978. In more recent years, Ann DeBolt has led several BLM teams surveying for rare plants in the District. Field investigations for rare plants such as *Astragalus mulfordiae* (Moseley 1989), *Chaenactis cusickii* (Moseley 1994), *Hackelia cronquistii* (Moseley 1996), *Haplopappus radiatus* (Mancuso and Moseley 1993), and *Mentzelia mollis* (Smithman 1989) have included areas near Idaho populations of Malheur prince's plume.

My 1997 survey represents the first systematic inventory undertaken in Idaho for Malheur prince's plume. Appendix 5 lists and discusses the areas surveyed in 1997, where no Malheur prince's plume was found. Surveys were conducted in the Weiser and Payette areas (Washington, Payette, and a little of Gem counties), the McBride Creek, Reynolds, and Oreana areas (northwestern Owyhee County), and the Little City of Rocks area in the Mount Bennett Hills (Gooding County). The majority of survey work was conducted on lands managed by the BLM's Lower Snake River District.

Malheur prince's plume has a spotty, relatively widespread range in Idaho. Large portions of this range have difficult access. Private land is common in some areas with potential habitat for this species. The result of this combination of factors is that a number of areas remain either unsurveyed or poorly surveyed for Malheur prince's plume. Areas where potential Malheur prince's plume habitat is known or thought to exist (based on geologic maps) include:

Weiser/Payette area

1. The ridge complex on the north side of Cherry Gulch, extending west from near Occurrence 005.
2. Big Willow Creek upstream of the confluence of Dry Creek, to the Sulphur Gulch area.
3. Scattered outcrops on the north side of Sheep Ridge, approximately 12 miles east of Payette.

Marsing and Succor Creek areas

1. Extensive outcrops of Poison Creek Formation rock occur south of Marsing and Homedale along the base of the Owyhee Mountains. It seems reasonable that pockets of potential habitat occur in this area.
2. Succor Creek, approximately two miles northeast of Sheaville, Oregon. Most of this area has been searched in the past for other rare plant species, but none of the extensive Sucker Creek Formation outcrops were looked at in 1997.
3. Coal Mine Basin, approximately six miles northeast of Sheaville, Oregon. Several botanists have visited this area in the past, but not looking for Malheur prince's plume.
4. The Baxter and Hooker creek drainages west of Swisher Mountain near the Oregon-Idaho state line.

Oreana area

1. Fossil Creek area, east of Fossil Butte, north of Oreana.
2. Between Fossil and Sinker creeks, north of Occurrence 004. I was able to survey only scattered portions of this several square mile area.

Reynolds area

1. Scattered large and small clay and ash exposures west and southwest of Reynolds.

Mount Bennett Hills area

1. The plateau east of Little City of Rocks where Occurrence 006 is located was incompletely surveyed in 1997. The gently sloping plateaus further west (east and west of Burnt Willow Canyon) appear to have habitat similar to Occurrence 006. Additional potential habitat may be present in other areas of the Mount Bennett Hills as well.

HABITAT

General habitat description: In Idaho, Malheur prince's plume occurs in the semiarid, sagebrush-steppe ecosystem characterizing much of the southwestern part of the state. Malheur prince's plume is found on open, relatively sparsely vegetated exposures of clay soil. Attributes of the clay soils precludes establishment of all but a few plant species. In Oregon, a few collections are reported from sandy soils. In Idaho, I found a few plants on soils with a sandy-clay texture at the Rye Patch North occurrence (003). Shrubs are relatively sparse or absent, while several native or exotic annual species may be common. Patches of Malheur prince's plume tend to be small and local.

Malheur prince's plume is most common on northwest to northeast aspects, but has been observed on west- to southeast-facing exposures. It occurs on steep to nearly flat slopes. These slopes often have a convex shape. In the Mount Bennett Hills it occurs on slightly raised, convex-shaped mounds similar to what is found in areas with patterned ground. Elevations in Idaho range from approximately 2,400 ft., to 5,000 ft.

In 1997, all but a few stray plants were restricted to northerly (NW to NE) aspects. The northerly-facing slopes provide relatively mesic conditions in these otherwise dry habitats. It is unclear if Malheur prince's plume is more or less confined to northerly aspects in Idaho, or if this was just the case in 1997, a year that apparently represented less than ideal flowering conditions for this species.

Geology and soils: In Idaho, Malheur prince's plume is restricted to deep clay substrates. The clay soils weather to a popcorn or cracked surface structure and likely possess a high shrink-swell capacity. The clays are derived from a variety of parent materials such as basalt flows, lacustrine sediments, and tuff. The soils are often colorful, and noticeably distinct from the surrounding substrates. Soil colors range from brown, to off-whites, including orange, yellow, beige, and tan hues.

001 Buttermilk Slough - The clay soils of this population are derived from Pliocene age rock mapped as the Idaho Formation (Mitchell and Bennett 1979).

002 Macks Creek - The slopes where Malheur prince's plume was collected near lower Macks Creek are mapped as a Miocene-aged basalt derived from many thin flows of dark greenish-gray and black basalt that weather to brown and orange-brown (Ekren et al. 1981).

003 Rye Patch North - This population is underlain by sediments of the upper part of the Bruneau Formation. These Pleistocene lake bed sediments consist of tan and white clay in massive sequences (Ekren et al. 1981).

004 Dead Horse Creek - This population is underlain by brownish- to tan-colored elements of the Sucker Creek Formation. This Miocene-aged formation consists of altered and vitric nonwelded bedded tuffs (Ekren et al. 1981). Much of the Sucker Creek Formation is made up of layers that were originally deposits of airborne volcanic ash. This volcanic ash is comprised of tiny fragments of pumice, other kinds of natural glass, and small amounts of mineral grains. These fragments readily decompose after the layers containing them have been further buried. A mineral called montmorillonite, a kind of clay, is the main product of decomposition. Montmorillonite can absorb water, and it swells up and feels greasy to the touch when wet. When exposed to surface weathering it swells, cracks and sloughs off (Kittleman 1973). Most plant species are not adapted to these conditions.

005 Cherry Gulch NE - The clay soils of this population are derived from Pliocene age rock mapped as the Idaho Formation (Mitchell and Bennett 1979).

006 East of Little City of Rocks - The clay soil mounds supporting Malheur prince's plume are derived from basalt belonging to an undivided unit of the Banbury group. This unit is comprised of mostly thin, vesicular flows of olivine basalt that erupted during Miocene times (Worl et al. 1991).

Associated species: Most associated species are annuals such as *Cleome platycarpa*, *Cleomella macbrideana*, *Mentzelia albicaulis*, *Phacelia lutea* var. *lutea*, *Phacelia lutea* var. *calva*, *Gayophytum* sp., annual *Eriogonum* species, *Descurainia* sp., *Lepidium perfoliatum*, *Halogeton glomeratus*, and *Bromus tectorum*. A few perennial species noted at one or more sites are *Atriplex confertifolia*, *Oryzopsis hymenoides*, *Eriogonum ochrocephalum*, and *Lomatium nudicale*. The habitat is surrounded by shrub-steppe vegetation dominated by *Artemisia arbuscula*, *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia tridentata* ssp. *xericensis*, or *Atriplex confertifolia*.

Other rare species: Malheur prince's plume is sympatric with four other rare plant species at the Dead Horse Creek (004) site, *Chaenactis cusickii* (Cusick's false yarrow), *Lomatium packardiae* (Packard's desert-parsley), *Mentzelia mollis* (smooth stickleaf), and *Phacelia lutea* var. *calva* (Malheur yellow phacelia). *Chaenactis cusickii* and *Mentzelia mollis* are endemic to the Succor Creek drainage and adjacent portions of Malheur County, Oregon, and Owyhee County, Idaho (Smithman 1989). Similarly, the *Phacelia*

is restricted to the Succor Creek area, as well as disjunct populations in northwestern Humboldt County, Nevada (Cronquist 1984). *Lomatium packardiae* is a regional endemic distributed from northwestern Nevada to southeastern Oregon and adjacent Idaho (Cronquist 1997). At Buttermilk Slough (001) Malheur prince's plume is associated with *Eriogonum ochrocephalum*, but at this time it is uncertain if it is the variety *calcareum*, considered rare in Idaho.

While conducting field surveys for Malheur prince's plume in 1997, I discovered new locations or was able to update records for eight other rare plant species with overlapping ranges, including *Chaenactis cusickii*, *Mentzelia mollis*, *Phacelia lutea* var. *calva*, *Cymopterus acaulis* var. *greeleyorum* (Greeley's wavewing), *Astragalus cusickii* var. *packardiae* (Packard's milkvetch), *Eriogonum ochrocephalum* var. *calcareum* (calcareous buckwheat), *Cryptantha propria* (Malheur cryptantha), and *Aspicilia fruticulosa* (rim lichen).

POPULATION BIOLOGY

Population size and condition: Malheur prince's plume is known from six occurrences in Idaho. Four (003, 004, 005, 006) contained flowering plants in 1997. No plants were found at the Macks Creek occurrence (002) in 1997. The Buttermilk Slough occurrence (001) on private land could not be directly accessed, and no plants were observed while scanning the putative site from a nearby road with binoculars. I consider all Idaho occurrences to be extant even though no plants were observed at two sites in 1997. The combination of intact habitat, and the apparent capability of intermittent germination/flowering years makes calling these two occurrences extirpated unwarranted at this time.

The six known occurrences cover an estimated 12 to 15 acres, with the large Rye Patch North (003) population accounting for 80% or more of this area. Approximately 1,000 flowering plants were observed in 1997. The Rye Patch North population accounted for about 95% of this total. Vegetative basal rosettes seemed to be rare except at the Dead Horse Creek (004) population. Old Malheur prince's plume skeletons were present at the four occurrences with flowering plants. Their numbers indicated more plants flowered in 1996 than in 1997. Populations consisted of most plants being clumped in one or more relatively small areas along with fewer scattered individuals. Overall density was low in 1997, except at a local (at clumps) scale.

Because of its annual-biennial habit and apparent capability of prolonged dormancy (thereby, not producing above-ground plants each year), the number of plants is by itself an inadequate assessor of population quality. Habitat quality and area are other attributes that should be used to assess a population's conservation status.

The four occurrences I was able to assess in 1997 have been assigned an occurrence rank ("EORANK" field in the records in Appendix 3). The "A" (highest) through "D" (lowest) ranks are based primarily on occupied area, ecological quality of the site, and above ground population numbers. Secondary considerations include population isolation and habitat fragmentation, and imminent threats. Estimates of population abundance and area are provided below.

001 Buttermilk Slough - This population was most recently observed in 1987, but there is no information regarding its size. Marcus Jones' 1900 collection contains only vague location data, but is assumed to be from the same general vicinity. For this reason it has been assigned to this occurrence location. I was unable to access this population in 1997, which occurs on private land about five miles south of Weiser. There are several scattered clayey outcrops along the steep upper slopes east of Buttermilk Slough that appear to contain suitable habitat for Malheur prince's plume. I searched all of these areas from points below

using binoculars at two different times during the expected flowering period. I did not observe any target plants. If only a few plants were present they could have been easily overlooked, however. Although the lower and middle sections of the slopes near Buttermilk Slough are weedy, the clay outcrops along the upper slopes are sparsely vegetated and appear to be largely intact. These clay outcrops total several acres in size. It is uncertain which outcrop(s) actually contain Malheur prince's plume. They all appear to be light-colored, in contrast to the black color noted during the 1987 visit.

002 Macks Creek - First observed in 1964. There is no population information for this site. I am confident I relocated the area described by the 1964 collection, but was unable to find any plants in 1997. Approximately one acre of suitable-appearing habitat is present in the immediate area. It is intact despite widespread weedy patches.

003 Rye Patch North - This is the largest occurrence known for Idaho. Originally discovered in 1980, the extent of this occurrence was greatly expanded during 1997. This occurrence consists of several subpopulations covering an estimated 12 acres. Approximately 1,000 flowering plants were observed in 1997. Habitat conditions range from undisturbed, to areas adversely impacted by weed invasion. Occurrence rank = A.

004 Dead Horse Creek - Approximately 400 flowering plants were noted when this population was discovered in 1994. During a revisit in 1997, I observed only 12 flowering plants, plus between 100 and 200 basal rosettes and an estimated 100 skeletons from 1996. This population covers less than one acre, although additional unoccupied habitat occurs within this extensive Sucker Creek Formation exposure. The area also supports four other rare plant species - *Chaenactis cusickii*, *Lomatium packardiae*, *Mentzelia mollis*, and *Phacelia lutea* var. *calva*. Weedy species are established in the area, but the clay slopes are mostly undisturbed. Occurrence rank = A.

005 Cherry Gulch NE - A small occurrence. It was discovered in 1996, when 150-200 flowering plants were observed. Less than ten plants were seen in 1997, along with about 30 skeletons from the previous year. This occurrence is found in a remnant patch of sagebrush-steppe habitat surrounded by seeded and other agricultural land. Less than 0.3 acre contains Malheur prince's plume. Occurrence rank = C.

006 East of Little City of Rocks - This occurrence was discovered in 1976 and revisited in 1997. Twenty-five flowering plants were observed in 1997 on scattered mounds clustered in two areas. The mounds containing Malheur prince's plume cover less than 0.1 acre. Occurrence rank = C.

Phenology: Germination and growth patterns for Malheur prince's plume have not been investigated. Several patterns seem possible, but I am unsure which most accurately depicts the life history of this species. One possibility is as a winter annual - where plants germinate in the fall, overwinter as a small rosette, initiate reproduction the following spring, and then ripen seeds and die by about mid-summer. Another possibility is as a biennial, where plants remain in the rosette stage for one year before completing their life cycle the second year. A third possibility is as a spring annual - where germination takes place in the spring, and the plant completes its life cycle sometime in the summer. A pattern that is more or less a continuum of all these possibilities may be more accurate.

Elevation and seasonal weather patterns influence the onset of flowering. Plant collection dates range from late April to early July, with mid-May being the most common. The indeterminate, elongated raceme of Malheur prince' plume typically has a sequence of fruits, flowers and flower buds developing simultaneously

during the spring. None of the plants I observed in 1997 were dispersing seeds before my inventory was concluded in mid-June. It seems likely that seeds ripen through the summer and are dispersed by late summer.

Reproductive biology: Malheur prince's plume reproduces by seed. Seed production appears to be prolific based on the number of fruits a plant can produce. It appears that on some plants certain fruits may not mature. This is based on my observation of some stunted, curled siliques. Nothing is known about seed dispersal, viability, or dormancy and germination requirements. I observed bumblebees, other small and large bees, and beetles visiting flowers. No pollination studies have been conducted for this species. The species' showy flowers, especially enmasse, suggests an insect pollinator.

It seems clear that Malheur prince's plume forms a seedbank, and likely this bank can have a prolonged dormancy. At all four occurrences (003, 004, 005, 006) where plants were observed in 1997, there were fewer flowering plants than old 1996 skeletons. At the two occurrences with two years of population estimates available for comparison, the 1997 counts are substantially lower. For example, at Dead Horse Creek (004), an estimated 400 flowering plants were observed in 1994. In 1997, I found only 12. At the Cherry Gulch NE occurrence (005), 150-200 flowering plants were estimated in 1996, while in 1997, less than 10 plants were counted. As Jean Findley (Vale District BLM, Oregon; pers. comm.) has pointed out to me, it seems remarkable that such a showy species has been so rarely collected or noted. One reason may just be its rarity, but another factor may be that populations are represented by flowering plants only episodically, during periods of favorable weather patterns. These favorable patterns likely occur erratically, both temporally and spatially.

Thelypodium repandum (wavy leaf thelypody) is another showy, rare mustard known to reappear at a site after being absent for several years. This east-central Idaho endemic has a life cycle that often exceeds 12 months, technically making it a biennial. However, because it germinates in the fall, it more closely resembles a winter annual (Elzinga 1996). Reproductive biology studies for this species can assist to formulate similar studies for Malheur prince's plume sometime in the future.

Biological Interactions: Unknown.

Competition: It is unknown if weedy annual species that have invaded some Malheur prince's plume sites to one degree or another are a limiting factor. It is also unknown if intraspecific competition may take place under some conditions.

Herbivory: None observed.

LAND OWNERSHIP AND THREATS

Land ownership: Occurrences in Idaho are known from private and BLM land. Two occurrences are managed by the BLM's Lower Snake River District.

001 Buttermilk Slough - Private land. Small parcels of BLM land managed by the Lower Snake River District, Cascade Resource Area are located less than one mile from this occurrence

002 Macks Creek - Private land. Surrounding land is mostly managed by the BLM's Lower Snake River District, Owyhee Resource Area.

003 Rye Patch North - Lower Snake River District BLM, Owyhee Resource Area. This occurrence is located within the Snake River Birds of Prey National Conservation Area.

004 Dead Horse Creek - Lower Snake River District BLM, Owyhee Resource Area.

005 Cherry Gulch NE - Private land. There are parcels of BLM land managed by the Lower Snake River District, Cascade Resource Area land within 0.25 mile of this occurrence.

006 East of Little City of Rocks - Upper Snake River Districts BLM, Shoshone Resource Area.

Land use and threats: All Malheur prince's plume populations in Idaho face current or potential threats to their long-term integrity. Weed invasion is the most widespread problem. Off-road motorized recreation is a serious concern at one occurrence. Most populations are found in areas open to livestock grazing. However, livestock use and related direct threats to Malheur prince's plume habitat appears to be minimal. Current land uses and ongoing or possible threats are listed below for each occurrence.

001 Buttermilk Slough - The surrounding landscape is used primarily for agriculture. There are abandoned and active irrigation canals in the general vicinity of this occurrence. The erosive, steep upper slopes where Malheur prince's plume occurs likely receives minimal use. Various aggressive weed species are well established near this occurrence, but the level of threat they pose is unknown. Activities that would increase disturbance to the habitat of Malheur prince's plume would likely increase the threat of weeds adversely affecting the population.

002 Macks Creek - Livestock grazing occurs throughout the occurrence area. The relatively steep, open slopes where I believe this occurrence is located appear to receive relatively little use. Several invasive species such as cheatgrass (*Bromus tectorum*) are widespread and can be fairly abundant even on the fluffy clay soils. In addition, a road passes below this site.

003 Rye Patch North - This area is used by livestock and motorized recreationists. Motorcycle and ORV riding, and drive-by sightseeing are probably the main recreational uses. Seasonal use by hunters, and some horseback riding and hiking also takes place. Illegal off-road use by ORV's (especially motorcycles) is the main threat to the Malheur prince's plume. There are tracks that pass directly through portions of this population. This disturbance seems to be enhancing weed invasion on the clay soils occupied by Malheur prince's plume. Livestock grazing is minimal on sites occupied by this species.

004 Dead Horse Creek - This site is largely undisturbed. Livestock grazing takes place in nearby sagebrush-steppe habitats, but is minimal within the sparsely vegetated ashbed complex. The main disturbance at the site in 1997 was caused by burrowing rodents. I am unsure if there are any active mining claims within this extensive ash outcrop area. Mining would potentially be devastating to the Malheur prince's plume population.

005 Cherry Gulch NE - Livestock grazing is the predominant current land use. The entire area around this population has been seeded to crested wheatgrass cultivars. A number of weedy forb species are well established and threaten the ecological integrity of the site. Habitat fragmentation may be a threat in this area.

006 East of Little City of Rocks - The unroaded sloping plateau east of Little City of Rocks is largely undisturbed. The low sagebrush (*Artemisia arbuscula*) communities dominating the plateau are in late or

mid-seral condition. The scattered raised mounds supporting Malheur prince's plume tend to be more weedy than adjacent rocky, shallow soil areas, however. It is unclear if this is having an impact on the Malheur prince's plume.

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Conservation Assessment: Malheur prince's plume is known from only six occurrences in Idaho. All but one of these is small. Even though no plants were observed at two populations in 1997, I consider all of them to be extant. Despite extensive searches throughout the species' Idaho range, no new populations were found in 1997. Based on the number of flowering plants I saw, 1997 was not a prime year for Malheur prince's plume. Future surveys conducted during a year of optimum flowering conditions may find new sites within Idaho.

It seems clear that population numbers of above-ground plants can fluctuate greatly between years. Because of its annual/biennial habit and apparent capability of prolonged seed dormancy, the number of plants is by itself an inadequate assessor of population quality. Habitat quality and area are other attributes that need to be used to assess a population's conservation status.

Three occurrences of Malheur prince's plume are located on BLM land, including the Rye Patch North population (003). This is by far the largest population known for Idaho. The other three occurrences are on private land. Weed invasion is the most widespread potential threat to Idaho populations. It already appears to be a problem at two sites (005, 006). Off-road recreation has impacted portions of the Rye Patch North (003) population on BLM land in the Snake River Birds of Prey National Conservation Area. Most populations occur in areas open to livestock grazing, although livestock use and related direct threats on Malheur prince's plume habitat are negligible.

Malheur prince's plume is rare in Idaho and deserves to be a priority conservation concern in the state. The conservation status of Malheur prince's plume still needs to be determined for Oregon. Until this is done, a rangewide understanding of the species' conservation status will not be possible.

Recommendations:

1. Malheur prince's plume is rare and a conservation concern in Idaho. It should remain on the BLM Sensitive Species list for Idaho.
2. The distribution, abundance and conservation status of Malheur prince's plume in Oregon needs to be determined. Based on the limited amount of information presently available for Oregon, this species is a good candidate for the Oregon BLM Sensitive species list as well. A conservation assessment for Oregon is needed before any recommendations to the U.S. Fish and Wildlife Service will be considered credible.
3. Three occurrences of Malheur prince's plume are located on BLM land. They should receive the agencies' fullest protection when making management decisions that may affect the populations. This protection should include a buffer area whenever possible. The Dead Horse Creek (004) and East of Little City of Rocks (006) populations are largely undisturbed at the present time. However, portions of the large Rye Patch North (003) population have already been impacted by illegal motorized off-road use. This population deserves immediate attention by the BLM. The population at Dead Horse Creek is worthy of a special protection designation. The large bowl-like exposure of Sucker Creek Formation ash at this location contains populations of five Idaho

BLM Sensitive species - *Chaenactis cusickii*, *Lomatium packardiae*, *Mentzelia mollis*, *Phacelia lutea* var. *calva*, and *Stanleya confertiflora*. This area also has high scenic and geologic value.

4. A Habitat Conservation Assessment and Conservation Strategy for three former federal candidates (*Astragalus sterilis*, *Chaenactis cusickii*, and *Mentzelia mollis*) endemic to the Succor Creek region was proposed several years ago as part of the Idaho Conservation Effort, but never developed. Malheur prince's plume is sympatric with populations of two of these other rare plants at the Dead Horse Creek site. If efforts are resumed to produce the Assessment and Strategy documents, Malheur prince's plume should be added for any protection measures recommended for the Dead Horse Creek site.

5. BLM field personnel should be made aware of known populations and the potential for discovering additional sites. For the Lower Snake River District, Malheur prince's plume is known from the Weiser/Payette, Oreana, Reynolds and McBride Creek areas. For the Upper Snake River Districts it is known from the Mount Bennett Hills near Little City of Rocks. Confirmed sightings should be reported to the Idaho Conservation Data Center for entry into their permanent rare plant data base.

6. A number of areas known or believed to contain potential habitat for Malheur prince's plume remain unsurveyed or poorly so. These areas were listed earlier in this report (pages 8 and 9) and should be inventoried as time allows.

7. Very little is known about the life history specifics or ecology of Malheur prince's plume. Initiation of monitoring and research studies would go a long ways to clarify some basic questions. The apparent prolonged seed dormancy capabilities of the species should be verified to help interpret population abundance data.

8. Malheur prince's plume was not recognized as a conservation concern in Idaho until fairly recently. For this reason, it was not included in the Conservation Data Center's earlier herbaria searches for Idaho's rare flora. Herbaria at Boise State University (SRP), Albertson College (CIC), and the University of Idaho (ID) were consulted in 1997, for this project. In the spring of 1997, Jean Findley (BLM botanist, Vale District, Oregon) provided me with label information for *Stanleya* collections housed at the Oregon State University Herbarium (OSC). In the future, other regional herbaria should be searched for additional Idaho collections of Malheur prince's plume.

9. The Macks Creek occurrence (002) area should be resurveyed, especially after a wet winter/spring. I did not find any plants in 1997, but this may be an artifact of Malheur prince's plume apparent prolonged seed dormancy capability. Although it is believed to occur on private land, the general area can be viewed from the county road. If the plants are restricted to the top of the slope they may be hard to see from the road. An effort to revisit and pinpoint the Buttermilk Slough (001) population should be undertaken during a good flowering year. The assistance of Roger Rosentreter (BLM State Botanist, Boise, Idaho) would expedite this effort, as he (along with Duane Atwood) discovered the site in 1987.

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