

**FIELD INVENTORY OF BUREAU OF LAND MANAGEMENT
SPECIAL STATUS PLANTS ON THE OWYHEE FRONT,
CASTLE CREEK TO MUD FLAT ROAD**

by

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March 2003

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**Challenge Cost-Share Project
Lower Snake River District, Bureau of Land Management
Idaho Department of Fish and Game
(Order No. DAF020072)**

Abstract

At least 18 taxa of Bureau of Land Management (BLM) special status plants are known to occur on the Owyhee Front, in southwest Idaho. The habitats supporting special status plants on the arid Owyhee Front are derived from sedimentary and volcanic geology, and have unique soils and microsites. Numerous special status plant inventories have been conducted in this area and threats to these species (e.g., OHV use, livestock grazing, exotic species invasion, mining, etc.) have been well documented. However, many areas have never been surveyed or are inadequately surveyed. To address these survey gaps, the Idaho Conservation Data Center (CDC) entered into a challenge-cost-share agreement with the Lower Snake River District BLM to conduct a broad-scale, multi-species inventory of special status plants across a portion of the Owyhee Front in 2002. The inventory resulted in 20 newly discovered special status plant occurrences and 6 updates and/or expansions of prior known occurrences. Discoveries included four new occurrences of *Astragalus mulfordiae*, one of the BLM's species of highest conservation concern in southwest Idaho. Portions of all *Astragalus mulfordiae* occurrences were imminently threatened by OHV traffic. Approximately 5,240 acres were surveyed in eight geographic areas. Of the 26 new or updated occurrences documented during this inventory, 20 had imminent, high magnitude threats present. Documented imminent, high magnitude threats were disturbances related to OHV trails, cattle grazing, and exotic plant species invasion (e.g., *Bromus tectorum*). Numerous occurrences had more than one recorded threat. OHV trails were near 70% of the occurrences. Moderate to heavy cattle grazing within, or adjacent to, occupied habitat was observed at about 30% of the occurrences. Moderate to high cover of *Bromus tectorum* was observed at only four occurrences. No active mining was observed within the areas surveyed, although old mines and/or mining claims were observed in the vicinity of three occurrences. Information on special status plant distribution, threats, habitat condition, and landscape context can be used by the BLM to protect occurrences and their habitat within the framework of multiple-use management and Resource Management Plan revision.

Acknowledgements

Thanks to Ann DeBolt and Valerie Geertson, botanists with the Lower Snake River District BLM, for their assistance in determining the species and areas targeted for inventories. The Lower Snake River District BLM provided funding for this project. Terry Vernholm, with the Idaho Department of Fish and Game, helped review this report.

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Introduction

The basin between the Owyhee Mountains and the Snake River in southwest Idaho, known as the Owyhee Front, supports a large number of rare plant species. At least 18 taxa of Bureau of Land Management (BLM) special status plants are known to occur on the Owyhee Front. The habitats supporting these species are uncommon in Idaho and result from unusual volcanic and lacustrine sedimentary geology, unique soils and microsites, and an arid climate (Caicco and Wellner 1983; Moseley 1987; Jenks et al. 1998). A flora having elements of both the Great Basin and Columbia Basin characterizes this environmental setting. The habitat for the majority of special status plants on the Owyhee Front is mixed desert shrubland and sparse *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) vegetation, similar to vegetation in parts of central Nevada. Numerous plant taxa are at the northern-most edge of their ranges or disjunct from their main populations in the Great Basin and desert southwest. Several endemic taxa, including two of Idaho's most imperiled species, *Astragalus mulfordiae* (Mulford's milkvetch) and *Stanleya confertiflora* (Malheur princesplume), also occur here.

Numerous special status plant inventories have been conducted on the Owyhee Front (e.g., Beisel and Elmore 1994; Carroll et al. 1995; Narad et al. 1997; Mancuso 1999; Mancuso and Murphy 2001; Mancuso et al. 2003; and others), from which much population, habitat, threat, and distribution information has been gained. However, gaps remain regarding the distribution of special status plants in this large area. Areas of potential rare plant habitat have never been surveyed, or have had only cursory surveys. To help fill one of these information gaps, the Idaho Conservation Data Center (CDC), funded by the Lower Snake River District BLM, conducted a broad-scale, multi-species inventory of BLM special status plants across a portion of the Owyhee Front.

Threats to special status plants have been well documented on the Owyhee Front. The increasing use of off-highway vehicles (OHVs) is recognized as the main threat to rare plants and their habitat in this area. Dramatic growth in OHV use is expected to continue, due to the Owyhee Front's proximity to the Boise metropolitan area. Over 100 miles of new OHV trails have been developed during the last 15 years. Lacustrine soils, often supporting special status plants, are highly susceptible to OHV damage. Livestock grazing, salt block placement and water developments, exotic plant species invasion, and land ownership changes are other threats (BLM 1999). The area has in the past, and still is, utilized for cattle grazing and mining. These disturbances, combined with wildfire and rehabilitation activities, can facilitate invasion by competitive exotic species, especially *Bromus tectorum* (cheatgrass). Because of these disturbances, special status plants on the Owyhee Front face on-going habitat loss and degradation, and are a management priority for the BLM.

The area surveyed in 2002 partially coincided with a livestock allotment covered by the 1983 Bruneau Resource Management Plan, currently under revision. Information collected during our 2002 field inventory is useful to BLM planners for managing OHV use and livestock, as well as assessing the impacts of wildfire, mining, and other activities. The BLM can use this information to protect special status plant occurrences and their habitat within the framework of multiple-use management.

Survey Area

The inventory occurred on the Owyhee Front, between Castle Creek and Mud Flat Road, south of Snake River (and exclusive of the Snake River Birds of Prey National Conservation Area) and below (north of) the 4,000-foot elevation line. This area covered over 150 square miles within Owyhee County. Precipitation in the study area averages about 8 to 10 inches per year; winter temperatures are relatively mild, and summers hot and very dry. Soils are typically sandy to silty, gravelly and well-drained, but calcareous, alkaline, selenium-rich, and/or clay-rich outcrops occur in basins and atop certain sediment layers (BLM 1999). Many sites are underlain by cemented layers, or hard pans. Erosion potential is moderate to high. Soils are derived from Miocene and Pliocene-aged Lake Idaho sediments, such as clay, silt, sand and sandstone, oolitic limestone, and gravel. These sediments are often interbedded with altered basalt flows, white and tan ash layers, and tuffs. In the late Pliocene, as Lake Idaho drained to the Snake River, lacustrine sediments and volcanic layers were overlain by

terraces of fluvial sediments and alluvial fans emanating from the Owyhee Mountains. During the Pleistocene to Holocene, scattered sand dunes also formed on the Owyhee Front (Jenks et al. 1998).

Unconsolidated sands, decomposed sandstone, and oolitic limestone can support *Astragalus mulfordiae*, as well as several other special status plants (Mancuso 1999). Pockets of vegetated sand dunes mapped by Jenks et al. (1998) in the Twentymile Gulch and Lower McKeeth Wash areas that were not surveyed in 1999 for *Astragalus mulfordiae* (Mancuso 1999), were a major focus of 2002 inventories. This potential habitat was characterized by having mostly unconsolidated sand with low cover of desert shrubs and *Artemisia tridentata*, minor amounts of *Stipa comata* (needle-and-thread) and *Oryzopsis hymenoides* (Indian ricegrass), numerous forbs adapted to sandy substrates, little microbiotic crust cover, and a high amount of bare ground. Clay and ash outcrops, common in the Birch Creek area, were also habitats specifically targeted during this inventory.

Methods

Preparatory Phase - Prior to field inventories, a list of special status plant taxa targeted for field inventories was developed in consultation with Ann DeBolt and Valerie Geertson, botanists with the Lower Snake River District BLM (Table 1). Specific target areas in need of survey and known to have potential habitat for special status plants were identified at the same time. Prior known occurrences of special status plants in the survey area and relevant literature were reviewed to develop a profile of potential habitat for each target species. Identification of special status plants was made using “Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A., Volumes 3 - 6” (Cronquist et al. 1977, 1984, 1989, 1994, 1997) and “Field Guide to the Special Status Plants of the Bureau of Land Management Lower Snake River District” (Atwood et al. 2000). Nomenclature for all species in the report follows the above references. Below is a brief non-technical description and habitat profile for all target species. The above references should be consulted for complete species descriptions. Mancuso et al. (2003) also provides technical descriptions and thorough information on the biology, habitat, and conservation of all of these special status plants.

***Astragalus mulfordiae* (Mulford’s milkvetch)**: This perennial milkvetch has small, white to yellowish flowers and produces small, distinctively three-angled, green pods. The leaflets are small, pale greenish, and diffusely scattered on thin ascending stems. It is endemic to the Snake River Plain of southwestern Idaho and adjacent eastern Oregon, with a cluster of populations scattered across the southeastern part of the Owyhee Front. Typical habitat is characterized by unconsolidated sandy soil derived from lacustrine or alluvial deposits, decomposed sandstone or oolitic rock, and old stabilized dunes. Plants typical of sandy sites, such as *Chrysothamnus* spp. (rabbitbrush), *Leptodactylon pungens* (prickly phlox), *Oryzopsis hymenoides*, and annual forbs, are commonly associated. Due to a wide range of various threats throughout its limited range, this species is one of Idaho’s most imperiled. The main threats on the Owyhee Front are from OHV use and *Bromus tectorum* invasion.

***Astragalus purshii* var. *ophiogenes* (Snake River milkvetch)**: This variety of the common and widespread species *Astragalus purshii* is endemic to the Snake River corridor and vicinity from Twin Falls County to eastern Oregon. It is a small, stemless perennial having herbage covered with whitish hairs. It produces small pinkish-purple flowers early in the spring. This variety is identified mainly by its strongly incurved, wooly pods. This plant grows on a variety of drought-prone sites, but most occurrences have soils with a distinctly sandy component. One of the most common threats is the invasion by *Bromus tectorum*. Populations are relatively frequently encountered in its range, but most populations are small, composed of widely scattered individuals.

***Blepharidachne kingii* (King’s desertgrass)**: The core range of this small tufted perennial grass is across the central Great Basin, but two disjunct populations are known from the Owyhee Front near Oreana. The species is distinctive, with spikelets having four-flowers, fertile lemmas with plumose awns, and the upper-most lemma having a three-awned bristle-like rudiment.

***Chaenactis stevioides* (desert pincushion)**: This white-flowered, branched composite is a desert annual usually less than 15 cm tall. This species has leaves that are much less wooly than *Chaenactis douglasii* (Douglas’ dustymaiden), and has smaller, more brightly white flowers than *Chaenactis macrantha* (bighead dustymaiden).

Table 1. BLM special status plant species targeted for inventory.

Scientific Name	Common Name	Global Rank*	State Rank*
<i>Astragalus mulfordiae</i>	Mulford's milkvetch	G2	S2
<i>Astragalus purshii</i> var. <i>ophiogenes</i>	Snake River milkvetch	G5T3	S3
<i>Blepharidachne kingii</i>	King's desertgrass	G4	S1
<i>Chaenactis stevioides</i>	desert pincushion	G4	S2
<i>Cymopterus acaulis</i> var. <i>greeleyorum</i>	Greeley's wavewing	G5T2	S2
<i>Eatonella nivea</i>	white eatonella	G4	S3
<i>Eriogonum shockleyi</i> var. <i>packardiae</i>	Packard's cowpie buckwheat	G5T2	S2
<i>Eriogonum shockleyi</i> var. <i>shockleyi</i>	matted cowpie buckwheat	G5T4	S2
<i>Glyptopleura marginata</i>	white-margined wax plant	G4	S3
<i>Ipomopsis polycladon</i>	spreading ipomopsis	G4	S2
<i>Nemacladus rigidus</i>	rigid threadbush	G4	S2
<i>Penstemon janishiae</i>	Janish's penstemon	G4	S2
<i>Peteria thompsoniae</i>	spine-noded milkvetch	G4	S2
<i>Psathyrotes annua</i>	turtleback	G5	S2
<i>Stanleya confertiflora</i>	Malheur princessplume	G1	S1

*Global (G) rank applies to the species' conservation status rangewide; (T) is the trinomial rank indicator; denotes rangewide status of infraspecific taxa. State (S) rank applies to its conservation status within Idaho (Idaho Conservation Data Center 2002, NatureServe 2002): 1 = critically imperiled because of extreme rarity or because of some factor of its biology making it especially vulnerable to extinction (often 5 or fewer occurrences); 2 = imperiled because of rarity or because of other factors demonstrably making it vulnerable to extinction (often 6 to 20 occurrences); 3 = rare or uncommon, but not imperiled (often 21 to 100 occurrences); 4 = not rare and apparently secure, but with cause for long-term concern; 5 = demonstrably widespread, abundant, and secure.

Both of these other *Chaenactis* species can occur in potential *Chaenactis stevioides* habitat. The species is relatively widespread, ranging from the Sonoran Desert north through the Great Basin and east to the Colorado Plateau. Disjunct populations occur on the Owyhee Front and along the Snake River. Habitat supporting *Chaenactis stevioides* can vary. Many sites have sandy or gravelly soils with *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex* spp. (saltbrush), *Chrysothamnus* spp., *Oryzopsis hymenoides*, and annual forbs. Other sites have silty, and sometimes clay-rich, soils that can be slightly alkaline and support *Sarcobatus vermiculatus* (greasewood). *Bromus tectorum* can sometimes have moderate to high cover in occupied habitat, with poorly known long-term effects on this species. OHV use is another major threat.

Cymopterus acaulis var. *greeleyorum* (Greeley's wavewing): This variety of *Cymopterus acaulis* is distinguished from other varieties by having umbels of yellow flowers (versus white) with yellow stamens. It is a low-growing, taprooted perennial with flat, pinnately dissected leaves near the ground. The fruits have prominent wavy wings. The variety is endemic to the Owyhee Front, the McBride Creek area, and adjacent eastern Oregon. One cluster of populations is known from around Bruneau Dunes State Park. The early spring (or even late winter) flowering period of this species occurs before the time of most special status plant surveys. As a result, the diagnostic yellow flower color is not often observed, and the variety of *Cymopterus acaulis* at numerous sites has never been confirmed. This plant typically grows on sparsely vegetated, light-colored ash and clay exposures (i.e., at McBride Creek), as well as on unproductive sandier sites within mixed desert shrub and *Artemisia tridentata* ssp. *wyomingensis* communities (i.e., at Bruneau Dunes). Most populations are small and threat information is not well documented within its narrow range.

Eatonella nivea (white eatonella): This tiny white-flowered annual composite is typically no more than 2 or 3 cm tall. It is usually found by recognizing small tufts of whitish woolly leaves scattered over drought-prone, sparsely vegetated sites. As with other desert annuals, its numbers and reproductive success can vary widely year to year. Typical habitats for the species on the Owyhee Front are slopes or bluffs with coarse sand and fine

gravel, probably of alluvial or lacustrine origin, that support scattered desert shrubs, such as *Chrysothamnus* spp. and *Salvia dorrii* (purplesage), sparse grass (e.g., *Oryzopsis hymenoides*), and annuals. In other areas, like the Snake River canyon, *Eatonella nivea* occurs on dark volcanic cinder. The species is near the northern periphery of its range in southeast Oregon and southwest Idaho. Disjunct populations are known from eastern Washington and in the Salmon River area of east-central Idaho. It is otherwise known from the west-central Great Basin. OHV activity is the most imminent threat on the Owyhee Front.

Eriogonum shockleyi var. *packardiae* (Packard's cowpie buckwheat): This species is easily recognized in the field by its low, densely caespitose, or mounded, cushions of small blueish-green hairy leaves on a woody caudex. The flowering stems appear to be absent on variety *packardiae*, but are actually just very short (about 5 mm tall) and about the same height as the cushion of leaves. *Eriogonum shockleyi* is at the northeastern periphery of its range along the Snake River and some tributary basins (e.g., Bruneau River) in southwest Idaho. Variety *packardiae* is a narrow endemic, known only from the canyon rims of the Snake River in Ada and Owyhee counties, as well as scattered locations on the Owyhee Front and Bruneau River. Both varieties of *Eriogonum shockleyi* grow on unproductive azonal habitats with edaphic characteristics that few other species can tolerate. Soils are often derived from lacustrine deposits and range from thin, gravelly claypan or calcium carbonate derived soils to sandy and/or cobbly desert pavement derived from alluvial deposits. The most common associated species include *Atriplex confertifolia* (shadscale), *Chrysothamnus* spp., *Enceliopsis nudicaulis* (nakedstem sunray), *Eriogonum microthecum* (shrubby buckwheat), *Oryzopsis hymenoides*, *Penstemon acuminatus* (sharpleaf penstemon), *Phlox* spp., *Stanleya pinnata* (desert princesplume), and *Tetradymia glabrata* (litleleaf horsebrush). Wildfires and impacts from suppression and post-fire rehabilitation, as well as OHV use and mining, have been identified as high magnitude threats in southwest Idaho.

Eriogonum shockleyi var. *shockleyi* (matted cowpie buckwheat): This variety of *Eriogonum shockleyi* is distinguished from variety *packardiae* by having a longer flowering stem (about 1 to 6 cm) that rises a little above the cushion. This variety is widespread in the Great Basin, from Utah west to eastern California. It occurs along the Snake River corridor from Twin Falls County to Owyhee County. The habitat and conservation aspects of this variety on the Owyhee Front are very similar to those mentioned above for variety *packardiae*.

Glyptopleura marginata (white-margined wax plant): This Great Basin/Mojave Desert annual composite reaches the northern periphery of its range in southwest Idaho. It is recognized by its distinctively white-margined, toothed to lobed, lettuce-like leaves that lie low in a basal cluster. The species has inconspicuous white flowers (aging pinkish) on short stalks that are often hidden within the basal leaf cluster. As with other desert annuals, individuals vary in size (from 4 to 12 cm in diameter) depending on seasonal moisture conditions. The species grows on sandy to sandy-gravelly soils (often observed on old ant mounds), but occasionally it occurs on cinder or desert pavement. Habitat can range from basin flats to steep slopes, but the associated vegetation is typically desert shrubland. Associated vegetation is often mixed *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex canescens* (fourwing saltbrush), *Grayia spinosa* (spiny hopsage), *Sarcobatus vermiculatus*, and *Tetradymia glabrata*, with *Oryzopsis hymenoides* and *Bromus tectorum* present in the understory. There are numerous populations of *Glyptopleura marginata* known on the Owyhee Front, but most have relatively few individuals. Imminent threats on the Owyhee Front are mostly disturbance from OHVs, as well as increased fire risk and competition from *Bromus tectorum*.

Ipomopsis polycladon (spreading ipomopsis): Typically less than 15 cm tall, this glandular and hairy desert annual has several slender, reddish-colored branched stems ascending from a cluster of toothed basal leaves. The flowering heads, with numerous tiny white flowers, are distinct because they are subtended by toothed leaves. This species is relatively widespread in desert regions of southwestern North America, but it reaches the northern periphery of its range in southern Idaho (most populations are known on the Owyhee Front). Populations occur on unproductive microsites, often with concave microtopography, within open desert shrubland vegetation (similar habitat to *Glyptopleura marginata* and *Chaenactis stevioides*). Soils can be shallow over claypans, but are typically sandy (or sometimes gravelly). Populations in Idaho are usually composed of clusters of less than 50 plants covering small microsites. The main threat on the Owyhee Front is from OHV traffic.

Nemacladus rigidus (rigid threadbush): Commonly no more than 5 cm tall, this is a dark greenish to brownish-purple colored annual in the Campanulaceae family. The species is characterized by its basally branching, thin but stout, stems ascending from small basal leaves. The branches bear tiny white flowers, with unequal sepals, on relatively long pedicels. This species is disjunct on the Owyhee Front from its main range in the central Great Basin. Habitats on the Owyhee Front are sparsely vegetated microsites in desert shrub communities. The soil is shallow over claypan or sedimentary rock, with sand or dark colored cinders on the surface. Such sites can also support other special status desert annuals. The risk of fire and *Bromus tectorum* invasion on such sites is low, but OHV traffic can be high due to the openness of the habitat. This is one of the most difficult special status plants to survey for because of its small size and dark color, on dark colored habitat substrate.

Penstemon janishiae (Janish's penstemon): Reaching the northern periphery of its range on the Owyhee Front and in southeast Oregon, this is a distinctive glandular penstemon with relatively large (18 to 28 mm) pale purple to deep pink flowers. The flower throats are broad and open, due to the deeply clefted tube, and the staminode is conspicuously exerted and coiled. On the Owyhee Front, plants are restricted to whitish, often chalky textured, clay soils derived from volcanic ash or lacustrine deposits within sagebrush and desert shrub communities. Such sites are sometimes sparsely vegetated with only a few associated species, such as *Eriogonum ochrocephalum* (whitewoolly buckwheat), *Phlox hoodii* (spiny phlox), and *Stanleya pinnata*. The main threats on the Owyhee Front are from OHV traffic and mining.

Peteria thompsoniae (spine-noded milkvetch): Superficially resembling an *Astragalus*, this perennial species differs by having spine-like stipules at the base of its pale green, strigose leaves. The flowers are cream colored on terminal inflorescences. Much of the plant is distinctively covered with glandular hairs. Individual plants can vary in size, partially in response to moisture conditions. Populations on the Owyhee Front are usually on gravelly volcanic sands with desert shrub vegetation. Populations occur on slopes, sometimes covered with basalt talus, as well as ridges and flats. The species is widespread in the southern and central Great Basin, adjacent Mojave, and across southern Utah, occurring on a variety of substrates. The disjunct populations on the Owyhee Front are restricted to the lower Bruneau River. Invasion and competition by *Bromus tectorum* poses an imminent threat to populations that have been burned. Other threats on the Owyhee Front include OHVs, cattle grazing, and mining.

Psathyrotes annua (turtleback): This is a distinctive desert annual species characterized by a low, cushion-like growth of rounded, toothed leaves that are bluish-green color and fuzzy due to a scurfy covering. The yellow flower heads of this composite are tiny and discoid. Although widespread in the southern Great Basin and adjacent Mojave Desert, this species is disjunct on the Owyhee Front. It is sometimes sympatric with other special status plants on the Owyhee Front, such as *Chaenactis stevioides*, *Glyptopleura marginata*, *Nemacladus rigidus*, and *Peteria thompsoniae*. Habitats are barren to sparsely vegetated openings in desert shrub communities. The soils are shallow with a sandy or cinder surface (very similar to those supporting *Nemacladus rigidus*). Like other annuals, its numbers can fluctuate year to year depending on moisture conditions. The main threat to the species is OHV traffic. Cattle use and *Bromus tectorum* invasion are low in this species' habitat.

Stanleya confertiflora (Malheur princesplume): This mustard is recognized by its single stem of entire, sessile, clasping, glabrous, and glaucous leaves topped by a dense raceme of dull yellow or cream flowers. These features, combined with its biennial or annual habit, distinguish it from other *Stanleya* species, such as *Stanleya viridiflora* (green princesplume). This species is endemic to eastern Oregon and southwest Idaho, where relatively few, and widely scattered, populations are known. The habitat is often restricted to sparsely vegetated clay soil derived from weathered, brownish to purplish colored ash outcrops with various slopes and aspects. There are usually few associated species, with *Atriplex confertifolia*, *Cleome platycarpa* (golden spiderflower), *Halogeton glomeratus* (halogeton), and *Phacelia lutea* (yellow phacelia) being some of the more commonly observed species. The species is of high conservation concern because of its natural rarity and imminent, high magnitude threats from OHV traffic.

Fieldwork - Field inventory was conducted between May 9 and June 4, 2002, during the time of peak flowering for nearly all of the special status plants on the Owyhee Front (except *Cymopterus acaulis* var. *greeleyorum*). Areas were surveyed by following a meandering transect through potential special status plant habitat. The vast areas of potential habitat and time constraints prohibited tight, gridded searches and exact counts of individual plants at some of the largest special status plant populations. The exception was in potential *Astragalus mulfordiae* habitat, where tight gridded surveys were conducted. At each special status plant occurrence found, or at prior known occurrences revisited or expanded, information on population size and area, habitat, threats (including OHV use, cattle grazing, and *Bromus tectorum* invasion), landscape context, and conservation needs were recorded. Locations were recorded with a navigational grade GPS unit.

Data Management - Information collected at all new or updated special status plant occurrences were used to create element occurrence records (EORs) in the CDC database. An “element occurrence” is the standard database record used throughout the Natural Heritage Program/CDC network to track rare species, or “elements,” of conservation concern. Occurrences represent a specific geographic location and may or may not be equivalent to the biological definition of a population because of management, habitat, and geographic considerations (NatureServe 2002). Each occurrence is assigned a three-digit number for tracking purposes. Each EOR is given a rank that represents the estimated viability, or probability of persistence, of occurrences based on current habitat condition, population size, and landscape context. An ‘A’ rank equals excellent estimated viability; a ‘B’ rank equals good; a ‘C’ rank equals fair; and a ‘D’ rank equals poor. Information regarding the special status plant occurrences discovered or updated in 2002 within the Owyhee Front survey area, as well as their EOR ranks, are summarized in Table 2. The complete EORs are in Appendix 1. Occurrence maps for all special status plants found or updated during this inventory are in Appendix 2. Maps of all areas surveyed are in Appendix 3.

Results

The inventory resulted in 20 newly discovered occurrences of special status plants and six updates and/or expansions of prior known occurrences. Approximately 5,240 acres were surveyed in eight geographic areas. For each survey area, the geographic location, environment (including geomorphology, soils, vegetation, and special status plant habitats), and landscape context (including land use and condition) is detailed below. A description, including habitat and threat information, of each special status plant occurrence found or updated in 2002 is also included by survey area. Table 2 summarizes important population, threat, and landscape context information for each of these occurrences.

Birch Creek

Geographic Description: This survey area consisted of about 3 miles of the Birch Creek watershed and adjacent breakslopes, ridges, benches, and badlands (including adjacent McKeeth Wash to the southeast) upstream from where the Poison Creek Cutoff Road crosses Birch Creek. Small areas of white clay badlands were surveyed on the west side of Birch Creek, immediately to the north of the Poison Creek Cutoff Road.

Environment: The Birch Creek survey area is a geologically diverse and highly scenic area composed of impressive white clay badlands in the lower reaches, overlain by brownish colored sedimentary layers (mostly sand and tuff deposits), with interspersed sandstone, ash, sand, and clay layers. These layers have been differentially eroded into steep breakslopes or terraces depending on their resistance to weathering. The upper slopes tend to have coarse textured, but unproductive, soil supporting scattered desert shrubs. The lower slopes typically have very unproductive and clay rich soil characterized by widely scattered forbs and desert shrubs. In the middle portion of the survey area, Birch Creek has carved through a 10 m thick terrace of oolitic sandstone, forming steep canyon walls complete with narrow tributary slot canyons. Shallow ash, sand, and clay layers perched atop these sedimentary terraces form very unproductive soils, with only widely scattered plants, but large numbers of *Penstemon janishae*. In several patches, erosion of sandstone, combined with deposition of sand has created excellent potential habitat for *Astragalus mulfordiae*. Surveys of these areas yielded no new populations of the species. Further up the canyon, Birch Creek begins to carve through basaltic bedrock.

Table 2. List of BLM special status plant occurrences discovered or updated during 2002 inventory.

Species (EOR#)	Occurrence Name (Survey Area)	EO	7.5 Minute Quad	Population Size & Area	Imminent/High Level Threats	Habitat Condition & Landscape Context	EO Rank
<i>Astragalus mulfordiae</i> (011)	Twentymile Gulch (20mile Gulch—Gravel Pit)	update	Chalk Hills & Grand View	300 (estimated) 30+ ac	heavily used OHV trails within 100 m; road within 10 m	low <i>Bromus tectorum</i> ; light grazing; OHV use common; sand/gravel quarry & road; desert shrub/burn mosaic/degraded wash	A
<i>Astragalus mulfordiae</i> (023)	Between 20mile Gulch & Shoofly (NW of Shoofly)	new	Chalk Hills	15 0.20-0.25 ac	heavily used OHV trail within 20 m	low <i>Bromus tectorum</i> cover; light to moderate grazing & OHV use; mostly intact desert shrubland, burn mosaic to N	C
<i>Astragalus mulfordiae</i> (024)	Twentymile Gulch N (Twentymile Gulch)	new	Perjue Canyon	20 2.25 ac	heavily used OHV trail within 2 m	low <i>Bromus tectorum</i> cover; light grazing; frequent OHV use; intact desert shrubland, degraded valley bottom	C
<i>Astragalus mulfordiae</i> (025)	Lower Vinson Wash (Lower McKeeth Wash)	new	Vinson Wash	53 0.20 ac	OHV trail within 10 m; locally heavy grazing	low <i>Bromus tectorum</i> & weed cover; light to locally heavy grazing; one OHV trail; intact desert shrubland, degraded valleys	C
<i>Astragalus mulfordiae</i> (026)	Sandhill Point (Lower McKeeth Wash)	new	Vinson Wash	15 0.10 ac	several adjacent OHV trails	low <i>Bromus tectorum</i> cover; light grazing; frequent OHV use; intact desert shrubland, degraded valleys and flats	C
<i>Astragalus purshii</i> var. <i>ophiogenes</i> (053)	Lower McKeeth Wash—Sandhill (Lower McKeeth)	new	Vinson Wash	15 (estimated) <0.10 ac	immediately adjacent OHV trail	good soil crust cover; low <i>Bromus tectorum</i> cover; light grazing & OHV use; intact desert shrubland	C
<i>Astragalus purshii</i> var. <i>ophiogenes</i> (054)	Missile Base Rd—Low. Vinson Wash (Lower McKeeth)	new	Vinson Wash	3 0.10 ac	locally moderate grazing	low <i>Bromus tectorum</i> & weed cover; light to moderate grazing; intact desert shrubland benches, burnt valley bottoms	C
<i>Astragalus purshii</i> var. <i>ophiogenes</i> (055)	SE of Castle Creek (SE of Castle Creek)	new	Rough Mountain NE	1,000+ (estimated) ? ac	infrequently used OHV trails adjacent	low <i>Bromus tectorum</i> & weed cover; light grazing & OHV use; intact desert shrub benches, degraded valley bottoms	A
<i>Astragalus purshii</i> var. <i>ophiogenes</i> (056)	Birch Creek—Upper McKeeth Wash (Birch Ck.)	new	Rough Mountain NE	69 (estimated) 0.20 ac	infrequently used OHV trails adjacent	poor soil crust; low <i>B. tectorum</i> cover; moderate grazing; OHV use common; intact sagebrush-steppe, degraded valleys	B
<i>Astragalus purshii</i> var. <i>ophiogenes</i> (057)	Middle Vinson Wash (Vinson Wash)	new	Perjue Canyon	13 <0.10 ac	no imminent threats; old OHV/dozer trails within 100 m	low <i>Bromus tectorum</i> & weed cover; light grazing; infrequent OHV use; old dozer trail; road through intact desert shrub	B
<i>Astragalus purshii</i> var. <i>ophiogenes</i> (058)	West Ridge of Twentymile Gulch (NW of Shoofly)	new	Chalk Hills & Perjue Canyon	20+ (estimated) 0.30-0.50 ac	recent OHV trails within 10 m; grazing; exotic weeds	low-moderate <i>B. tectorum</i> , <i>Salsola kali</i> cover; light to moderate grazing; OHV use common; desert shrub & burn mosaic	C
<i>Chaenactis stevioides</i> (004)	SE of Castle Creek (SE of Castle Creek)	update	Rough Mountain NE	1,000+ (estimated) 10 ac	mining claims nearby; heavy grazing; exotic weeds	high <i>Bromus tectorum</i> cover; old mining in area; heavy grazing; degraded, early seral greasewood basin	C
<i>Chaenactis stevioides</i> (023)	Twentymile Gulch (Twentymile Gulch-Gravel Pit)	new	Grand View	1 point (<0.10 ac)	recent OHV trail within 50 m	moderate <i>B. tectorum</i> cover; light grazing; OHV use, sand/gravel quarry, & road in area; intact desert shrubland	D

Species (EOR#)	Occurrence Name (Survey Area)	EO	7.5 Minute Quad	Population Size & Area	Imminent/High Level Threats	Habitat Condition & Landscape Context	EO Rank
<i>Chaenactis stevioides</i> (024)	Twentymile Gulch SE (NW of Shoofly Creek)	new	Chalk Hills	158 0.25 ac	locally heavy grazing; exotic weed invasion	high <i>B. tectorum</i> , <i>Salsola kali</i> cover; moderate to heavy grazing; OHV use common; degraded sagebrush/burn mosaic	C
<i>Eatonella nivea</i> (023)	Perjue Canyon (Poison Creek)	update	Perjue Canyon	75-100+ (estimated) 3+ ac	no imminent threats	low <i>Bromus tectorum</i> cover; widespread grazing; OHV use in area; intact desert shrubland	B
<i>Eatonella nivea</i> (027)	E of Vinson Wash (Vinson Wash)	new	Vinson Wash	7,000-10,000 (estimated) 0.50-1 ac	no imminent threats; OHV within 125 m; rodent & ant impacts	moderate <i>Bromus tectorum</i> cover; light grazing; OHV use common; intact desert shrubland, degraded valley bottoms	A
<i>Eatonella nivea</i> (028)	Twentymile Gulch N (Twentymile Gulch)	new	Perjue Canyon	30-50 (estimated) 0.10-0.20 ac	OHV trail within 5 m & heavily used trail within 20 m	low <i>Bromus tectorum</i> cover; light to moderate grazing; frequent OHV use; intact desert shrubland, degraded valleys	C
<i>Eriogonum shockleyi</i> var. <i>packardiae</i> (019)	S Vinson Wash—N of 20mile Gulch (Vinson Wash)	new	Perjue Canyon	50,000-60,000 (estimated) 10+ ac	no imminent threats; old OHV/dozer trails within population	low <i>Bromus tectorum</i> & weed cover; light grazing; infrequent OHV use; old dozer trail; road through intact desert shrub	A
<i>Glyptopleura marginata</i> (004)	Poison Creek (Poison Creek)	update	Perjue Canyon	160+ (estimated) 2 ac	several adjacent OHV trails; grazing; exotic weeds	moderate to high <i>B. tectorum</i> & weed cover; moderate grazing; OHV use common; intact desert shrubland, degraded valley bottoms	C
<i>Glyptopleura marginata</i> (030)	Lower Vinson Wash (Lower McKeeth Wash)	update	Vinson Wash	10+ (estimated) ? ac	locally moderate grazing	low <i>Bromus tectorum</i> cover; light to moderate grazing; intact desert shrubland	C
<i>Glyptopleura marginata</i> (056)	Twentymile Gulch (Twentymile Gulch-Gravel Pit)	new	Grand View	15 0.10-0.20 ac	locally heavy grazing; heavily used OHV trails adjacent	low <i>Bromus tectorum</i> ; light grazing; OHV use common; sand/gravel quarry & road; desert shrub/burn mosaic/degraded wash	C
<i>Glyptopleura marginata</i> (057)	Between 20mile Gulch & Shoofly (NW of Shoofly)	new	Chalk Hills	20 <0.25 ac	heavily used OHV trail within 5 m	low <i>Bromus tectorum</i> cover; light to moderate grazing; OHV use common; intact desert shrub, degraded valleys and flats	C
<i>Glyptopleura marginata</i> (059)	Basin E of Castle Creek (SE of Castle Creek)	new	Rough Mountain NE	50-100 (estimated) 3+ ac	grazing; mining claims nearby; OHV trails within 50 m	variable <i>Bromus tectorum</i> cover; old mining in area; mostly light grazing; OHV use common; degraded sagebrush & greasewood	C
<i>Ipomopsis polycladon</i> (023)	Twentymile Gulch NW (Vinson Wash)	new	Perjue Canyon	5 <0.10 ac	no imminent threats; old OHV trail within 50 m	low <i>B. tectorum</i> & weed cover; light grazing; OHV use in area; intact, but degraded desert shrub & burn mosaic	C
<i>Penstemon janishiae</i> (012)	Birch Creek N (Birch Creek)	update	Rough Mountain NE	3,000 (estimated) 13 ac	recent OHV trails within 50 m	low <i>Bromus tectorum</i> cover; light grazing; OHV use common; intact desert shrubland, degraded valley bottom	B
<i>Penstemon janishiae</i> (020)	Basin East of Castle Creek (SE of Castle Creek)	new	Rough Mountain NE	125-250 (estimated) 2+ ac	no imminent threats; mining claims nearby	low <i>Bromus tectorum</i> cover; old mining in area; light grazing and OHV use; intact desert shrubland, degraded valley bottoms	B

Most of the benchlands are composed of more recent gravelly and cobbly alluvial fan deposits that cap underlying sedimentary layers. The benchlands are mostly dominated by *Artemisia tridentata* ssp. *wyomingensis*/*Poa secunda* vegetation with *Atriplex confertifolia* and mixed desert shrubs on more gravelly or cobbly ridges. This vegetation is good habitat for *Astragalus purshii* var. *ophiogenes*. The vegetation of benchlands was mostly intact, but a small area of burn mosaic occurs in the upper McKeeth Wash area.

Landscape Condition: The predominant land uses in this survey area are cattle grazing and OHV recreation. Occasional dispersed camping and associated 4 x 4 driving also occurs in the Birch Creek bottom. The unique geology and scenic value of the area make it desirable for camping and hiking activities. There are a few mining claim stakes widely scattered in the survey area. Birch Creek is an ephemeral stream in the upper portion of the survey area, supporting some riparian vegetation, but quickly becomes a wide, sand-filled dry wash as you approach the Poison Creek Cutoff Road. Cattle grazing is widespread in the area, but grazing intensity in the uplands is generally light to moderate. Although perennial grasses dominate the understory of upland vegetation, microbial soil crust is often degraded or lacking. In contrast to uplands, cattle congregate in the creek bottom. Similarly, due to the rugged breaklands, OHV use is generally heaviest in the creek bottom, although numerous spur trails go up small tributary washes. However, several OHV trails were observed going cross-country on ridge slopes and benches. As a result of multiple disturbances, *Bromus tectorum* density, as well as density of other exotic species such as *Cardaria draba* (hoary whitetop), was highest in the valley bottom.

Element Occurrences:

- 1) *Astragalus purshii* var. *ophiogenes* (056) (new): This occurrence consisted of five sub-populations totaling about 70 individuals. The total area covered by the sub-populations was only about 0.20 acre. Plants occurred on break slopes and hillsides of alluvial fan benches with gravelly, cobbly, and sandy loam soils. The predominant vegetation was open *Artemisia tridentata* ssp. *wyomingensis* with *Poa secunda* (Sandberg's bluegrass) and/or *Oryzopsis hymenoides* in the understory, and scattered *Tetradymia glabrata*. *Astragalus purshii* var. *ophiogenes* was also observed in a *Salvia dorrii*/*Oryzopsis hymenoides* community. Only trace to low cover of *Bromus tectorum* was present. The main threats were from widespread OHV travel, and to a lesser degree, cattle grazing. An old, infrequently used OHV track was present 15 m downslope of a sub-population, while heavily used OHV trails were present about 40 m away. Although cattle grazing intensity was low to moderate, there was evidence of decreased microbial soil crust due to livestock trampling.
- 2) *Penstemon janishiae* (012) (update/expansion): Prior to 2002, only one small population located on a slope on the southeast side of Birch Creek was known at this occurrence. Thorough surveys this year found a total of nine sub-populations with an estimated 3,000 plants. About 60 to 80% of the plants observed were in bloom and all age classes were represented. Plants mostly occurred on gentle toeslopes and steeper slopes, often with northwest, north, or northeast aspects, as well as on flatter sedimentary rock benches. The soil supporting *Penstemon janishiae* was whitish colored, and varied from clay-rich to ashy, but usually had sand and gravel, as well as alluvial cobbles and stones, embedded. The microtopography was undulating and rilled from erosion. Plants did not occur on "fluffy" ash, pure white clay outcrops, or very rocky or sandy areas. The associated vegetation had low total cover of shrubs, such as *Chrysothamnus humilis* (Truckee rabbitbrush), *Gutierrezia sarothrae* (broom snakeweed), and *Salvia dorrii*, with scattered *Oryzopsis hymenoides* in the understory, and up to 90% cover of bare soil. Associated forbs included *Eriogonum ochrocephalum*, *Astragalus toanus* (Toano milkvetch), *Stanleya pinnata*, and *Phlox hoodii*. *Bromus tectorum* cover was also low. Due to the lack of forage and rough terrain, cattle grazing intensity was light within occupied habitat. OHV use poses the greatest threat. Although most OHV use occurred in adjacent draws and washes less than 50 m away, several old OHV trails crossed benches next to occupied habitat. OHV traffic, weed cover, and cattle grazing were much higher in the bottom of Birch Creek immediately below the sub-populations.

Lower McKeeth Wash

Geographic Description: This survey area included most (but not all) of the ridges and breakslopes forming the northwest side of the McKeeth Wash drainage, stretching over 6 miles from Missile Base Road southwest to the Poison Creek Cutoff Road. The survey area also included immediately adjacent portions of breakslopes in the

lower Birch Creek watershed. The most intensive surveys were concentrated around the Sandhill triangulation point in the lower third of this reach of McKeeth Wash. Due to the similarity of habitat with lower McKeeth Wash, a tributary to lower Vinson Wash located on the southeast side of Missile Base Road (about 1 mile from McKeeth Wash) was also included in this survey area.

Environment: McKeeth Wash is an intermittent, sandy-bottomed wash (rarely carrying water). In the upper two-thirds of the survey area, the wash cuts through sandy and gravelly alluvial fan deposits capping brownish colored sedimentary layers (mostly sand, clay, gravel, and tuff deposits) that have eroded into large, steep-sloped bluffs. There are occasional badlands of eroded ash and clay layers both below and above these bluffs, mainly exposed on the Birch Creek side of the ridge. The vegetation on these bluffs is mainly sparse desert shrubland. A few pockets of gray-brown ash occur that are potential habitat for *Stanleya confertiflora*. These areas were surveyed, but no plants were found. There were also a few bands of claypan soil atop thin sedimentary rock layers, often with prominent *Enceliopsis nudicaule*, that had potential habitat for *Eriogonum shockleyi* and *Penstemon janishae* (no occurrences were documented). Most of the gentle toeslopes in the middle to upper portion of the survey area (and also on the benches along Missile Base Road) were composed of fine-textured silty-sandy soil supporting a mosaic of large, homogeneous *Eurotia lanata* (winterfat) patches, with inclusions of *Atriplex nuttallii* (Nuttall's saltbrush) and *Atriplex confertifolia* patches, in a matrix of *Artemisia tridentata* ssp. *wyomingensis* vegetation. This vegetation was mostly in fair to good ecological condition and unburned. With the exception of occasional lenses of sandy soil (old stabilized dunes) with potential for *Astragalus mulfordiae*, very little habitat for special status plants was observed. The number of sandy soil lenses increased in the lower third of the survey area (especially around Sandhill but also in the lower tributary to Vinson Wash). Much habitat for special status plants was present in these sandy areas.

Landscape Condition: The vegetation in the survey area is intact and unburned. The ecological condition varies from fair (decreased perennial grass and increased *Bromus tectorum*) to very good (with intact microbiotic crust). OHV recreation is the most obvious impact to the landscape condition in the survey area. The majority of the area surveyed is criss-crossed with OHV trails, most frequently in the wash bottoms, but also on ridges, slopes, and benches. A few heavily utilized tracks are present (especially about one-half mile southwest of Sandhill), resulting in vegetation damage, soil erosion, and imminent threats to rare plants. The upper third of the survey area had a lower density of OHV trails. Cattle grazing is widespread in the landscape, but intensity is generally light throughout the survey area (except for a few localized areas). Only in the bottom of McKeeth Wash was grazing heavy. In the lowest part of McKeeth Wash near Missile Base Road, years of grazing impacts, possibly combined with fire or shrub removal, has led to highly degraded valley flats now dominated by *Bromus tectorum*, often with *Halogeton glomeratus*.

Element Occurrences:

- 1) *Astragalus mulfordiae* (025) (new): Three small sub-populations, totaling about 0.20 acre, were observed. A total of 53 plants were counted, 80% of which were non-reproductive during the survey. The sub-populations usually occurred on loose sand (ranging from fine to coarse textured), mostly on upper slopes of low ridges with variable aspects. The associated vegetation was relatively low cover of shrubs including *Chrysothamnus* spp., *Atriplex canescens*, and *Leptodactylon pungens* with *Oryzopsis hymenoides*, *Stipa comata*, and annuals, such as *Mentzelia albicaulis* (whitestem blazingstar) and *Lupinus pusillus* (rusty lupine), in the understory. *Bromus tectorum* cover was low throughout the habitat. The intensity of cattle grazing was variable, with the southern sub-population having relatively high levels of hoof prints and scat piles, much more than the northern sub-populations. Similarly, an OHV trail was observed less than 10 m below occupied habitat at the southern sub-population, while no OHV tracks were observed at the other sub-populations. OHV disturbance presents the greatest threat, but cattle grazing impacts could facilitate the spread of *Bromus tectorum* onto disturbed or compacted sandy soil.
- 2) *Astragalus mulfordiae* (026) (new): This occurrence consisted of one 0.10-acre population of 15 plants. About 35% of the plants observed were reproductive this year. The population occurred on loose, fine-textured sand on an easterly facing gentle slope. The community was open mixed desert shrubs with *Stipa comata* dominating the understory. Sandy site perennials, such as *Oryzopsis hymenoides*, *Arenaria franklinii*

(Franklin's sandwort), and *Abronia mellifera* (white sand verbena), along with annuals, including *Bromus tectorum* and *Nama aretioides* (purplemat), were associated. *Astragalus mulfordiae* did not occur on adjacent crusted or consolidated sand. OHV trails were an imminent threat, with several recent motorcycle trails near occupied habitat both in washes and on slopes. Overall cattle grazing intensity was low and soil disturbance minor. Total *Bromus tectorum* cover was also low.

- 3) *Astragalus purshii* var. *ophiogenes* (053) (new): Approximately 15 plants were observed in a less than 0.10-acre area. Plants occurred within an intact desert shrub community on eroded bluffs composed of mixed sand, conglomerate, and lacustrine deposits. Associated shrubs included *Artemisia tridentata* ssp. *wyomingensis*, *Atriplex confertifolia*, and *Gutierrezia sarothrae*, with *Oryzopsis hymenoides* and *Phlox hoodii* being the most prominent herbaceous species. Cattle grazing disturbance was minimal and microbiotic soil crust was intact. The most imminent threat was from widespread OHV use. Although mostly confined to washes, OHVs occasionally go up hills and ridges in the area, including immediately adjacent to occupied habitat.
- 4) *Astragalus purshii* var. *ophiogenes* (054) (new): This was another small occurrence. Only three plants were tallied in a 0.10-acre area. It occurred in the same habitat as sub-population #2 of *Astragalus mulfordiae* (025). See *Astragalus mulfordiae* (025) for habitat and threat information.
- 5) *Glyptopleura marginata* (030) (update/expansion): The original occurrence, located in 1993, consisted of one sub-population with only 10 plants reported. In 2002, an additional sub-population of one plant was found about 0.40 miles northeast of the original. The habitat was characterized by sandy and gravelly soil on gentle slopes, with an intact community of sparse desert shrubs. Associated shrubs included *Chrysothamnus nauseosus*, *Grayia spinosa*, *Atriplex canescens*, and *Tetradymia species*, with scattered *Oryzopsis hymenoides*, *Bromus tectorum*, and *Sphaeralcea grossulariifolia* (gooseberryleaf globemallow) in the understory. Current OHV use is minimal. Cattle grazing intensity was light to moderate. The habitat is relatively close to an improved gravel road that provides easy access to the area for OHVs.

Northwest of Shoofly Creek

Geographic Description: This survey area included about a one-square mile area of undulating plateau, ridges, and sand hills southeast of Twentymile Gulch, located about one mile northeast of the Mudflat Oolite Research Natural Area (RNA) and one-half mile northwest of Mudflat Road and Shoofly Creek. The most intensive surveys were along the sandy ridge forming the northwest side of the Shoofly Creek drainage above the junction of Mudflat Road and Shoofly Cutoff Road.

Environment: The area is dominated by a gently undulating plateau of mostly silty and sandy loam soil on top of lacustrine and alluvial deposits that gradually tilts upward from Twentymile Gulch towards Shoofly Creek. The plateau is dissected by numerous dry gullies of shallow depth. The dominant vegetation on both the plateau and gully slopes is *Artemisia tridentata* ssp. *wyomingensis*/*Oryzopsis hymenoides*, with patches of *Chrysothamnus* spp., *Leptodactylon pungens*, and other desert shrubs. Burnt areas in the northern half of the survey area are dominated by *Bromus tectorum*. The plateau also includes several closed or nearly closed basins with *Atriplex nuttallii* vegetation and fine-textured, possibly alkaline soils with scattered *Sarcobatus vermiculatus*. *Chaenactis stevioides* habitat occurs at the interface of sandy loam soils and fine-textured and/or alkaline soils. At its highest point, the plateau forms a broken sandy and gravelly ridge with numerous sand hills (i.e., an old stabilized dune system). Many areas had excellent potential to support *Astragalus mulfordiae*. Further south toward the Mudflat Oolite RNA, there are unusual reddish-colored bluffs composed of coarse, water-rounded gravels, over eroded clay. Only marginal potential habitat for *Penstemon janishiae* and *Eriogonum shockleyi* was observed here.

Landscape Condition: In the north half of the area, the landscape is composed of an old burn mosaic with large degraded patches dominated by *Bromus tectorum* (also with *Salsola kali* (tumbleweed) and *Halogeton glomeratus*) in burnt flats. Most of the southern half is sandy ridges and hills with fair to good condition vegetation characteristic of old stabilized dunes, and large areas of plateau with locally degraded *Artemisia*

tridentata ssp. *wyomingensis* and desert shrubland communities. In general, the plateau and burnt flats have received heavier cattle grazing intensity over long periods of time and have much higher cover of *Bromus tectorum* than the sandy ridges and hills. The sandy sites have less forage for cattle and are more difficult to walk on. The risk of future wildfire is high in the survey area. The survey area is also highly accessible for OHV travel due to the presence of a 4 x 4 road onto the plateau, the general openness of the vegetation, and the area's close proximity to farms, ranches, and the town of Grand View. OHV trails are common, although widely scattered, in the area. However, OHV trails most commonly occur on open sandy ridges supporting *Astragalus mulfordiae* and *Glyptopleura marginata*.

Element Occurrences:

- 1) *Astragalus mulfordiae* (023) (new): Fifteen plants were observed in three small sub-populations covering an area of about 0.25 acre. About 50% of the plants observed were immature or seedlings and the remainder were large, mature plants. Only one plant was forming flower buds. The plants occurred in small groups on mid to upper convex slopes of low sandy ridges (old stabilized dunes) with southerly aspects. The soil was light colored, unconsolidated sand and fine gravel. The plant community was best classified as *Chrysothamnus* spp.-*Leptodactylon pungens*/*Oryzopsis hymenoides* with about 10 to 15% total vegetative cover. Annuals common on sandy soils were also associated. These included: *Astragalus geyeri* (Geyer's milkvetch), *Cryptantha circumscissa* (cushion cryptantha), *Glyptopleura marginata*, *Malcothrix glabrata* (smooth desert dandelion), and *Mentzelia albicaulis*. Associated weedy species included *Bromus tectorum* (low cover) and *Amsinckia tessellata* (bristly fiddleneck). OHV use was an imminent threat at this occurrence, with a heavily used trail present within 20 m of one sub-population and several other trails in the area. OHV access is facilitated by the presence of a 4 x 4 road located about one-third mile to the north. Winter and early spring cattle grazing was widespread, but intensity was mostly light, although pockets of moderate impacts were observed. Although *Bromus tectorum* cover was low in occupied habitat, the species did dominate burnt areas immediately to the north, increasing fuels available for future fires.
- 2) *Astragalus purshii* var. *ophiogenes* (058) (new): Four widely scattered sub-populations, with at least 20 individuals distributed over a 0.30 to 0.50-acre area, were observed during a cursory survey. *Astragalus purshii* var. *ophiogenes* was associated with *Astragalus mulfordiae* (023) at one sub-population and with *Glyptopleura marginata* (057) at another sub-population. The habitat and threats at these sub-populations were the same as for *Astragalus mulfordiae* (023). Another sub-population was located within 150 m of *Chaenactis stevioides* (024) on an old stabilized dune. The habitat had low cover of shrubs with *Bromus tectorum*, *Salsola kali*, and *Oryzopsis hymenoides* in the understory. A large burnt area, now dominated by *Bromus tectorum*, was immediately adjacent. Cattle grazing impacts were widespread and common at this sub-population. OHV use was light, but the open sandy and gravelly slopes are highly accessible.
- 3) *Chaenactis stevioides* (024) (new): The population consisted of approximately 160 plants discontinuously distributed in five small patches throughout a 0.25-acre area. The habitat had gravelly and sandy loam soils on toeslopes transitional between sandy ridges above and deeper, fine-textured soil of basin flats below. The microtopography was undulating due to rill erosion. *Chaenactis stevioides* often occurred in small gullies and swales. The community was characterized by low cover of *Chrysothamnus nauseosus*, *Leptodactylon pungens*, and *Artemisia tridentata* ssp. *wyomingensis*. Other associated species included *Artemisia spinescens*, *Oryzopsis hymenoides*, *Stipa comata*, and various annual forbs. *Bromus tectorum* had moderately high cover in the community supporting *Chaenactis stevioides*, while *Salsola kali* was widespread with low cover, and *Halogeton glomeratus* had trace cover. *Bromus tectorum* dominated an old burn on basin flats immediately below the population. Invasion by *Bromus tectorum* and other exotic species are an imminent threat, especially on disturbed soils. Cattle grazing disturbance was moderate to locally heavy. OHV use was light (single use trails), but the area is highly accessible due to the presence of a 4 x 4 road about one-third mile away.
- 4) *Glyptopleura marginata* (057) (new): *Glyptopleura marginata* was sympatric with *Astragalus mulfordiae* (023). Four sub-populations, totaling less than 0.25 acre, with 20 plants, were observed. Like *Astragalus mulfordiae* (023), *Glyptopleura marginata* occurred in small groups on old stabilized dune sites with sandy

soils. Plants were observed both on ridge shoulders and toeslopes, including in concave “blowout” areas, with southerly aspects. The associated vegetation was the same as for *Astragalus mulfordiae* (023). Threats and habitat conditions were also the same, except that a heavy use OHV trail occurred within 5 m of a *Glyptopleura marginata* sub-population.

Poison Creek

Geographic Description: This survey area was within the Poison Creek watershed, starting about 0.5 mile northeast of the Poison Creek Cutoff Road and continuing down the breaks near the wash for about 2 miles (and onto the north side bluffs), ending about 2.5 miles upstream from the Mudflat Oolite RNA. The breakslopes and ridges forming the south-southeast divide between Shoofly Creek and Poison Creek, about 0.5 mile north-northwest of Mudflat Road, were also surveyed. The ridge forming the divide between Twentymile Gulch and Poison Creek was not surveyed, nor was the broad benchland between Mudflat Road and the main ridge.

Environment: As it leaves the foothills, Poison Creek quickly transitions from an ephemeral stream into a dry, intermittent wash cutting into alluvial fan benchlands. The gravelly bluffs, ridges, slopes, and benches above Poison Creek have sandy and gravelly soil supporting desert shrubs. The perennial grass layer is reduced, partially replaced by *Bromus tectorum*. The sandy toeslopes and flats along Poison Creek are degraded, mainly due to cattle overuse. *Bromus tectorum*, along with *Ranunculus testiculatus* (bur buttercup) and *Halogeton glomeratus*, dominate the understory of mixed *Sarcobatus vermiculatus* and *Atriplex canescens* communities along the wash. Despite locally heavy *Bromus tectorum* invasion, the sandy-gravelly soil is good potential habitat for *Glyptopleura marginata*.

Landscape Condition: The benchlands, ridges, and breakslopes surrounding Poison Creek support intact, but locally degraded, desert shrubland vegetation. *Bromus tectorum* cover is low to moderate in the landscape surrounding Poison Creek. However, the perennial grass layer is reduced, probably the cumulative effects of many years of cattle grazing. Although cattle sign is widespread in the area, the lack of forage reduces the overall intensity of grazing. Cattle trailing was clearly heaviest in the valley bottom of Poison Creek and, as a result, this area had the highest cover of *Bromus tectorum*. OHV use is infrequent in the area. However, heavily used gravel roads (within one-half mile) provide OHV access to the area.

Element Occurrences:

- 1) **Eatonella nivea (023) (update/expansion):** This population was first discovered in 1997 when at least 100 plants were observed. A similar number of plants were observed the following year and again during inventories in 2002. Plants were scattered over approximately 3 acres. The habitat was open desert shrub, probably a *Salvia dorrii*/*Oryzopsis hymenoides* community type, on sandy soil. Other associated shrub species included *Artemisia tridentata* ssp. *wyomingensis*, *Leptodactylon pungens*, and *Sarcobatus vermiculatus*. Annuals, such as *Bromus tectorum*, *Cryptantha circumscissa*, and *Glyptopleura marginata*, were also present. No imminent threats were observed. Overall, cattle grazing was widespread, but due to the lack of forage in the area, impacts were minimal. No OHV travel was observed in the immediate area.
- 2) **Glyptopleura marginata (004) (update/expansion):** *Glyptopleura marginata* was first collected in this area in 1943 by J. H. Christ. In 1997, plants were relocated in two small groupings. During the 2002 inventory, six additional sub-populations were found, bringing the total known sub-populations to eight, scattered over about 2 miles. The total area of occupied habitat was 2 acres. Typical of this annual species, plant size highly varied. Sub-populations occurred both on terraces and toeslopes along wash bottoms, as well as on knolls, ridges, and rims above Poison Creek. The habitat was usually flat to gently sloping with sandy soils. The vegetation was desert shrubland with *Oryzopsis hymenoides* scattered in the understory. Various annuals were also noticeable. *Bromus tectorum* cover was high in wash bottoms and on flats degraded by a long history of cattle grazing. *Ranunculus testiculatus* and *Halogeton glomeratus* were also common in some areas along the wash bottom. Besides weed invasion and cattle grazing, OHV use was another imminent threat, especially near occupied habitat in the wash bottoms.

Southeast of Castle Creek

Geographic Description: This survey area encompassed rims, benchlands, breakslopes, and flats around dry washes of a large tributary basin to Castle Creek. This basin entered Castle Creek from the southeast about 3.75 miles upstream from where Castle Creek Road crosses Castle Creek. The survey began at an old open pit mine in the bottom of the basin and covered about 2 miles of the basin south-southeast from the mine. Over two miles of the east basin rim were surveyed. This rim abutted the Birch Creek survey area. A small area of sloping benchland west of the mine to the rim overlooking Castle Creek was surveyed as well.

Environment: The basin included a diverse mix of geologic features, from dry washes and clay barrens, to large cliffs, box canyons, and "falls." *Sarcobatus vermiculatus* and *Atriplex canescens*, with an understory dominated by *Bromus tectorum*, characterized the vegetation on gravelly, sandy, and silty soils of the basin flats. These areas were habitat for both *Chaenactis stevioides* and *Glyptopleura marginata*. Sparsely vegetated fans composed of whitish, light brown, to yellowish clay stretched from the flats to beneath nearly vertical bluffs. *Atriplex confertifolia*, including many dead individuals, was common on clay fans. The bluffs, rims, and benches were mostly sedimentary, including sandstone layers and alluvial fan deposits. The soil associated with the bluffs and benches was coarse sandy, with rounded grains and gravels, including shell fossils, oolitic sands, and finer beach-like sand. Few of these sandy areas were suitable habitat for *Astragalus mulfordiae*, but *Astragalus purshii* var. *ophiogenes* was commonly scattered on these soils along the basin rim. An unidentified variety of *Cymopterus acaulis* also occurred on these sandy rim soils. These soils supported a diverse mix of desert shrubs. Near the south end of the basin, the bluffs were less steep. The breaks were eroded into knolls, low ridges, and slopes with unproductive clay and sand soil that supported *Penstemon janishiae* with *Eriogonum ochrocephalum* and various desert shrubs (with low cover).

Landscape Condition: The rims, bluff, breakslopes, and benches in the survey area support intact mixed desert shrubland vegetation that is mostly in good ecological condition. In contrast, the flats along the washes are in poor to fair ecological condition, with locally heavy impacts from mining, cattle grazing, and OHVs. Cattle sign is widespread in the area, but due to the lack of water and forage, grazing intensity is mostly light. Cattle trailing is clearly heaviest on the flats. As a result, *Bromus tectorum* cover is high and perennial grass cover low. OHV tracks were also mostly confined to washes and adjacent flats, but widely scattered cross-country tracks were observed, possibly leading to mining claims. Mining claims are widely scattered in the basin and their development poses a threat to special status plant habitat. An old open pit mine, possibly for zeolite, occurs at the north end of the survey area in an area supporting both *Chaenactis stevioides* and *Glyptopleura marginata*.

Element Occurrences:

- 1) *Astragalus purshii* var. *ophiogenes* (055) (new): Four sub-populations, totaling over 1,000 plants, were observed in an area that extended over 2.5 miles along the basin rim and over to slopes in the Birch Creek drainage. The habitat varied from breakslopes and hills to basin rims, and was generally composed of gravelly, cobbly, and sandy silt loam soils derived from eroded alluvial fan benches and lacustrine deposits. The vegetation included open *Artemisia tridentata* ssp. *wyomingensis* communities, as well as areas of *Salvia dorrii*/*Oryzopsis hymenoides*. A variety of other shrubs, such as *Chrysothamnus* spp., *Gutierrezia sarothrae*, *Leptodactylon pungens*, and *Purshia tridentata* (bitterbrush), were associated and mixed with perennial forbs including *Cryptantha spiculifera* (Snake River cryptantha) and *Phlox hoodii*. *Bromus tectorum* cover was very low in occupied habitat. Cattle grazing intensity was mostly light in the area, with only occasional impacts to soil microbiotic crust. OHV tracks were also uncommon on slopes and canyon rims, although several old tracks occurred nearby the population.
- 2) *Chaenactis stevioides* (004) (update/expansion): This population was first discovered in 1994, when over 1,000 plants were reported in about a 10-acre area. In 2002, only about 50 plants were observed. Most plants occurred under or near shrubs, possibly due to very dry soil conditions this year or competition from *Bromus tectorum*. The population occurred on gravelly and sandy loam soil in the flat bottom of a basin cut by a series of dry washes. The community type was *Sarcobatus vermiculatus*/*Bromus tectorum* with various desert shrubs and annuals (including *Glyptopleura marginata*) present. The population occurred next to an old open pit mine in an area degraded by heavy livestock grazing and extensive *Bromus tectorum* invasion.

- 3) *Glyptopleura marginata* (059) (new): About 50 to 100 plants were observed in at least five sub-populations scattered over about 1 mile of the basin bottom. Occupied habitat was about 3 acres. The habitat and threats were similar to *Chaenactis stevioides* (004), although *Glyptopleura marginata* also occurred in an *Artemisia tridentata* ssp. *wyomingensis*/*Poa secunda* community on gentle toeslopes. The soils varied from sandy loam to gravelly. In general, due to livestock use and other factors, the perennial grass component of vegetation has nearly been eliminated in the basin bottom. Although *Bromus tectorum* density was relatively low in 2002, it is clearly the dominant herbaceous species in the area and apparently has higher cover in moister years. Cattle use was widespread, but variable in intensity. OHV tracks were mainly confined to washes, but a few tracks crossed potential habitat to reach open clay toeslopes in the basin. Most plants were observed near the old open pit mine, but no recent mining activity was observed.
- 4) *Penstemon janishiae* (020) (new): Four sub-populations, occupying about 2 acres, were distributed on knolls and slopes over approximately 0.50 miles of the southern end of the basin. The total number of plants was estimated to be 125 to 250, about 50% of which were reproductive this year. The habitat was sparsely vegetated slopes and ridges, varying from flat to steep, with aspects other than southerly. The soil was clayey to sandy, but often mixed and unproductive. Such sites supported only widely spaced stunted shrubs, such as *Salvia dorrii*, *Gutierrezia sarothrae*, and *Artemisia tridentata* ssp. *wyomingensis*, with scattered *Eriogonum* spp. and *Phlox hoodii*. The lack of forage on these soils results in only light cattle grazing. No OHV trails were observed within occupied habitat, but OHV use was evident in washes below. Mining claims were widely scattered throughout the basin on clay soils, but no stakes were observed within occupied habitat. Current threats were of low imminency, but the habitat supporting *Penstemon janishiae* is susceptible to future OHV and mining activities.

Twentymile Gulch

Geographic Description: This survey area was confined to the large sandy bluffs, slopes, and ridges forming the north-northwest side of the Twentymile Gulch drainage. The survey area started about 2 miles northwest of the junction of the Mudflat and Shoofly Cutoff roads and continued up the slopes and bluffs on the northern side of Twentymile Gulch for about 3 miles. It abutted the Twentymile Gulch—Gravel Pit survey area immediately to the northeast, the Vinson Wash survey area to the west and northwest, and the Northwest of Shoofly Creek survey area to the east.

Environment: In this area, the northern side of Twentymile Gulch is characterized by a series of sandy or fine gravelly slopes, ridges, and bluffs. The largest bluff is over 30 m tall and forms a landmark visible from the northeast for several miles. The topography varies from convex, rounded ridges, to undulating dune-like areas, to steep or concave toeslopes. The main bluffs and slopes are formed from greyish colored beach-like sands and fine gravels, although a layer of much coarser alluvial gravel caps the bluffs to the west. The more gravelly sand is potential habitat for *Eatonella nivea*. In contrast, finer yellowish-brown colored sands, possibly old stabilized dunes, form the upper layers of the bluffs to the east-northeast. These sandy habitats are excellent potential habitat for *Astragalus mulfordiae*. The dominant vegetation community throughout the survey area is intact *Chrysothamnus* spp.-*Leptodactylon pungens*/*Oryzopsis hymenoides* with scattered annual forbs and sand-loving perennials. Several excellent condition stands of *Salvia dorrii*/*Oryzopsis hymenoides* vegetation are also present. Thin layers of poorly consolidated sandstone are present along the toeslopes of the bluffs. Pockets of unproductive sandy-clay soils occur on toeslopes and support desert shrubs, *Stanleya pinnata*, and some habitat for special status plants. The adjacent plateau above the bluffs to the north is mostly intact desert shrubland.

Landscape Condition: Although the vegetation on the adjacent plateau and bluffs is mostly intact, the area is currently being degraded by OHV traffic. Several heavily used trails exist in the immediate area, including one that runs up a ridge and directly across the top of the bluffs through occupied special status plant habitat. In addition, three areas of OHV hill climbing go up the bluffs, also causing soil erosion in occupied special status plant habitat. Due to the relatively loose sand with little forage, cattle grazing intensity is light to locally moderate (in the valley bottom) and currently causes minimal soil disturbance. The flats downstream

surrounding Twentymile Gulch are degraded by an old burn mosaic and are now dominated by *Bromus tectorum* and patchy *Artemisia tridentata*.

Element Occurrences:

- 1) *Astragalus mulfordiae* (024) (new): Twenty plants were observed in two loosely defined sub-populations covering about 2.25 acres. About 35% of the plants observed were reproductive. Plants occurred on convex shoulder slopes of sandy ridges and bluffs in areas of undulating microtopography resulting from water and wind erosion. The soil was unconsolidated coarse sand with a small amount of fine gravel intermixed. The community was *Chrysothamnus* spp./*Oryzopsis hymenoides* with low total vegetative cover. The most prominent associated species was *Bromus tectorum*, but its cover was mostly low. Associated shrubs included *Leptodactylon pungens* and *Purshia tridentata*. Perennial forbs, such as *Psoralea lanceolata* (scurfpea) and *Lygodesmia* spp. (skeletonplant), and various annuals common on sandy sites were also associated. OHV use on the sandy bluff was an imminent, high magnitude threat to these sub-populations. At one sub-population, a heavily used OHV trail traversed the ridgetop about 2 to 3 m above occupied habitat. This trail was 1 to 2 m wide and OHVs drifted off the trail, further widening the trail. In addition, a major hill climb route degraded habitat about 4 m from the western end of the occupied habitat. Although the nearest OHV trail to the other sub-population was 75 m below in a wash, the potential for hill climbing is high. Cattle grazing intensity was light to moderate in the area.
- 2) *Eatonella nivea* (028) (new): This occurrence consisted of two small sub-populations, each less than 0.10 acre, with a total of about 30 to 50 plants. Plants occurred on the mid to upper convex shoulder slopes of a sandy and gravelly bluff. The soils were coarser sand and more gravelly than nearby habitat supporting *Astragalus mulfordiae* (024). The aspects were mostly southerly and slopes were steep, making the habitat very drought-prone, unproductive, and susceptible to erosion. The vegetation was *Chrysothamnus* spp.-*Leptodactylon pungens*/*Oryzopsis hymenoides* with low total vegetative cover. *Bromus tectorum*, *Chaenactis douglasii*, *Leucocrinum montanum* (starlily), *Psoralea lanceolata*, *Rumex venosus* (veiny sand dock), *Salvia dorrii*, and a few annual forbs were also associated. OHV use on the bluff was an imminent, high magnitude threat to these sub-populations. Although no recent OHV travel was observed within occupied habitat, a hill climb route was present within 5 m and heavily used trails were present on the ridge within 20 to 50 m. Cattle grazing intensity was currently light to moderate.

Twentymile Gulch—Gravel Pit

Geographic Description: This survey area included a plateau, as well as low sandy ridges and draws, to the west of the gravel pit, about 250 m northwest of lower Twentymile Gulch. The survey routes went across the plateau to the west and northwest for about 1.5 miles, then south up ridges toward Twentymile Gulch for about one mile, and then back across the plateau to the northeast for about 2 miles to the gravel pit. The slopes and ridges along lower Twentymile Gulch, from the gravel pit upstream for about 1 mile, were previously inventoried for *Astragalus mulfordiae* and not surveyed in 2002. However, a previously uninventoried section of sandy habitat on the southeast toeslope above Twentymile Gulch about 1.25 miles upstream of the gravel pit (wedged between the Northwest of Shoofly Creek survey area to the southeast and the Twentymile Gulch survey area to the west-southwest) was surveyed. Like the area immediately downstream, this habitat supported *Astragalus mulfordiae*.

Environment: This area is predominantly a shallowly dissected, gently sloped plateau, with low sandy ridges and draws punctuating the landscape. Intact mixed desert shrubland dominates most of the survey area (especially on the plateau, but also in swales and draws) on sandy and gravelly soils. The understory is sparse, mainly *Bromus tectorum* and *Oryzopsis hymenoides*. Some habitats with eroded bluffs, consolidated sands, or clay-rich substrates also occur. *Stanleya pinnata* was common on such sites, possibly indicative of a difference in soil chemistry. Patches of potential habitat for special status plants, especially *Glyptopleura marginata*, *Ipomopsis polycladon*, and *Chaenactis stevioides*, are widely scattered in the survey area. Although most common on the ridges and slopes around Twentymile Gulch and around the gravel pit, a few lenses of unconsolidated, yellowish to reddish-colored sand and fine gravel occur in the survey area. These sandy areas are potential habitat for *Astragalus mulfordiae*.

Landscape Condition: An old sand and gravel quarry pit is located on the edge of the survey area. Mining likely destroyed potential special status plant habitat in the past. Currently, the quarry site is used as an OHV recreation area. Heavy use OHV trails occur in Twentymile Gulch and several tributary washes. Several cross-country trails were observed on neighboring ridges, bluffs, and plateaus. Due to the dirt road accessing the gravel pit, OHV access for hill climbing and cross-country travel is high, posing a threat to special status plants in the area. Farms occur about 1.5 miles downstream of the gravel pit at the mouth of Twentymile Gulch. Throughout most the survey area, *Bromus tectorum* has no more than 10% cover, but it dominates parts of the burn mosaic on benches to the southeast, as well some areas in the bottom of Twentymile Gulch. *Bromus tectorum* invasion is a threat where soil has been disturbed by cattle. With the exception of a few loafing areas, there is light intensity winter/early spring cattle grazing, with minimal soil disturbance.

Element Occurrences:

- 1) *Astragalus mulfordiae* (011) (update/expansion): Over 300 plants were observed in seven sub-populations scattered over about 1 mile of Twentymile Gulch. The furthest north sub-population was next to the road by an old sand quarry. Upstream of the sand quarry, sub-populations occur on both sides of the gulch, mostly located on upper slopes above the wash and on gently sloped shoulders leading to adjacent benchlands. The population is apparently vigorous, with plants of all size and reproductive classes represented over about 30 acres of habitat. In 2002, a new sub-population was located about 0.25 mile upstream of prior known sub-populations, on an upper convex-shaped, westerly facing slope of a low sandy ridge (old stabilized dune). The soil was mostly light colored, fine to coarse, unconsolidated sand with trace amounts of silt and gravel intermixed. The habitat was usually *Chrysothamnus viscidiflorus*-*Leptodactylon pungens*/*Oryzopsis hymenoides* vegetation with about 15 to 20% total cover. Other commonly associated species, all with low cover, included *Abronia mellifera*, *Arenaria franklinii*, *Atriplex canescens*, *Chrysothamnus nauseosus*, *Petalostemon ornatus* (Blue Mountain prairieclover), *Stipa comata*, and annuals (e.g., *Camissonia* spp. (evening primrose), *Coldenia nuttallii* (Nuttall's crinklemat), *Cryptantha circumscissa*, *Malcothrix glabrata*, and *Mentzelia albicaulis*). *Bromus tectorum* was also scattered with about 3% cover. *Bromus tectorum* dominated parts of the burn mosaic on nearby benches, as well as the bottom of the wash immediately below sub-populations, increasing the risk of fire in the area. Currently, there is light intensity winter/early spring cattle grazing, with minimal soil disturbance. The lowest sub-population is within 10 m of a dirt road and sand quarry. This area is frequently used by OHVs and highly vulnerable. Heavy use OHV and 4 x 4 vehicle use occurred in the wash below other sub-populations and access for OHV hill climbing is easy. Light use hill climbs were observed less than 100 to 200 m away from lower sub-populations.
- 2) *Chaenactis stevioides* (023) (new): One flowering plant was observed at the base of an *Atriplex confertifolia* shrub on sandy soil on a plateau breakslope. The site was an open desert shrub community with undulating, rodent-churned sand mounds and eroded swales with clay-rich soil. Associated species included *Artemisia spinescens*, *Bromus tectorum* (patchy, moderate cover), *Chrysothamnus humilis*, *Mentzelia albicaulis*, *Oryzopsis hymenoides*, *Stanleya pinnata*, *Tetradymia glabrata*, and several annuals. Cattle grazing intensity was light, but further disturbance of sandy soils may result in the expansion of *Bromus tectorum* in this habitat. A recently used OHV trail was located 50 m downslope in a draw and occasional trails were observed on adjacent plateaus. The old sand quarry was located about 500 m to the east. OHV hill climbing could be a future threat at this occurrence.
- 3) *Glyptopleura marginata* (056) (new): Two small sub-populations, each less than 0.10 acre, with a total of 15 plants were found. The southeastern sub-population, located next to the dirt road near the old sand quarry pit, co-occurred with the northern-most sub-population of *Astragalus mulfordiae* (011). The habitat and threat information was the same as for *Astragalus mulfordiae* (011). No *Glyptopleura marginata* were observed here when the site was first visited in 1999. The northwestern sub-population of *Glyptopleura marginata* occurred in a coarse sandy soil gap between desert shrubs on a convex bluff with low vegetative cover. Associated species were *Bromus tectorum*, *Chrysothamnus viscidiflorus*, *Grayia spinosa*, *Sarcobatus vermiculatus*, and a wide array of annual forbs. The microsite supporting *Glyptopleura marginata* was degraded by cattle trailing and *Bromus tectorum* invasion. A heavily impacted cattle loafing site was located

3 m below the sub-population next to a wash. A moderately to heavily used OHV trail was located in the wash 10 m below. Both cattle and OHV activity pose high and imminent threats to this site.

Vinson Wash

Geographic Description: The plateau, sandy bluffs, ridges, and breaklands forming the divide between Vinson Wash and the next major draw to the southwest were surveyed. The most intensive surveys occurred on the sandy slopes along the dry draw, as well as on clay breaklands in a small basin between the draw and Vinson Wash. One sandy slope with potential habitat for *Astragalus mulfordiae* on the ridge immediately above Vinson Wash was also surveyed. The survey area is about 4 to 5 miles east-northeast of the Poison Creek Cutoff Road and 3 miles south-southwest of Twentymile Flat. The survey area is immediately adjacent to the Twentymile Gulch survey area to the southwest.

Environment: Desert shrubland communities characterize plateaus and ridges in the survey area. *Atriplex confertifolia*/*Sitanion hystrix* communities occurred on relatively flat plateaus with gravelly and cobbly loam derived from alluvial fan deposits. *Artemisia tridentata* ssp. *wyomingensis*/*Poa secunda*, mixed with desert shrubs, dominate more productive gravelly sand or silt loam soils on plateaus and ridges. These communities have a sparse perennial grass understory and *Bromus tectorum* cover is locally moderate. There are numerous pockets of potential habitat for *Astragalus purshii* var. *ophiogenes*, *Glyptopleura marginata*, *Chaenactis stevioides*, and other special status plants, especially where sand and fine gravel is plentiful. Small patches of depressional “blowout” habitat also occur on the plateaus. These areas have sparsely vegetated silty-clay soil (with petrified wood and sandstone gravel intermixed) and support scattered desert shrubs. Although, this is potential habitat for *Eriogonum shockleyi*, *Ipomopsis polycladon*, *Nemocladus rigidus*, *Penstemon janishae*, and *Psathyrotes annua*, only *Ipomopsis polycladon* was found. A similar, but much larger area of clay-rich soil occurs on the breaks and toeslopes of a small basin in the southwest portion of the survey area. Here, *Eriogonum shockleyi* var. *packardiae* occurs in a unique habitat with sparsely vegetated shallow clay pan soils dominated by *Chrysothamnus humilis*, *Phlox hoodii*, and *Cryptantha spiculifera*, with lesser amounts of desert shrubs, *Astragalus* spp., and *Enceliopsis nudicaulis*. On the breaks and rim of the basin, there was desert pavement of gravel, cobble, and stone alluvium. On the basin toeslopes the soil is whitish and chalky-textured, derived from weathered ash or other deposits. Sandy soils occur to the northeast of the clay basin. The northwest facing slope above Twentymile Gulch, as well as a few small sandy hills (old stabilized dunes) to the south-southwest, have the best sandy habitat for *Astragalus mulfordiae*. In contrast, bluffs and ridges on the slope above the draw to the southeast of Vinson Wash are more gravelly and supported *Eatonella nivea*.

Landscape Condition: Mostly intact desert shrubland and *Artemisia tridentata* ssp. *wyomingensis* communities dominate the landscape. *Bromus tectorum* and *Ranunculus testiculatus* have low cover, including in areas supporting special status plants. However, *Bromus tectorum* is most dense around shrub bases. A patchy burn mosaic does occur on the plateau to the northeast, toward Twentymile Flat. Patches of burned habitat were dominated by *Bromus tectorum*. A cattle watering trough occurs within a burned patch, with associated heavy impacts to soil and vegetation from intensive cattle use. Elsewhere, cattle grazing is light in intensity, except in the bottoms of draws and washes where *Bromus tectorum* also dominates. Overall, OHV use is mostly light on the plateau and ridges, but moderately heavy in the bottoms of draws and washes. Potential for hill climbing of sandy slopes is high. Access to the middle of the survey area is facilitated by a rough dirt road on the plateau ridge, built for installation of an adjacent water pipeline and associated cattle troughs. OHV use in the clay basin supporting *Eriogonum shockleyi* var. *packardiae* mainly consisted of old tracks. In addition, an old dozer scraping, (possibly for mining exploration?) went through occupied habitat. Although there is no apparent recent use, the area is accessible to OHV traffic because of its location near the dirt road.

Element Occurrences:

- 1) *Astragalus purshii* var. *ophiogenes* (057) (new): Two small sub-populations, totaling only 13 plants in less than 0.10 acre of habitat, were found. One sub-population was located very near the southwest end of the *Eriogonum shockleyi* var. *packardiae* (019) population and the other was located near the *Ipomopsis polycladon* (023) occurrence. See these two occurrences (below) for habitat and threat information.

- 2) *Eatonella nivea* (027) (new): Three sub-populations, occupying an area between 0.50 and 1 acre, were observed. Based on density estimates, there were between 7,000 and 10,000 plants in the population, roughly split between flowering individuals and those already with seeds. The sub-populations occurred on mid-slopes, shoulders, and tops of low ridges that had southerly to easterly aspects and slopes up to 20%. Plants were occasionally observed on toeslopes and northerly facing ridge shoulders. Sites were old stabilized dunes with undulating microtopography caused by wind and water erosion. The soil varied from unconsolidated sand to mixed sand and gravel. Sites supported less than 30% total vegetative cover. The plant community was *Chrysothamnus viscidiflorus/Bromus tectorum* with scattered *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus nauseosus*, *Purshia tridentata*, and *Salvia dorrii*. *Bromus tectorum* was locally abundant, mainly under shrubs. *Oryzopsis hymenoides* and *Stipa comata* were also present, along with various annual forbs. Other than *Bromus tectorum* invasion, other threats were not imminent. Although the nearest observed OHV trails were about 125 m away in the wash, the potential for hill climbing on these open slopes is high. Only trace evidence of cattle grazing was observed.

- 3) *Eriogonum shockleyi* var. *packardiae* (019) (new): Between 50,000 and 60,000 plants were estimated to occur in this large population. Plants of all age classes, about 67% of which were reproductive, were discontinuously distributed over at least 10 acres of habitat. The population occurred on eroded basin toeslopes, shallow draws, concave “blowout” areas, claypan breaks, rims, and rocky benches. These sites were characterized by having shallow, unproductive clay-rich soils (probably derived from weathered ash, lacustrine deposits, and alluvium) with variable amounts of silt, sand, gravel, and cobble intermixed. These sites had less than 15% total shrub cover and much bare soil or desert pavement. The dominant community type was *Artemisia tridentata* ssp. *wyomingensis*-*Chrysothamnus humilis*, with moderate cover of *Phlox hoodii*, *Cryptantha spiculifera*, and *Eriogonum shockleyi* var. *packardiae*. Other associated species included *Astragalus* spp., *Atriplex confertifolia*, *Enceliopsis nudicaulis*, *Penstemon acuminatus*, *Stanleya pinnata*, and *Tetradymia glabrata*. Only a trace amount of *Bromus tectorum* was observed. Recent OHV use was minimal, but numerous old OHV tracks crossed the occurrence. In addition, old bulldozer scrapings (for mining exploration?) were present in occupied habitat. *Eriogonum shockleyi* var. *packardiae* was observed growing on these disturbed areas.

- 4) *Ipomopsis polycladon* (023) (new): One small population with five plants was observed in an area covering less than 0.10 acre. The habitat was an eroded, depressional “blowout” area with unproductive silty-clay soil and low vegetative cover. Sand, gravel (including petrified wood and sandstone), and occasional cobble were mixed in the soil. The vegetation was desert shrubland, mainly classified as a *Chrysothamnus* spp./*Oryzopsis hymenoides* community. Other associated species included *Astragalus purshii* var. *ophiogenes*, *Atriplex confertifolia*, an unidentifiable *Cymopterus* species, *Tetradymia glabrata*, and several annual forbs. *Bromus tectorum* and *Ranunculus testiculatus* were both present, but only with trace cover. No imminent, high-level threats were observed. Only trace evidence of recent cattle grazing was observed. An old OHV track was located 40 m to the northwest, but none were near occupied habitat. However, a road, water pipeline and cattle trough, and burn mosaic all occur within 0.75 miles of the habitat.

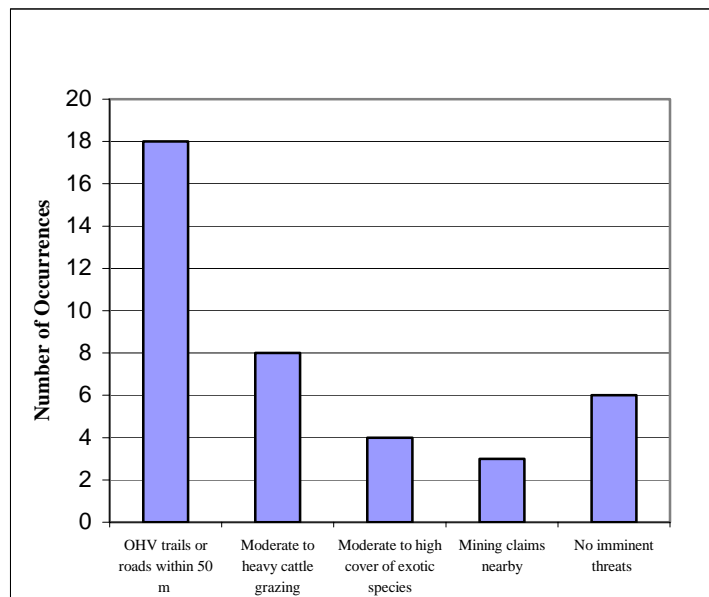
Discussion—Summary of Threats, Habitat Conditions, and Conservation Assessments

Of the 26 new or updated occurrences of special status plants documented during this inventory, 20 had imminent, high magnitude threats (Table 2). Imminent threats were defined as on-going activities or habitat degradation within, or immediately adjacent to (within 50 m), occupied habitat. High magnitude threats are those with the high probability of directly destroying portions of special status plant populations or degrading the condition of occupied habitat, making it less suitable. Figure 1 summarizes the number of occurrences at which imminent and/or high magnitude threats were observed. Numerous occurrences had more than one threat recorded. Documented imminent, high magnitude threats were: recent or heavily used OHV trails and roads; moderate to heavy cattle grazing (indicated by dense soil pugging and scat piles); and exotic species invasion (moderate to high cover, greater than about 10%, of *Bromus tectorum* or other exotic species). OHV trails (including two-track dirt roads) were observed within 50 m of 69% of the occurrences. About half of those trails were within 10 m of occupied special status plant habitat (and within 5 m at five occurrences). Moderate to

heavy cattle grazing within, or immediately adjacent to (within about 20 m), occupied habitat was the next most documented threat, observed at about 31% of the occurrences. Moderate to high cover of *Bromus tectorum*, and other exotic weeds such as *Salsola kali* and *Halogeton glomeratus*, were observed at only four occurrences. No active mining was observed within the areas surveyed. However, two occurrences of special status plants were observed within 100 m of inactive mines. Mining claims (a high magnitude threat, but not imminent until development is planned) were documented within about 250 m of three occurrences.

At the landscape level, OHV use was present in every survey area and in the vicinity of nearly every special status plant occurrence. However, the level of use (indicated by the density of trails) varied. Most special status plant occurrences were in areas of intact desert shrubland or sagebrush-steppe that had low to moderate cover of *Bromus tectorum*. *Bromus tectorum* and other exotic species had their highest cover in burnt areas and valley bottoms or washes where cattle grazing and OHV disturbances were the highest. With the exception of two *Chaenactis stevioides* occurrences and portions of two *Glyptopleura marginata* occurrences, special status plants were not observed in the degraded valley bottoms or burnt areas.

Figure 1. Number of special status plant occurrences with imminent and/or high magnitude threats.



Below is a summary of the threats, habitat conditions, and conservation assessments for each special status plant species documented in 2002.

Astragalus mulfordiae: Portions of all five occurrences were imminently threatened by OHV traffic. Heavily used trails were present within 20 m of the Between Twentymile Gulch and Shoofly Creek (023) and Twentymile Gulch North (024) occurrences. Less frequently used trails, or a road in one case, were within 10 m of the other occurrences. The whole population at Sandhill Point (026) was threatened, while at each of the other occurrences only one sub-population was threatened. While washes had the most concentrated OHV use, numerous trails traveled cross-country onto slopes, ridgelines, and sandy hills supporting *Astragalus mulfordiae*. While OHVs were the main threat, locally heavy cattle grazing that caused soil disturbance was a threat at one sub-population of the Lower Vinson Wash (025) occurrence. Currently, invasion by *Bromus tectorum* was minimal at all occupied habitat. However, soil disturbance by OHVs and cattle, combined with wildfires, have the potential to promote invasion by *Bromus tectorum* and other exotic species.

Astragalus purshii var. *ophiogenes*: Four of the six occurrences had OHV trails within 50 m (and within 10 m at two of those occurrences). The majority of the population was imminently threatened by OHV traffic at both the Lower McKeeth Wash—Sandhill (053) and West Ridge of Twentymile Gulch (058) occurrences. The other two

occurrences were larger or dispersed, with OHV traffic less likely to impact very much of the population. The Southeast of Castle Creek (055) occurrence was the largest and most secure of all occurrences. Impacts from cattle grazing, such as decreased microbiotic soil crust and bunchgrass cover, was moderate at two small and vulnerable occurrences in the Lower McKeeth Wash survey area. The direct impact of grazing on *Astragalus purshii* var. *ophiogenes* is unclear, but soil disturbed by grazing can be invaded by *Bromus tectorum* and *Salsola kali*. One result of exotic species invasion is increased risk of wildfire.

Chaenactis stevioides: In general, the habitat supporting *Chaenactis stevioides* was not in good ecological condition. Current and historic cattle grazing, invasion by exotic annual species (sometimes facilitated by adjacent burns), and occasional OHV traffic were the threats observed. Only one occurrence had OHV trails within 50 m. OHV use occurred within the landscape surrounding the other occurrences. *Bromus tectorum* had high cover at two of the three occurrences. These occurrences also had locally heavy impacts from cattle grazing. *Chaenactis stevioides* apparently persists in early seral habitats disturbed by livestock and invaded by *Bromus tectorum*. However, the effects of long-term competition by annual exotic weeds on the viability of these populations are not known. Only one *Chaenactis stevioides* individual was observed at Twentymile Gulch (023) occurrence. Unless more plants are observed upon future visits, the viability of this population is in doubt.

Eatonella nivea: Only one of the three occurrences was imminently threatened. OHV hill climbing occurred within 20 m and a ridge trail was present within 5 m of the Twentymile Gulch North (028) occurrence. Because this is also a small population, the viability of this occurrence is of concern. While *Bromus tectorum* cover was not currently moderate or high within any occupied habitats, on-going soil disturbance by OHVs can facilitate its invasion. *Bromus tectorum* could be a major competitor for scarce moisture and nutrients on sites supporting *Eatonella nivea*.

Eriogonum shockleyi var. *packardiae*: The one occurrence had no recent OHV trails evident. Several old trails, as well as an old bulldozer scrape, did traverse occupied habitat. However, *Eriogonum shockleyi* var. *packardiae* was observed growing on the old tracks. Although the open habitat is susceptible to OHV travel, OHVs are a low magnitude threat at this time. Most damage would occur in the winter or early spring when the clay soils are moist. No other threats were observed and this large population is apparently secure.

Glyptopleura marginata: Portions of all five occurrences had imminent or high magnitude threats. Because *Glyptopleura marginata* often occurs in widely scattered clusters of small numbers of plants, the exact percentage of the total population at each occurrence affected by these threats is not known. The best estimate is that about 20 to 25% of the sub-populations were likely imminently threatened. The Poison Creek (004) and Basin East of Castle Creek (059) occurrences appeared secure at this time. The main threat was OHV traffic, with OHV trails documented within 50 m of four of the five occurrences. Locally moderate to heavy cattle grazing also threatened four occurrences. Sub-populations located on flats in valley bottom or toeslope positions were most likely to be impacted by cattle grazing. While the cover of *Bromus tectorum* and other exotic species was moderate to high within occupied habitat at only one occurrence, many of the nearby valley bottom positions were degraded. The valley bottoms of the Owyhee Front often have high cover of *Bromus tectorum*, the result of a long history of livestock grazing, as well as fire or other shrub removal events.

Ipomopsis polycladon: Although the total number of plants observed in 2002 was small, there were no imminent, high magnitude threats observed at the one occurrence. Low cover of exotic species and only light cattle grazing were observed. General OHV use in this area was infrequent. The silty-clay soil of the *Ipomopsis polycladon* habitat would be most susceptible to damage from cattle and OHVs during moist conditions in the winter and spring.

Penstemon janishiae: Both occurrences visited in 2002 appeared secure. While a few recent OHV trails were within 50 m of occupied habitat, the Birch Creek North (012) occurrence was very large and dispersed. As a result, the number of sub-populations likely to be impacted by OHVs was low. However, OHV use is high in the area and hill climbing is a major risk in this area. Although the Basin East of Castle Creek (020) occurrence was

not imminently threatened, it is not a large population and future development of mining claims or increased OHV traffic could decrease the long-term viability of this population.

Conclusions and Recommendations

Based on data collected from field inventories, OHV use is clearly the main threat to special status plants on the Owyhee Front. For example, the two areas on the Owyhee Front with the most *Astragalus mulfordiae*, lower Vinson Wash and Twentymile Gulch, are both heavily utilized for OHV recreation. About 70% of all special status plant occurrences are at high risk of being disturbed by OHV traffic. Moreover, new OHV trails are still being developed nearby or within occupied habitat. OHVs are not always staying in permitted riding areas, such as washes or on designated trails. Areas with high concentrations of special status plant occurrences, intact potential habitat in good ecological condition, and all *Astragalus mulfordiae* occurrences, should be closed to OHV use. This could be accomplished by construction of exclosures and designations of new Areas of Critical Environmental Concern or Research Natural Areas.

Threats from cattle grazing are more localized and probably more easily mitigated through careful allotment management planning. For example, the strategic placement of drift fences, water troughs, and salt blocks can lure cattle (and their trails) away from occurrences. Invasion and competition by *Bromus tectorum* and other exotic annual species is also currently a localized problem at a few special status plant occurrences. However, *Bromus tectorum* invasion is a serious long-term threat across the Owyhee Front. As both wildfire events and soil disturbance by OHVs and cattle continue on the Owyhee Front, *Bromus tectorum* and other exotic species will find suitable bare soil habitat for increasing their populations. Intact habitat that is susceptible to invasion, such as plateaus, benches, and stabilized sand areas, should be minimally disturbed by future land use activities. These areas should be identified in Resource Management Plan revisions. Livestock numbers and the season of use should be adjusted to be compatible with maintaining special status plant habitat, as well as any surrounding intact desert shrubland in good ecological condition. Suppression of wildfire should also be a high priority on the Owyhee Front, to prevent further *Bromus tectorum* invasion. However, firefighting and post-fire rehabilitation efforts should be avoided in, or nearby, occupied special status plant habitat. Development of mining claims, road building, or other activities should also be avoided within and adjacent to occupied habitat.

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Appendix 1

Element Occurrence Records of special status plants discovered or updated during 2002 inventory

Appendix 2

Map locations of special status plant occurrences discovered or updated during 2002 inventory

Appendix 3

Maps of areas surveyed on the Owyhee Front during 2002 inventory

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