

**THE STATUS OF WELSH'S BUCKWHEAT
(*ERIOGONUM CAPISTRATUM* VAR. *WELSHII*)
IN IDAHO**

By

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SUMMARY

Welsh's buckwheat (*Eriogonum capistratum* var. *welshii*) is a mat-forming perennial buckwheat with yellow flowers and blue-green tomentose leaves. It was not described until 1989. Welsh's buckwheat is endemic to the basins and foothills of the upper Big Lost, Little Lost, and Pahsimeroi Rivers, and adjacent areas in east-central Idaho. It is found between about 6000 and 8000 feet elevation, and distributed within an area about 40 miles in diameter, centered at Mount Borah. Prior to 2001, no formal survey had ever been conducted for Welsh's buckwheat and it was known from only nine occurrences. All but two of these occurrences were based on herbarium collections made before 1981. The purpose of the project was to collect data regarding the precise location and range of populations, its habitat and substrate requirements, population sizes, threats, and general conservation status. This was done by re-visiting all previously reported occurrences of Welsh's buckwheat and searching additional areas with potential habitat. Photo-monitoring stations and vegetation plots were established at selected occurrences. Field surveys for Welsh's buckwheat were performed between July 2 and July 18, 2001. Of the nine originally known Welsh's buckwheat occurrences, six were positively re-located (two of which were combined into one large meta-population). One occurrence was tentatively re-located and two were not re-located. The meta-population at the South of Mud Flats occurrence is estimated at over 300,000 plants, covering at least 25 acres. Five new population occurrences were discovered in 2001. No expansions of Welsh's buckwheat's known range were found. Cattle grazing, off-highway vehicle use, and mining were the main threats to Welsh's buckwheat and its habitat. Most of the severe impacts were localized, however. Though current threats were widespread, their short-term impacts to Welsh's buckwheat occurrences were of low magnitude. Plants were restricted to shallow, gravelly clay-loam soils on convex topographic positions. Such sites were unproductive and drought prone (due to their windswept nature), usually supporting only sparse and low vegetation characterized by fringed sagebrush (*Artemisia frigida*), scattered bunchgrasses, and cushion like forbs. Populations were located on calcareous soils (of limestone origin) of alluvial fan benches and foothill ridges, as well as on volcanic bluffs (of ash and tuff origin).

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INTRODUCTION

Welsh's buckwheat (*Eriogonum capistratum* var. *welshii*) is a mat-forming perennial buckwheat with yellow flowers and blue-green tomentose leaves. It was not described until 1989 (Reveal 1989) when it was separated from golden buckwheat (*Eriogonum chrysops*), a species endemic to eastern Oregon. Welsh's buckwheat is endemic to the basins and foothills of the upper Big Lost, Little Lost, and Pahsimeroi Rivers, and adjacent areas in east-central Idaho. Prior to 2001 surveys, it was known from only from nine occurrences, found between about 6000 and 8000 feet elevation, and distributed within a roughly circular area about 40 miles in diameter, centered at Mount Borah. All but two of these occurrences were based on herbarium collections made before 1981. Only one occurrence had been visited in the last five years. No formal survey had ever been conducted for Welsh's buckwheat and data regarding the precise location and range of populations, its habitat and substrate requirements, population sizes, threats, and general conservation status was incomplete. In 2000, the Idaho Native Plant Society (INPS) identified it as one of the state's highest priority species in need of field surveys (Idaho Native Plant Society 2000). To better understand the true rarity of this buckwheat, the Upper Snake River District of the Bureau of Land Management (BLM) funded the Idaho Conservation Data Center (CDC) to conduct a field inventory in 2001.

METHODS

Field surveys for Welsh's buckwheat were performed between July 2 and July 18, 2001. The study area, determined from known occurrences of Welsh's buckwheat and field observations, was a roughly circular area about 50 miles in diameter, centered at Mount Borah in the Lost River Range. Foothills and valley bottoms between 5500 and 8000 feet elevation were searched by following a meandering transect through suitable habitat. The large population sizes, vast areas of potential habitat, and time constraints prohibited tight, gridded searches and exact counts of individual plants. The identity of buckwheat plants was determined from descriptions by Reveal (1989). Flowering heads were required for making a positive identification, though vegetative characteristics were also useful. Voucher specimens were collected at each occurrence with over 20 flowering plants (this criteria was not met at the Lime Creek occurrence and no voucher specimen was collected). The taxonomy of species in this report follows the PLANTS Database (National Resources Conservation Service 2001). The field survey project had four main goals:

- 1) To re-locate all previously reported occurrences of Welsh's buckwheat, concentrating first on those located on BLM land. At each occurrence, the following information was documented or updated:
 - a) exact locations of occurrence (utilizing a navigation grade GPS unit and topographic maps)
 - b) occurrence size and demographic characteristics
 - c) habitat and substrate features
 - d) associated communities and species (including other rare species)
 - e) current land uses and threats

This information was entered into the CDC database and detailed Element Occurrence Records were generated (Appendix 1). An occurrence is a standard database device used throughout the Natural Heritage/Conservation Data Center network for tracking rare species, or "elements" (Conservation Data Center 2001; Mancuso 2001). Species occurrences represent specific geographic locations and their delineation is based predominantly on biological data, but also account for environmental or other factors. Thus, an occurrence is often not equivalent to the biological definition of a population. A three-digit code is assigned to each occurrence that corresponds to the reference number used by the CDC database. The precise locations of Welsh's buckwheat occurrences observed in 2001 were also mapped (Appendix 2).

- 2) Photo-monitoring stations were established at selected occurrences (using methods similar to Mancuso 2001). When practical, the station was marked with re-bar. In addition, the plant community supporting Welsh's buckwheat was described from vegetation plots centered at a subset of photo-monitoring stations. Cover of all species in the vegetation plot was estimated using methods outlined in Bourgeron et al. (1992). At each station, photos were taken at bearings of 0, 45, 90, 135, 180, 225, 270, and 315 degrees from the re-bar (if practical). Declinations of bearings were corrected according to the topographic map used. A "point

and shoot” camera, set to the widest lens angle possible, was used. Photos are on file at the Upper Snake River District BLM and the CDC. The locations of photo-monitoring points are mapped in Appendix 2. The following table shows which occurrences had photo-monitoring points established and vegetation plots:

Table 1. Summary of locations and other information regarding photo-monitoring stations.

| Occurrence (#) | GPS Location (UTM: E, N +/- error) | Re-bar Plot Marker? | # of Photos | Veg. Plot? | Directions to Photo-monitoring Station (including reference bearings) |
|---|------------------------------------|---------------------|------------------|------------|---|
| Burma Road—North of Corral Creek Summit (003) | 274876, 4869845 (+/-4.3m) | yes | 8 | yes | in center of lowest elevation sub-population; re-bar is on low ridge N of Leavitt Spring; from re-bar to cattleguard on Burma Road is +/- 300 m at 68 deg.; from re-bar to Mackay Fish Hatchery is 330 deg. |
| Chilly Buttes (011) | 266702, 4883292 (+/-4.2m) | no | 8 | no | in center of largest sub-population on top of SW ridgetop; in gravelly opening between limestone outcrops; about 300 m NW of Chilly Cemetery |
| Lime Creek (002) | 734088, 4920525 (+/-5.4m) | no | 4 (N, E, S, & W) | no | in center of largest sub-population; on bench, on top of bluff, about 100 m N of road & 100 m W of draw |
| Mill/Big Creek Confluence North (008) | 286488, 4928400 (+/-4.1m) | no | 8 | no | in center of largest sub-population; on E facing bluff, about 10 m upslope from draw; in major draw, about 100 m N-NE of dirt road |
| Pahsimeroi Road (Donkey Creek) (001) | 292565, 4912294 (+/-18 feet) | yes | 8 | yes | at the W end of foothill/butte, about 200 m SE of Donkey Creek road; from re-bar to Donkey Ck. Road/Pahsimeroi Road junction is 44 deg. & 0.7 mi. |
| South of Mud Flats (009A) | 307144, 4902657 (+/-4.3m) | yes | 8 | yes | +/-125 m at 52 deg. from where Little Lost River road crosses swale (150 m W of R. 25E/R. 26E line, at 307000, 4902542); from re-bar to Bell Peak is 98 deg.; from re-bar to Hawley Mt. summit is 164 deg.; re-bar located 15 m up from swale |
| South of Mud Flats (009B) | 310510, 4900356 (+/-3.3m) | no | 8 | yes | located at a large rock on a bluff above the Little Lost River road; from rock to cattleguard and a fence is 125 deg.; a hollowed out rock is 10 m to NW |

- 3) To search public land, on a variety of geologic and soil substrates supporting potential habitat (determined from known occurrences), for new occurrences. Surveys were performed both at the margins of, and within, the known range of Welsh’s buckwheat so that its actual range and habitat requirements could be better defined. Location, population, habitat, and threat data were also collected at any newly discovered occurrences. Surveys concentrated on the following areas (searched areas are mapped in Appendix 3, including the Corral Creek Summit (004) and Willow Creek (006) occurrence areas):
 - a) along the southern range margin in the Little Lost River Valley, around Wet Creek and Clyde, and around Mackay Reservoir in the Big Lost River Valley
 - b) the foothills along the south and west side of the Donkey Hills
 - c) the alluvial fan benches of the upper Pahsimeroi River
 - d) along the northern range margin in the Pahsimeroi River Valley, including the Goldburg Hills and foothills between Grouse Creek and Doublespring Creek, and around Antelope Flat (and the adjacent Spar Canyon Road) in the Warm Springs Creek drainage
 - e) the foothills of the Thousand Springs Valley in the upper Big Lost River basin
- 4) Assess the conservation status of Welsh’s buckwheat and make any necessary recommendations to the BLM regarding conservation management.

RESULTS

Of the nine originally known Welsh’s buckwheat occurrences, six were positively re-located. Two of these occurrences (005 and 009) were combined into one large meta-population at South of Mud Flats (009). One

occurrence was tentatively re-located (Lime Creek (002)), and two not re-located (Corral Creek Summit (004) and Willow Creek (006)). The meta-population at the South of Mud Flats occurrence is estimated at over 300,000 plants covering at least 25 acres. Five new population occurrences were discovered in 2001 (Barney Creek Foothills (010), Chilly Buttes (011), Dry Creek (012), Elkhorn Creek (013), and North of Summit Creek Research Natural Area (014)). No significant expansions of Welsh's buckwheat's known range were found. Cattle grazing, off-highway vehicle (OHV) use, and mining were the major threats to Welsh's buckwheat and its habitat. Most of the severe impacts were localized, however. Though current threats were widespread, their short-term impacts to Welsh's buckwheat occurrences were of low magnitude.

Plants were restricted to shallow, gravelly clay-loam soils on convex topographic positions. Such sites were unproductive and drought prone (due to their windswept nature), usually supporting only sparse and low vegetation characterized by fringed sagebrush (*Artemisia frigida*), Sandberg's bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), ricegrass (*Achnatherum* species), and cushion like forbs. Well-developed stands of big or low sagebrush-steppe vegetation occurred on adjacent areas of deeper, silt loam soil. Populations were located on both calcareous (usually limestone) and volcanic (i.e., ash and tuff of Challis volcanics) substrates that produce clay rich soils upon weathering. On calcareous substrates, Welsh's buckwheat occurred on both alluvial fan benches and foothill ridges and slopes. On volcanic substrates, Welsh's buckwheat occurred on eroded bluffs (badlands). Welsh's buckwheat was not found on rocky or sandy alluvial fan benches, nor on talus or scree covered slopes (e.g., those often supporting black sagebrush (*Artemisia nova*)). Similarly, it was not found on quartzite or marble substrates. Moreover, Welsh's buckwheat was discontinuously distributed in suitable habitat within its range. The following status report provides a more detailed analysis of the survey results and state of our knowledge regarding Welsh's buckwheat.

TAXONOMY

Scientific name: *Eriogonum capistratum* Rev. var. *welshii* Rev.

Full bibliographic citation: Reveal, J. L. 1989. Combinations and novelties in *Eriogonum* (Polygonaceae). *Phytologia* 66(3):251-265.

Type specimen: Idaho, Custer County: "along the road from Ellis to Howe, 38 mi S of May and 46 mi N of Howe, 6 mi S of Summit Reservoir and 8.9 mi N of the Butte Co. line, on low windswept barren gravelly clay upper slopes and ridgetops associated with *Artemisia* and *Atriplex* at about 6400 ft elev, 16 Jul 1976, *Reveal & Welsh* 4501" (holotype, U. S. National Herbarium, Smithsonian Institution, Washington, D.C.) (Reveal 1989).

Pertinent synonyms: *Eriogonum chrysops* Rydb. (Hitchcock 1964)

Common name: Welsh's buckwheat; Welsh's hidden buckwheat; Welsh's golden buckwheat

Size of genus: Approximately 250 taxa, mostly inhabiting the drier regions of the western North America. It is the largest genus in California's flora.

Family name: Polygonaceae

Common name for family: buckwheat

History of knowledge of taxon: *Eriogonum capistratum* (hidden buckwheat) was long known as a form within the species *Eriogonum chrysops* (golden buckwheat) (Reveal 1989). The original *Eriogonum chrysops* "complex" also included the closely related species *E. chrysocephalum* (shortstem buckwheat), *E. ochrocephalum* (whitewoolly buckwheat), *E. kingii* (Ruby Mountain buckwheat), *E. cusickii* (Cusick's buckwheat), and *E. mancum* (imperfect buckwheat) (Hitchcock 1964). Further collecting from east-central Idaho and surrounding areas in the 1970's and 1980's, and subsequent taxonomic work by Reveal (1989), led to descriptions of several new species formerly not separated from *E. chrysops*, including *E. capistratum*, *E.*

meledonum (guardian buckwheat), and *E. verrucosum* (graceful buckwheat); all endemic to east-central Idaho and vicinity. Reveal (1989) also described three varieties of *E. capistratum*: var. *capistratum*, var. *muhlickii*, and var. *welshii*. Based on Reveal's descriptions, the characteristics distinguishing *E. capistratum* from *E. meledonum* are subtle. Intermediacy, resulting from phenotypic response to ecological factors or genotypic response to hybridization, is commonly observed in other perennial members of the genus (Welsh et al. 1987). Intermediacy probably occurs within the *E. chrysops* "complex" as well.

The earliest collection of Welsh's buckwheat cited by Reveal (1989) is from 1964 by Holmgren and Reveal. The next collections cited by Reveal were not made until 1976 by the Reveals and Welsh. Numerous collections were made by University of Idaho researchers (e.g., Brunsfeld, Henderson, and others) in the late 1970's and early 1980's. Undoubtedly, collections by others (e.g., Bureau of Land Management range specialists) were identified as *Eriogonum chrysops* by using the key in the "Vascular Flora of the Pacific Northwest" (Hitchcock 1964).

One year after its description in the literature, Welsh's buckwheat was recognized as a possible conservation concern by the Idaho Native Plant Society (INPS) at the 1990 Rare Plant Conference. It was tracked on the "State Priority 2" list until 1997 when it was placed in the globally rare category. Its INPS status has not changed since 1997 (Idaho Native Plant Society 2001).

Alternative taxonomic treatments: none

LEGAL OR OTHER FORMAL STATUS

NATIONAL

U. S. Fish and Wildlife Service: none

Bureau of Land Management: Welsh's buckwheat was not identified by the Idaho BLM as a sensitive species until 1996. It is currently on the Idaho BLM Sensitive species list.

U. S. Forest Service: Welsh's buckwheat is currently on the Region 4, U. S. Forest Service (USFS) Sensitive species list.

Other current formal status recommendations: NatureServe, representing the network of Natural Heritage Programs and Conservation Data Centers, has assigned a global rank of G4 (widespread, abundant, and apparently secure) to *Eriogonum capistratum*. It has assigned a rank of T2 (globally imperiled due to rarity or other factors making it vulnerable to extinction) for the variety *welshii* because of its limited distribution and low number of known occurrences (Conservation Data Center 2001).

STATE

Idaho Conservation Data Center: The CDC assigns a state conservation rank of S2 (imperiled) to Welsh's buckwheat due to its limited distribution and low number of known occurrences (Conservation Data Center 2001).

Idaho Native Plant Society: The INPS currently tracks Welsh's buckwheat as "G4/T2" (same as NatureServe's rank) with a "threat rank" of 9 (a variety with imminent, low magnitude threats) (Idaho Native Plant Society 2001).

DESCRIPTION

General non-technical description: Welsh's buckwheat is a low, mat-forming perennial buckwheat. Its blue-green leaves are covered with dense, soft, white-colored woolly hairs (tomentose) that are not glandular. The spatulate to elliptic shaped leaf blades are typically between 5 and 12 mm long on petioles 4 to 9 mm long. The erect flowering stems are 2 to 10 cm long and covered with dense, sometimes tufted or tangled, long woolly hairs (tomentose to floccose). The yellow to golden colored flowers are not hairy (glabrous), 2 to 3 mm long,

and form a dense and tight, ball-like cluster terminating the flowering stem. The flowers have a greenish to reddish-brown mid-rib and become rosy-yellow upon maturity. The clusters of flowers are subtended by upward opening, bell-shaped bracts (an involucre) that is membrane-like in texture. It has 5 to 7 teeth and is covered with sparse to dense, soft, woolly hairs. The peak flowering period is from late June to early July.

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

Local field characters and identification aids: Specimens of Welsh's buckwheat collected from calcareous, clay-loam soils (e.g., those from the upper Little Lost and Pahsimeroi River Valleys and foothills, as well as Chilly Buttes) most closely fit the description by Reveal (1989). These specimens are easily identified in the field by their low and dense mats, white tomentose covered blue-green leaves, and yellow to golden flowers on tomentose to densely floccose scapes (Figure 1). No other buckwheat species found in these lower elevation areas on calcareous, clay-loam substrates share these characteristics. However, *Eriogonum mancum* (imperfect buckwheat), a closely related species, is sympatric with Welsh's buckwheat, at least at the margins of the latter's range. Both buckweats have the same mat-forming stature, share some floral characteristics, and both grow on calcareous substrates. However, *Eriogonum mancum* has cream to pinkish colored flowers (Hitchcock 1964). It also has grayish lanate leaves, but this character is not always easy to distinguish in the field from the "white tomentose" leaves of Welsh's buckwheat. Thus, without flowers, extreme care must be taken to properly identify and distinguish these two buckweats.

Specimens of Welsh's buckwheat growing on ashy soils derived from Challis volcanics (e.g., Pahsimeroi River valley foothills, Lime Creek, and White Knob Mountain foothills) less consistently fit the description of the taxon by Reveal (1989). These specimens tend to be slightly larger in leaf size and scape size. Other characteristics, such as the tomentose or densely floccose scapes and yellow flowers are true to description. In areas of volcanic derived soils at the north edge of Welsh's buckwheat's range, care must be taken in distinguishing between specimens of *Eriogonum verrucosum* (graceful buckwheat) and Welsh's buckwheat (the taxa are sympatric in the Lime Creek area; *E. verrucosum* was also documented at the head of Spar Canyon). These taxa share some characteristics (e.g., size, vegetative features, flower color), but *E. verrucosum* is identified by glabrous to thinly tomentose scapes and distinctly pustulose flowers (Reveal 1989). As commonly observed with other perennial buckweats, individuals of Welsh's buckwheat with intermediate characteristics, intergrading with related species, were observed during this field study.

On page seven is a key for identification of taxa known from Idaho within the *Eriogonum chrysops* "complex." It is a synthesis of various publications (Hitchcock 1964, Welsh et al. 1987, and Reveal 1989) and intended only as a field aid. Species descriptions should be consulted for making a positive identification. It does not include *Eriogonum chrysops* "complex" species from Nevada and Utah, known from the southern border of Idaho and south, (e.g., *Eriogonum desertorum*, *E. kingii*) or species endemic to eastern Oregon (e.g., *Eriogonum chrysops*, *E. cusickii*).

Photos and line drawings: No line drawings of Welsh's buckwheat are known from published literature. Line drawings of *Eriogonum chrysops* (Hitchcock 1964) show the general profile of the "complex" of species to which Welsh's buckwheat belongs. Figure 1 includes photos showing Welsh's buckwheat. A collection of other photos is on file at the CDC in Boise.

Figure 1. Photos of Welsh's buckwheat. Top photo taken at South of Mud Flats (009) on July 3, 2001 (plants are slightly larger than actual size). Bottom photo taken at Navarre Creek (007) on July 5, 2001 (plants are about one-half actual size).



Key to the Idaho species of the *Eriogonum chrysops* “complex” -

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

Key to the varieties of *Eriogonum capistratum* -

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

DISTRIBUTION

Global and Idaho distribution: Welsh's buckwheat is endemic to the valleys and foothills of the upper Big Lost, Little Lost, and Pahsimeroi Rivers, and immediate vicinity in east-central Idaho (Figure 2). After 2001 surveys, it is known from only 13 occurrences located in Custer County and immediately adjacent portions of Lemhi and Butte Counties in Idaho. Occurrences were found between 6000 and 8000 feet elevation, distributed within a roughly circular area about 40 miles in diameter, centered at Mount Borah in the Lost River Range. The majority of occurrences were concentrated in two areas. The largest concentration of Welsh's buckwheat (six of the thirteen occurrences) was found on the calcareous foothill flanks and surrounding alluvial fans of the Donkey Hills. The second large concentration (three occurrences, two of which are large and one (at Corral Creek Summit) not re-located in 2001) was in the northeastern foothills of the White Knob Mountains, immediately southwest of Mackay Reservoir. These foothills are derived from Challis volcanics. Welsh's buckwheat is known from three other scattered locations further north. Two occurrences were found on Challis volcanic substrates, one at Lime Creek southeast of Challis and the other near Goldburg on the Lemhi Mountain foothills in the Pahsimeroi River drainage. Another occurrence was found on Chilly Buttes, an isolated limestone outcrop in the upper Big Lost River drainage. One other occurrence, Willow Creek (006), could not be re-located due to vague location notes. It is suspected to occur either in the Big Lost River drainage at the foot of Mount Borah, or in the upper Pahsimeroi River near the Donkey Hills. There is no evidence to suggest that this occurrence, or the Corral Creek Summit (004) occurrence, are extirpated.

Precise occurrences in Idaho: Population, location, habitat, threat, and other conservation data are detailed in the Element Occurrence Record for each occurrence (Appendix 1; Conservation Data Center 2001). The precise locations of occurrences observed in 2001 are mapped in Appendix 2. The occurrences are summarized below:

Barney Creek Foothills (010): This occurrence was discovered in 2001. It is located in the Little Lost River/Summit Creek Valley, about two to three miles west-southwest of Barney Hot Springs. The occurrence is comprised of sub-populations located on barren foothill ridges projecting from the northeast side of the Donkey Hills, on both the west and east sides of Barney Creek draw.

Burma Road—North of Corral Creek Summit (003): This occurrence was re-located and expanded in 2001. It is located along the Burma Road, north of Corral Creek Summit and southeast of the Mackay Fish Hatchery, in the foothills of the White Knob Mountains. The lowest sub-population is located on the ridge just north of Leavitt Spring. Additional sub-populations are in suitable ridge habitat located up the Burma Road toward Corral Creek Summit to an elevation of about 7800 feet.

Chilly Buttes (011): This occurrence was discovered in 2001. It is located on the southern butte of the Chilly Buttes, prominent limestone outcrops located between Thousand Springs Valley and the Big Lost River. Plants are concentrated on the ridgetops leading to the butte summit, as well as on southerly slopes above an old mining adit and the historic Chilly Cemetery.

Corral Creek Summit (004): This occurrence from the White Knob Mountains was not re-located during a cursory survey in 2001 due to vague location data. It is based on the herbarium label of a Douglas Henderson collection made in 1979. No Welsh's buckwheat were found at the location mapped by the CDC. However, there is some potential habitat down the Burma Road toward occurrence 003.

Dry Creek (012): This occurrence was discovered in 2001. It is located about 17 miles west of Clyde on the south end of the Donkey Hills, at the foot of the Lost River Range. Plants are located on the alluvial fan bench following the north side of Dry Creek, as well as on a foothill toeslope.

Elkhorn Creek (013): This occurrence was discovered in 2001. The occurrence is located on the southwest side of the Donkey Hills, in the Elkhorn Creek drainage (a tributary of Long and Burnt Creeks, all of which feed the upper Pahsimeroi River). Plants are found on the summit of a foothill ridge.

Lime Creek (002): This occurrence was tentatively re-located in 2001. Both *Eriogonum verrucosum* (graceful buckwheat) and Welsh's buckwheat are known to occur in this drainage. The original occurrence directions are vague, based on the herbarium label of a 1979 collection by Steve and Pam Brunfeld. Plants resembling Welsh's buckwheat were found, but only a few flowering individuals were observed. Due to the lack of flowering individuals, no plants were collected and a positive identification could not be made. This occurrence is located at the foot of the west side of the Pahsimeroi Mountains, about 10 miles south of Challis. Plants are located on volcanic foothill bluffs about two miles east of Highway 93.

Mill/Big Creek Confluence North (008): This occurrence was re-located and expanded in 2001. The site is south-southeast of Patterson and six miles north-northwest of Goldburg, in Lemhi County. The population is on the foothills of the Lemhi Mountains, north of the confluence of Big Creek and Mill Creek (tributaries to the Pahsimeroi River). Access is via private land. The population is located on volcanic, ashy, badland bluffs about 200 m uphill from a farm field. Plants were found near, but not at, the location originally mapped by the CDC.

Navarre Creek (007): This occurrence was re-located and expanded in 2001. The occurrence is located on the northeastern foothills of the White Knob Mountains, four miles southwest of Mackay Reservoir. Plants are located on the bench to the west of West Fork Navarre Creek, immediately above an old mining adit with red dirt tailings. Plants were also found on the ridge east of West Fork Navarre Creek.

North of Summit Creek Research Natural Area (014): This small occurrence was discovered in 2001. It is located north of the Summit Creek Research Natural Area enclosure, about two miles northwest of Summit Creek Campground, in the Little Lost River basin. The population is on an alluvial fan bench, northwest of the drainage of Summerhouse Canyon.

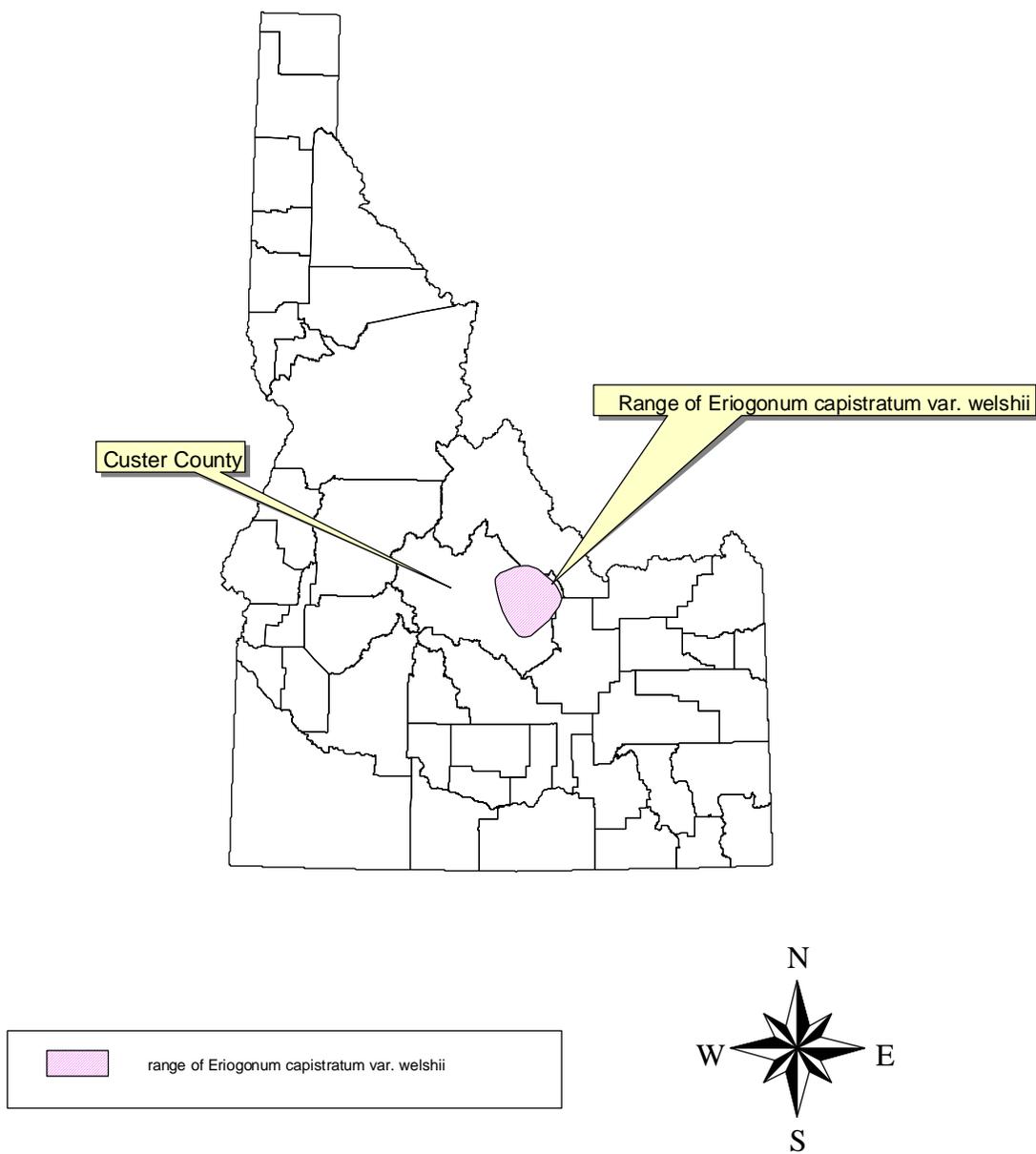
Pahsimeroi Road (Donkey Creek) (001): This occurrence was re-located in 2001. The occurrence is located at the north end of the Donkey Hills on a foothill butte, immediately east of Donkey Creek. The site is about six miles northwest of Summit Reservoir. Plants are located on the lower slopes of the butte.

South of Mud Flats (009): Surveys in 2001 significantly expanded two prior known occurrences (005 and 009) until they effectively could be mapped as one large meta-population. This large occurrence occupies the north trending finger ridges of the Mulkey Bar alluvial fan. The population stretches from the Custer-Butte County line, northwest along the bluffs paralleling the Little Lost River/Moffet Creek Valley, to about Barney Hot Springs. The population extends south, up the fan, and any one of these north to northeast trending alluvial fan ridges is likely to support Welsh's buckwheat.

Willow Creek (006): This occurrence was not re-located in 2001. The vague location data ("38 miles S of May") is derived from the herbarium label of a 1976 collection by Reveal and Reveal. Much potential habitat exists in the Willow Creek area and more surveys are needed. The occurrence may possibly be located 38 miles southeast of May, which would locate it near other Welsh's buckwheat occurrences in the Donkey Hills.

Figure 2. Map showing the known range of Welsh's buckwheat.

Known Range of Welsh's Buckwheat.



Unverified/undocumented reports: The BLM reports Welsh's buckwheat from alluvial fans at "Antelope Flat, east of Mackay" (Bureau of Land Management, 1996). Due to time constraints, neither alluvial fans east of Mackay, nor the Antelope Creek area southeast of Mackay, were surveyed. These areas are at lower elevations than any known Welsh's buckwheat occurrence. A small area of "Antelope Flat," located about 40 miles northwest of Mackay, was surveyed, but no Welsh's buckwheat was found.

Synopsis of past and needed inventories in Idaho: The inventory conducted in 2001, was the first systematic, rangewide survey of Welsh's buckwheat populations, habitat, and conservation status. The BLM did not consider Welsh's buckwheat a sensitive species until the 1996 list revision and it was not considered a priority for survey work until recently. The peak flowering period of Welsh's buckwheat is probably late June, rather than early to mid July (when surveys were done this year). Future surveys should be conducted around the end of June to match the peak flowering period. Additional inventories should be conducted in the Big Lost River Valley, near Mackay, and the Little Lost River valley, south of Clyde, to better delineate the species' southern extent. Similarly, only limited surveys were performed in the northwestern portion of the known range of Welsh's buckwheat. Future surveys could focus on the Warm Springs Creek drainage to better define the ranges of both Welsh's buckwheat and *Eriogonum verrucosum*. There are unidentified buckwheat specimens resembling Welsh's buckwheat collected from the Basin Creek drainage, a tributary to the Lemhi River. Additional inventories should also be considered in the Basin Creek drainage, the upper Lemhi River/Texas Creek Valleys, near Leadore, and the upper Birch Creek Valley, where potential habitat probably exists.

HABITAT

General habitat description: Welsh's buckwheat predominantly grows on harsh, windswept sites characterized by shallow, clay-rich soils. Table 2 summarizes the elevations, geology, and soils of Welsh's buckwheat occurrences. These sites typically support sparsely vegetated communities of *Artemisia frigida* (fringed sagebrush), *Artemisia arbuscula* (low sagebrush), and *Sphaeromeria argentea* (chicken sage) with widely scattered *Poa secunda* (Sandberg's bluegrass), *Pseudoroegneria spicata* (bluebunch wheatgrass), and *Achnatherum swallenii* (calcareous ricegrass). Low growing, often cushion-like forbs, especially *Arenaria kingii* (King's sandwort), *Stenotus acaulis* (stemless goldenweed), *Phlox hoodii* ssp. *muscooides* (musk phlox), are also common. Occurrences are known from 6060 to 7800 feet in elevation, with the median elevation about 6820 feet. Welsh's buckwheat ranges from valley bottom alluvial fans and benches to foothill ridges and bluffs of surrounding mountains. Figures 3 and 4 include photographs of typical valley and foothill habitats. Welsh's buckwheat is found on substrates formed of either calcareous rock (mainly limestone) or Challis volcanics geology. Regardless of the underlying geology or landform, this buckwheat is usually restricted to convex shaped (or undulating with bedrock outcrops) topography that is most often gently sloping (but sometimes flat or steeper). Such sites include the break shoulders of benches, mid to upper slopes of ridges, ridge and bench tops, or eroded fault escarpments. These habitats are all characterized by shallow, gravelly, clay-loam soil. The dry winds blow both snow and fine, silty soil off these sites, making them very drought-prone and low in productivity. Welsh's buckwheat is rarely found on toe- or lee-slopes, or in gullies, where more moisture and deeper, sandy loam soils support denser sagebrush-steppe vegetation. At South of Mudflats (009), Welsh's buckwheat was occasionally found on toe-slopes and flats where topsoil had been removed and compacted by bulldozers during road construction projects.

The range of Welsh's buckwheat lies within one of the harshest environments in Idaho. Habitats are in the rain-shadows of the White Knob Mountains, Boulder Mountains, Lost River Range, and Pahsimeroi Mountains. The annual precipitation is scant, averaging about 8 to 9 inches per year (typically ranging from 6 to 10 inches), in the upper Big Lost River (e.g., at Chilly Barton Flat) and Pahsimeroi River valleys (e.g., at May) (Bureau of Land Management 1996; Abramovich et al. 1998). The wettest three months are April to June, while the driest are January to March. Valley bottoms receive only about 15 to 19 inches of snow per year. This snow typically blows into drifts and adds little to soil moisture accumulation. Total snowfall and precipitation rises with elevation into the foothills of these valleys. Summer and fall rains are sporadic, usually occurring as short duration thunderstorms. Temperature fluctuations are often extreme, both daily and seasonally (Abramovich et al. 1998). The average January temperature is about 16 to 20 degrees, with a mean low of 3 to 8 degrees F. The

average July temperature is about 63 to 67 degrees F, with a mean high of 82 to 87 degrees F. The period between last and first frost in this region averages only about 60 to 80 days.

Geology and soils:

Calcareous substrates, landforms, and soils - In the area surrounding most of the Donkey Hills (e.g., at Barney Creek Foothills (010), Dry Creek (012), Elkhorn Creek (013), and South of Mud Flats (009)), as well as at Chilly Buttes (011), Welsh's buckwheat is found on alluvial deposits or residual foothill substrates derived from mid-Proterozoic age carbonate rocks, mostly Mississippian and Pennsylvanian limestone (Table 2; Link and Janecke 1999). The occurrences at North of Summit Creek Research Natural Area (014) (at the base of the Lemhi Mountains) and Pahsimeroi Road (Donkey Creek) (001) (on the north side of the Donkey Hills) are both found on deposits of mixed origin, including limestone and mid-Proterozoic age meta-sedimentary rocks (e.g., quartzite and marble) (Link and Janecke 1999).

The occurrences at Dry Creek (012), South of Mud Flats (009), and North of Summit Creek Research Natural Area (014) are found on convex breaks of low benches and finger ridges formed by the erosion of ancient alluvial fans (Table 2; Figure 3). These enormous alluvial fans formed from the deposition of Pleistocene glacial outwash and other deposits (Link and Janecke 1999). The alluvial fans have since been incised by creeks. The toes of these fans are often perpendicularly truncated by steep, dissected bluffs that mark recent uplift at faults. Cobble and stone sized rocks (both water-rounded and angular) are mixed in the alluvium. There are also occasional volcanic rocks from surrounding formations present. On the Mulkey Bar fan, near Mud Flats, the underlying alluvial layers have consolidated into conglomerate rocks. These rocks are occasionally exposed on the surface and support Welsh's buckwheat.

The occurrences at Barney Creek Foothills (010), Chilly Buttes (011), Elkhorn Creek (013), Pahsimeroi Road (Donkey Creek) (001), and a portion of Dry Creek (012) are located on convex mid to upper slopes and tops of foothill and butte ridges (Table 2; Figure 3). These foothill and butte ridges are formed from the erosion of mountains, hills, and outcrops composed of limestone, meta-sedimentary rocks, or other calcareous rock. Slopes are generally colluvial in nature while ridgetops have residual gravel, cobble, and stones. On butte and ridge slopes, patches of platy gravel, cobble, and stone scree and talus reflect the colluvial deposition. Ridgetops often have exposed bedrock, sometimes with buckwheat growing on the rocks.

On both alluvial fan and ridge landforms, the soil supporting Welsh's buckwheat is similar. These sites are characterized by distinctly shallow and unproductive soils. Depth to an impervious clay pan was only 15 cm at a portion of the South of Mud Flats occurrence. Wind and water have eroded the finer silty soil off these sites and deposited it in adjacent gullies and toe-slope areas. In addition, chemical weathering has led to the formation of clay-rich soil. As a result, sites are characteristically barren, or have only low vegetative cover, and have a "desert pavement" look in some flatter areas. The cover of microbiotic crust, as well as *Selaginella* (spikemoss) species, ranges from non-existent, to patchy, to extensive. Soils are heavy clay-loams with copious coarse, often platy, gravel. Cobble and stone sized rocks are often intermixed (forming up to 20% of ground cover). Buckwheat plants were not observed on all barren, shallow soil sites. For example, less clay-rich and more rocky or sandy alluvial soils with *Artemisia nova* (black sagebrush) rarely supported Welsh's buckwheat. Similarly, Welsh's buckwheat was not found in areas with high cover of *Atriplex nuttallii* (Nuttall's saltbrush), probably due to excessive salinity or alkalinity in these microsites.

Challis volcanics substrates, landforms, and soils - The occurrences at Burma Road—North of Corral Creek Summit (003), Mill/Big Creek Confluence North (008), Navarre Creek (007), and Lime Creek (002), all occur on mountain foothill landforms derived from Challis volcanics of Eocene age (Table 2; Figure 4; Link and Janecke 1999). The most common underlying rock type was tuffaceous sedimentary rock (e.g., ash siltstone or shale), but Welsh's buckwheat also occurred on substrates derived from ash beds, andesite, or rhyolite. The ash beds sometimes contained petrified wood. At Navarre Creek (007), the underlying geologic formation has been mined. At these occurrences, Welsh's buckwheat was not found on sharply defined dark-reddish cinder outcrops of basaltic and rhyolitic origin.

The foothill sites supporting Welsh’s buckwheat typically occur as steep, dissected (undulating, broken, and eroded) “badland” bluffs and benches (Table 2; Figure 4). These landforms are composed of a complex mosaic of igneous rock, ash layers, and sedimentary rock that have eroded into gullies, ridges, and outcrops. Welsh’s buckwheat is usually confined to convex mid- to upper-slopes, benches, rock outcrops, and ridgetops. On ridgetops, Welsh’s buckwheat occasionally grows on ash siltstone or shale rock outcrops.

At these volcanic foothill sites, soils are shallow, unproductive (i.e., they won’t support sagebrush), and easily eroded. This soil is derived from colluvial deposition, residuum, and chemically weathered or altered ash. Welsh’s buckwheat is typically found on reddish, yellowish, or grayish colored, gravelly clay-loam soil. The soil is mostly shallow, underlain by a clay-pan. Pieces of gravel, cobble, and stone derived from tuff (e.g., shale and siltstone), andesite, or petrified wood are often mixed in the soil. Welsh’s buckwheat is not typically found on deep, sandy loam soils found in gullies and on toeslopes, nor on talus. However, at the Mill/Big Creek Confluence North (008), Welsh’s buckwheat was found on relatively soft and loose, coarse gravelly clay-loam soil (even on toe-slopes). At Navarre Creek (007), it was most commonly observed on terrace-like patches of distinctly red colored clay soil, presumably with a shallow depth to a pan. The soil was iron rich and unable to support many species other than Welsh’s buckwheat. Few gravels or cobbles were intermixed in the soil at Navarre Creek (007). This soil apparently resists the percolation of water, causing overland runoff and erosion. In general, microbiotic crust was minimal to non-existent on volcanic soils.

Table 2. Summary of the environmental features at all confirmed Welsh’s buckwheat occurrences.

| Occurrence | Elevation Range (feet) | Geology | | Topographic Position (all sites are convex) | Soils (all soils are shallow, gravelly clay loams) | |
|--|------------------------|-------------------------------|--|--|--|---|
| | | Primary Bedrock | Landform | | Origin | Character |
| Barney Creek Foothills (010) | 6680 to 7020 | limestone | foothill slopes & ridges | mid to upper slopes & ridgetops | colluvium; residuum | calcareous; very gravelly with cobbles & stones |
| Burma Road-N. of Corral Creek Summit (003) | 6720 to 7800 | Challis volcanics; tuffaceous | foothill slopes & ridges | upper slopes & ridgetops | colluvium; residuum | ashy; gravelly with cobbles & stones |
| Chilly Buttes (011) | 6430 to 6720 | limestone | butte slopes & ridges | mid to upper slopes & ridgetops | colluvium; residuum | calcareous; gravelly with cobbles & stones |
| Dry Creek (012) | 7190 to 7370 | limestone | alluvial bench; foothill slopes | break shoulders; lower slopes | alluvium (glacial outwash) | calcareous; very gravelly with cobbles & stones |
| Elkhorn Creek (013) | 7550 to 7601 | limestone | foothill ridge | ridgetop & shoulders | residuum | calcareous; very gravelly with many cobbles |
| Mill/Big Creek Confluence North (008) | 6060 to 6100 | Challis volcanics; igneous | dissected bluff (“badland”) slopes | mid to upper slopes | colluvium; residuum | ashy; gravelly |
| Navarre Creek (007) | 6790 to 7000 | Challis volcanics; ash bed | dissected bluff slope; foothill ridges & benches | upper slopes, ridgetops, & benches | colluvium; residuum | ashy; iron rich |
| North of Summit Creek RNA (014) | 6725 to 6730 | meta-sedimentary & limestone | alluvial fan bench | break shoulder & bench top | mixed alluvium | very gravelly with many cobbles |
| Pahsimeroi Road (Donkey Creek) (001) | 6410 to 6600 | meta-sedimentary; quartzite | butte slopes & ridges | mid to upper slopes & ridgetops | colluvium; residuum | coarse gravelly with cobbles & stones |
| South of Mud Flats (009) | 6255 to 6650 | limestone; conglomerate | alluvial fan benches & finger ridges | break shoulders; bench tops; mid to upper slopes | alluvium | calcareous; gravelly with cobbles & stones |

Figure 3. Photos of Welsh's buckwheat habitat on calcareous substrates. Top photo taken at South of Mud Flats (009) on July 4, 2001; looking east to Little Lost River Valley and Bell Peak. The bottom photo taken at Elkhorn Creek (013) on July 11, 2001; looking east to Donkey Hills.



Figure 4. Photos of Welsh's buckwheat habitat on Challis volcanics substrate. Top photo taken at Mill/Big Creek Confluence North (008) on July 12, 2001; looking north at occurrence on the barren soil of the bluff (center of photo). Bottom photo taken at Burma Road—North of Corral Creek Summit (003) on July 18, 2001; looking northeast to Lost River Range.



Plant communities: Plant communities supporting Welsh's buckwheat are mostly barren or open, typically having less than 20 to 30% total vegetative cover. Exceptions are when *Selaginella* (spikemoss) species cover the ground (e.g., at Pahsimeroi Road (Donkey Creek) (001)) or when Welsh's buckwheat dominates microsites with moderate to high cover (e.g., at Mill/Big Creek Confluence North (008) and Navarre Creek (007)). Welsh's buckwheat most often occurs in windswept, open stands of *Artemisia frigida* (fringed sagebrush), though sparse *Artemisia arbuscula* (low sagebrush) communities also commonly support Welsh's buckwheat. *Sphaeromeria argentea* (chicken sage) is often present in these communities, with low cover. Widely scattered, often stunted, bunchgrasses are found in these communities. The most common bunchgrasses are *Poa secunda* (Sandberg's bluegrass), *Pseudoroegneria spicata* (bluebunch wheatgrass), and *Achnatherum swallenii* (calcareous ricegrass). Low growing, often cushion-like forbs (especially *Arenaria kingii* (King's sandwort), *Stenotus acaulis* (stemless goldenweed), and *Phlox hoodii* ssp. *muscoides* (musk phlox)) have about the same cover and frequency as bunchgrasses in these communities. Shrubs are typically low stature (less than 20 cm tall), though taller (but still stunted) *Chrysothamnus* (rabbitbrush) species or *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) may also occur. Welsh's buckwheat occasionally occurs in open *Atriplex nuttallii*/*Poa secunda* (Nuttall's saltbrush/Sandberg's bluegrass) communities. Welsh's buckwheat also grows in microsites within, or on the edge of, a denser sagebrush mosaic. This includes a complex mosaic of low sagebrush communities on shallow soil, such as those dominated by *Artemisia arbuscula* or *A. nova* (black sagebrush), and big sagebrush stands (*Artemisia tridentata* ssp. *wyomingensis* communities) on slightly deeper soil. These sagebrush community types are described in Hironaka et al. (1983). Denser shrub communities, such as those dominated by *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) or *Artemisia tripartita* (threetip sagebrush), found on more productive soils of draws, mounds, toeslopes, steeper northerly slopes, or where snow collects, do not support Welsh's buckwheat. At Lime Creek (002), tentatively identified Welsh's buckwheat occurs in a sparse *Ericameria nauseosa*/*Achnatherum hymenoides* (gray rabbitbrush/Indian ricegrass) community. The following is a list, in descending order from most frequently observed to least, of plant communities supporting Welsh's buckwheat:

Artemisia frigida/*Poa secunda*
Artemisia frigida/*Pseudoroegneria spicata*
Artemisia arbuscula/*Pseudoroegneria spicata*
Artemisia frigida/*Achnatherum swallenii*
Artemisia frigida/*Hesperostipa comata*
Atriplex nuttallii/*Poa secunda*
Artemisia arbuscula/*Poa secunda*
Artemisia nova/*Pseudoroegneria spicata*
Artemisia tridentata ssp. *wyomingensis*/*Poa secunda*
Artemisia tridentata ssp. *wyomingensis*/*Pseudoroegneria spicata*
Artemisia tridentata ssp. *wyomingensis*/*Achnatherum hymenoides*
Artemisia nova/*Poa secunda*
Artemisia longiloba/*Poa secunda*

Associated species: The following species were associated with Welsh's buckwheat at 70% or more of the occurrences: *Artemisia frigida* (fringed sagebrush), *Poa secunda* (Sandberg's bluegrass), *Pseudoroegneria spicata* (bluebunch wheatgrass), *Arenaria kingii* (King's sandwort), *Stenotus acaulis* (stemless goldenweed), and *Phlox hoodii* ssp. *muscoides* (musk phlox). These species were associated with Welsh's buckwheat at between 50 and 70% of the occurrences: *Artemisia arbuscula* (low sagebrush), *Sphaeromeria argentea* (chicken sage), *Achnatherum swallenii* (calcareous ricegrass), and *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush). The following associated species were documented at between 30 and 50% of the occurrences: *Chrysothamnus* and *Ericameria* species (including *E. nauseosus* (gray rabbitbrush) and *C. viscidiflorus* green rabbitbrush), perennial *Cryptantha* species (catseye), *Penstemon pumilus* (Salmon River beardtongue), *Elymus elymoides* (bottlebrush squirreltail), *Atriplex nuttallii* (Nuttall's saltbrush), *Krascheninnikovia lanata* (winterfat), and *Hesperostipa comata* (needle-and-thread). Other occasionally associated species were *Agropyron cristatum* (crested wheatgrass), *Pascopyrum smithii* (western wheatgrass), *Astragalus purshii* (woolly pod milkvetch), *Cymopterus* species (springparsley), *Cusickiella douglasii* (alkali false whitlowgrass), *Erigeron* species (e.g., *E. compositus* (cutleaf daisy), *Eriogonum mancum* (imperfect

buckwheat), *Hymenopappus filifolius* var. *idahoensis* (fineleaf hymenopappus), *Achnatherum hymenoides* (Indian ricegrass), *Oxytropis lagopus* (haresfoot locoweed), *Sedum lanceolatum* (spearleaf stonecrop), and *Townsendia florifer* (showy townsendia). At Navarre Creek (007), Welsh's buckwheat occurs with an odd assortment of species, all with low cover, including *Pinus contorta* (lodgepole pine), *P. flexilis* (limber pine), and *Carex rossii* (Ross' sedge).

Rare species: At Chilly Buttes (011), Welsh's buckwheat grows with *Astragalus aquilonius* (Lemhi milkvetch) (Element Occurrence (EO) 001). At Lime Creek (002), the buckwheat resembling Welsh's buckwheat grows with both *Astragalus aquilonius* (EO 008) and *Astragalus amblytropis* (Challis milkvetch) (EO 009). Each of these rare plant locations were known prior to this survey. Two other rare plant species endemic to the Challis volcanics region are known from upper Lime Creek (*Oxytropis besseyi* var. *salmonensis* (Salmon River crazyweed) (EO 007) and *Thelypodium repandum* (wavyleaf thelypody) (EO 015)), but neither were observed growing with buckwheat. *Eatonella nivea* (white false tickhead), a Great Basin disjunct species, is also known from the Lime Creek area.

POPULATION BIOLOGY

Population size and condition: Ten confirmed Welsh's buckwheat occurrences were surveyed in 2001. Table 3 summarizes the population information for these occurrences. The total estimated number of observed Welsh's buckwheat plants was between 320,000 and 350,000. About 300,000 of these plants grow at South of Mud Flats (009) alone. This is a very rough estimate based on density counts and extrapolation. For example, at South of Mud Flats (009), plant densities ranged from only 400 to 1500 individuals/100 square meters to very high (about 2250 to 5000 individuals/100 square meters). In general, plants were distributed in distinct, but widely separated, linear clusters within suitable habitat. Due to the large variation in population density and distribution, the true number of plants was impossible to accurately extrapolate; the total estimated here is probably low. Two occurrences known from herbarium collections, Corral Creek Summit (004) and Willow Creek (006), were not re-located due to vague location data and time constraints. Based on current knowledge, there is no reason to suspect that these two occurrences have been extirpated. The occurrence at Lime Creek was probably re-located, but plants could not be positively identified as Welsh's buckwheat. This occurrence is considered tentative.

Of the 10 confirmed occurrences, three were very large meta-populations composed of several large, as well as numerous small, sub-populations spread over a wide area. These occurrences, Burma Road-North of Corral Creek Summit (003), Barney Creek Foothills (010), and South of Mudflats (009), represent, by far, the largest population numbers and areas of Welsh's buckwheat. The latter two occurrences, in addition to the smaller North of Summit Creek Research Natural Area (014) occurrence, are separated from each other by only three to five miles. These three occurrences may actually be part of one very large meta-population centered at Moffet Springs, but this needs to be confirmed by additional surveys. Similarly, Navarre Creek (007), also supporting a large number of plants, and Corral Creek Summit (004), may be part of a northeastern White Knob Mountain foothill meta-population that includes the Burma Road sub-populations.

Despite locally high population numbers, the actual area covered by Welsh's buckwheat is low. The total acreage covered by Welsh's buckwheat was estimated at about 50 to 100 acres, with 20 to 50 of these acres at South of Mud Flats (009). Sub-populations typically formed narrow, often linear, strips that were discontinuously distributed across and within potential habitat areas. Common patch sizes ranged from only 100 to 400 square meters (+/- 0.1 acre) (typical of volcanic substrates) to long strips about 10 to 20 m wide by 200 to 400 m long (typical of alluvial fans and ridges). Plant density was often locally high, but not all areas of potential habitat supported Welsh's buckwheat. The following discussion, as well as Table 3, summarizes the population size and condition of each occurrence.

Barney Creek Foothills (010): This was a very large occurrence (over 10,000 plants, about 90% of which were large-sized and/or flowering) composed of two widely separated sub-populations. Plant density was locally high, but distribution was discontinuous on ridgetops and slopes. Welsh's buckwheat was occasionally the

dominant plant on barren slopes. Patch size ranged from less than 0.1 acre to nearly 1 acre in size. It is unknown if Welsh's buckwheat occurs on adjacent foothills and alluvial fan terraces in the Barney Creek drainage (separating the two sub-populations).

Burma Road—North of Corral Creek Summit (003): This was another occurrence (over 5,000 plants) that formed a meta-population. Plants were scattered in loose to locally dense patches throughout suitable habitat in at least six sub-populations. Plants occupied the majority of potential habitat in the area searched.

Chilly Buttes (011): This moderately dense occurrence of over 1,000 plants was relatively isolated from other known occurrences. Only about 30% of the large-sized plants flowered this year, but reproduction appeared good (about 30% of the population consisted of young, small-sized plants). Plant density was high on ridgetop and adjacent slopes where the majority of plants had nearly continuous distribution. Plant density was lower on the south slopes and adjacent ridges where several distinct, but widely separated clusters were observed. Plants occupied most of the potential habitat surveyed.

Corral Creek Summit (004): This occurrence from the White Knob Mountains was not re-located during a cursory survey of the site in 2001. No population data are available.

Dry Creek (012): This was a relatively small occurrence (1,000 plants or more), comprised of one large and two small clusters. Only about 30% of the large-sized plants bloomed this year. Plant density ranged from moderate to high, but Welsh's buckwheat did not occupy all the potential habitat surveyed and was discontinuous in distribution.

Elkhorn Creek (013): This was another relatively small occurrence (1,000 plants or more). An unknown percentage of the plants flowered this year, but reproduction seemed moderate to high (indicated by the large number of seedlings). Plant density was locally high, but distribution was discontinuous in the ridgetop habitat. It is unknown if Welsh's buckwheat occurs on adjacent barren foothills and ridges in the Elkhorn drainage.

Lime Creek (002): This occurrence was tentatively re-located in 2001. Both *Eriogonum verrucosum* (graceful buckwheat) and Welsh's buckwheat are known to occur in this drainage, but only a few flower heads were observed and identification was not confirmed. A buckwheat resembling Welsh's buckwheat was observed in four small patches, with a population total estimated at 500 to 1,000. Total population size was less than 1 acre. About 90% of the plants were large-sized, but far less than 50% of those flowered this year. Plants occupied the majority of potential habitat in the limited area searched and were not found on alluvial fan terraces and low volcanic hills about one mile to the west.

Mill/Big Creek Confluence North (008): This was a small, but locally dense occurrence. About 300 to 500 plants, of all age classes, were scattered in three small patches of suitable habitat (totaling only 0.1 to 0.2 acres). Plants did not occupy all the potential habitat in the area.

Navarre Creek (007): This was a moderately large occurrence with over 2,000 plants, but only 10% or less were seedlings. However, about 90% of the large-sized plants flowered this year and growth was vigorous. Thousands of plants, in two large sub-populations, were densely clustered in distinct, but well separated, patches (at least 12 patches, each +/- 15 meters in diameter). Welsh's buckwheat was the dominant plant within these patches.

North of Summit Creek Research Natural Area (014): This was a small (500 plants or more), but moderately dense, occurrence with good reproduction. Plants occupied only a small percentage of the potential habitat surveyed, covering less than 0.5 acres.

Pahsimeroi Road (Donkey Creek) (001): This was the smallest documented occurrence (only 10 to 50 plants). Welsh's buckwheat density was generally low throughout the occupied habitat. Overall, 99% of the buckwheat

species in the general area appeared to be *Eriogonum mancum* (identified by whitish-pink flowers). A follow up survey should be done in late June to better document the population characteristics at this site.

South of Mud Flats (009): This meta-population had too many Welsh’s buckwheat plants to count (the total estimate is over 300,000). Plant density ranged from less than 400 individuals/100 square meters to 5000 individuals/100 square meters. There were at least 25, but probably many more, sub-populations in the area that formed a large meta-population. Overall, about 20 to 40% of individuals observed were large, mature plants, and only about 15 to 50% flowered this year. Plants were distributed in distinct, but widely separated, linear clusters located in suitable habitat throughout the area. Plants occupied much, but not all, of the suitable habitat surveyed. Of all occurrences, this one was most impacted by livestock (and associated developments such as salt block clearings, water troughs, and pipelines), roads, mining, and OHV traffic. See the “Land use and threats” section for more discussion of specific impacts.

Willow Creek (006): This occurrence was not re-located in 2001. No population data are available.

Table 3. Population information for all confirmed Welsh’s buckwheat occurrences.

| Occurrence (#) | Population Estimate (# of sub-pop.) | Estimated Population Area (acres) |
|--|--|--------------------------------------|
| Barney Creek Foothills (010) | 10,000 to 20,000 (2 large) | 10 to 15+ |
| Burma Road-North of Corral Creek Summit (003) | 5,000 to 10,000 (6+) | 5+ |
| Chilly Buttes (011) | 1,000 to 5,000 (3) | 5+ |
| Dry Creek (012) | 1,000+ (3) | 1 to 2+ |
| Elkhorn Creek (013) | 1,000+ (1 large) | 2 to 3 |
| Mill/Big Creek Confluence North (008) | 300 to 500 (1) | 0.1+ |
| Navarre Creek (007) | 2,000 to 5,000 (2 large) | 1 to 2+ |
| North of Summit Creek Research Natural Area (014) | 500+ (1) | 0.3+ |
| Pahsimeroi Road (Donkey Creek) (001) | 10 to 50 (1) | 1 to 3 |
| South of Mud Flats (009) | 300,000+ (25+, small to large) | 20 to 50+ |

Phenology: In 2001, the peak flowering period for Welsh’s buckwheat was late June, rather than when expected in early to mid July. During surveys between July 2 and July 18, 75 to 100% of the plants observed were past flowering, with only a few heads still in bloom, and most flowers drying yellow-red or disintegrating. Two exceptions were observed. At higher elevations (above 7600 feet), many plants were still blooming on July 18 along Burma Road. At the Mill/Big Creek Confluence North occurrence on July 12, the majority of plants were still flowering. If plants are without flowers, it is very difficult to positively identify Welsh’s buckwheat (see “Local field characters and identification aids” section for more information).

Reproductive biology: Limited research has been done on the reproductive biology of *Eriogonum capistratum*. Welsh’s buckwheat reproduces in the wild by seed. Seeds likely require cold stratification to germinate (Natural Resources Conservation Service 2001). Seedlings apparently have low vigor and plants are probably slow growing, but long-lived. The species is probably moderately tolerant of fire and most likely re-sprouts after physical damage (Natural Resources Conservation Service 2001).

Wide variation in estimated population structures and reproduction rates were observed between occurrences in 2001. At the majority of population occurrences, between 50 and 80% of the plants observed were “mature” (i.e., large sized and/or flowering) and the remainder “immature” (i.e., small sized plants, such as seedlings or plants less than 5 cm wide, with no flowers). At Barney Creek Foothills (010), Navarre Creek (007), and Pahsimeroi Road (Donkey Creek) (001) occurrences, about 90% of plants observed were mature. At the majority of occurrences, between 30 and 75% of the mature plants flowered in 2001. At Navarre Creek (007), however, about 90% of the mature plants flowered this year. At some sub-populations at South of Mud Flats (009), less than 30% of the mature plants flowered this year. These percentages are rough estimates because distinguishing between immature plants and a non-flowering mature plant was often difficult. Seed production and seed viability were not determined.

Biological interactions: unknown

Competition and exotic species: The harsh, windswept, shallow clay soils supporting Welsh’s buckwheat appear to be edaphically determined communities (e.g., sparse *Artemisia frigida* (fringed sagebrush) and *Artemisia arbuscula* (low sagebrush) types). These open communities are most likely stable, long-lived, and represent the potential natural vegetation for these sites. No known invasive plant species (native or exotic) are expected to significantly compete with Welsh’s buckwheat on these sites. Exotic species invasion was minimal to non-existent on these mostly barren sites. *Agropyron cristatum* (crested wheatgrass) has been widely seeded in the general area around South of Mud Flats (009) and Navarre Creek (007), but it was present in only trace amounts on sites supporting Welsh’s buckwheat. *Halogeton glomeratus* (halogeton) and *Malcomia africana* (African mustard) were patchy on alluvial fans of the valley bottoms, mainly concentrated along roads, but never had high cover on Welsh’s buckwheat sites. Some minor amounts of *Bromus tectorum* (cheatgrass) and *Salsola tragus* (Russian thistle) were observed along road cuts and fill slopes at the Burma Road-North of Corral Creek Summit (003) occurrence. Trace amounts of *Bromus tectorum* were observed at Mill/Big Creek Confluence North (008) (in an area receiving moderate livestock grazing), but it was probably not a threat on the unproductive ashy soils. No exotic species were observed at any other occurrence.

Herbivory: No grazing or browsing of Welsh’s buckwheat by cattle, horses, ungulates, or other wildlife, was observed.

LAND OWNERSHIP AND THREATS

Land ownership and management responsibility: Eight of the 13 known occurrences of Welsh’s buckwheat are located entirely within the Challis Resource Area of the Upper Columbia-Salmon Clearwater District of the BLM (Bureau of Land Management 1999). Only two occurrences, South of Mud Flats (009) and Dry Creek (012), are located, in part, on the Upper Snake District of the BLM (at the very northern border). South of Mud Flats (009) occurs on both the Upper Columbia-Salmon Clearwater and Upper Snake River Districts, and also includes a privately owned parcel (S. 36). Two occurrences, Corral Creek Summit (004) and Navarre Creek (007), are located within the Salmon-Challis National Forest. Mill/Big Creek Confluence North (008) occurs on a parcel targeted for disposal in 1995, but the land has since remained in public ownership. The land ownership and management at the Willow Creek (006) occurrence is not known.

Land use and threats: In general, threats to Welsh’s buckwheat and its habitat were widespread and imminent, but of low magnitude. Table 4 summarizes the current threats to Welsh’s buckwheat habitat. All occurrences are in currently active livestock grazing allotments. Livestock grazing was widespread throughout the range of Welsh’s buckwheat, but actual utilization and impacts within occupied and potential habitat were typically low. Livestock apparently do not graze this species. Forage is minimal in buckwheat habitat and water is often far away. However, cattle impacts were locally noticeable when excessive use during the wet season has caused trail formation and pugging in the clay-loam soil. Associated activities, such as salt block placement, road construction, and water pipeline developments, also occur within occupied habitat and may pose more of a threat than grazing itself. Tracks and trailing by off-highway vehicles (OHVs) and 4 x 4s through occupied

Welsh's buckwheat habitat was documented at four occurrences, though OHV and 4 x 4 travel occurred nearby all occurrences. Repeated OHV use causes long-lasting trails devoid of vegetation (including buckwheat) that are susceptible to erosion (e.g., observed near Barney Hot Springs). Most soil damage occurs during the wet season. During the dry season, the clay loam soil dries very hard and is resistant to compaction and erosion. Isolated travel during the dry season does not leave a long-lasting track and causes minimal mechanical damage to buckwheat plants. Mining exploration and development, for both gravel and minerals, represents a significant potential threat at three occurrences and an unknown risk at three other occurrences. The actual probability of future mining at any occurrence is unknown. Overall, exotic species invasion was minimal. Only trace amounts of *Bromus tectorum* (cheatgrass) or other weedy species were observed. Occasional *Agropyron cristatum* (crested wheatgrass) plants have invaded from nearby seedings, but their cover and density was low. While wildfire (both natural and human ignited) is a potential threat to the surrounding sagebrush-steppe, the lack of fuel in Welsh's buckwheat habitat reduces fire risks. Naturally occurring disturbances, especially soil erosion on steeper slopes, may have some local impacts on Welsh's buckwheat.

No special OHV or mining restrictions are in place at any of the occurrences except for one small sub-population at Dry Creek (012) and at Elkhorn Creek (013). These occurrences fall within the Donkey Hills Area of Critical Environmental Concern that was designated for its crucial elk habitat and wintering range (Bureau of Land Management 1999). Motorized vehicles are prohibited from mid-December through April in the Donkey Hills Area of Critical Environmental Concern. Motorized vehicles are limited to established roads and trails the rest of the year.

The landscape surrounding Welsh's buckwheat populations is characterized by mostly intact, but often degraded, low and big sagebrush-steppe. Cattle grazing (and associated developments including water developments, salt blocks, roads, etc.), *Agropyron cristatum* seedings and invasion, road construction and maintenance, OHVs, mining, conversion to irrigated agriculture, and other activities are common and widespread. Overall, the landscape is in poorer ecological condition than the microsites supporting Welsh's buckwheat. The following, as well as Table 4, summarizes the threats and land uses at each occurrence:

Barney Creek Foothills (010): The area is currently within an active grazing allotment, but cattle rarely venture onto the steep, loose, rocky, and sparsely vegetated slopes and ridgetops supporting Welsh's buckwheat. Occasional OHV tracks and developed dirt roads cross the alluvial flats below, but only one steep and rough 4 x 4 road was found on the ridge. It leads up slope from Barney Creek and through a Welsh's buckwheat sub-population. This road (and others in the area) provide OHVs easy access to the erosive slopes for hill climbing (but OHV tracks were not yet observed in the immediate area).

Burma Road—North of Corral Creek Summit (003): The occurrence is within a moderate to heavily utilized livestock grazing allotment. Cattle use was concentrated around Leavitt Spring (near water and a small meadow) and salt blocks (at least one of which is located in occupied habitat). Burma Road is a graded dirt road, regularly used during the snow free seasons to access mining claims, rangeland, and recreation areas (hiking, hunting, OHV trails) in the White Knob Mountains and Copper Basin. Burma Road cuts through the Welsh's buckwheat population and has likely removed buckwheat plants in the past. Current maintenance of cut and fill slopes may also remove plants. There is occasional off road travel by OHVs and 4 x 4s onto ridgetop habitats, such as a track observed in occupied habitat leading to a salt block. Tracks were imprinted in moist clay soils, but Welsh's buckwheat seems minimally impacted by just light traveling. Mining exploration and development represents a potential threat in the area. There are numerous mining claim stakes within the occurrence area.

Chilly Buttes (011): The area is within an active livestock grazing allotment, but cattle rarely venture onto the steep, loose, rocky, and sparsely vegetated slopes and ridgetops. Numerous OHV tracks and developed dirt roads cross the flats below, but only one 4 x 4 road (very steep and eroded) was found on the butte. It leads up from the historic Chilly Cemetery (located at the base of the butte) to access an old mining adit. The road makes the easily eroded slopes accessible by OHVs or other users. The old adit is located immediately below occupied

buckwheat habitat (no plants were observed on, or adjacent to, the mine tailings). The risk for more mining on the butte is unknown.

Corral Creek Summit (004): This occurrence from the White Knob Mountains was not re-located during a cursory survey in 2001. The general area was grazed by livestock. No specific threat data are available.

Dry Creek (012): Cattle use was generally light on the barren bench and rocky slopes supporting Welsh's buckwheat. Cattle concentrated near old water developments in the drainages below where they have severely degraded the surrounding area. Graded dirt roads, accessing water developments, mining claims, and recreation trails, follow the drainages immediately below the population. Expansion of mining is a potential threat to buckwheat habitat in this area. Numerous claim stakes are located immediately adjacent to the bench population. Any additional road building, mining, and water pipeline development on the bench or adjacent slopes will threaten the Welsh's buckwheat population. Though OHVs are not currently impacting occupied habitat, the area is easily accessible. OHV tracks were noticeable on the barren benches and slopes in the general area (the compact ground and lack of shrubs makes for easy traveling).

Elkhorn Creek (013): Cattle only occasionally venture onto the sparsely vegetated ridgetops and upper slopes supporting Welsh's buckwheat. One cattle trail, as well as a steep and rough 4 x 4 track, go up the slope from Elkhorn Creek to access an old cattle trough (for salt?) on the ridgetop. The road and trough are less than 50 m from occupied buckwheat habitat. This road (and others in the area) allow easy access to the ridge by OHVs or 4 x 4s. No other threats were observed.

Lime Creek (002): This occurrence was tentatively re-located in 2001. Only light cattle use was observed (mainly on the upper, less steep ridge slopes). No OHVs were observed in the habitat supporting *Eriogonum*. The area is generally too loose, rocky, and cliffy for easy travel by foot or vehicle. OHVs and vehicles use the dirt road up Lime Creek to access both private and public land. OHVs occasionally venture off onto the adjacent flats. The soft and erosive lower slopes are at risk for hill climbing, but the population area may be too steep and rocky for OHVs.

Mill/Big Creek Confluence North (008): The area receives light to locally moderate grazing by horses and cattle. Most livestock grazing occurs along the road, on less steep ridges, and in drainages, but some trails were observed in Welsh's buckwheat habitat. OHVs and other vehicles use the dirt road up Mill Creek, but no OHVs were observed in the population area. OHVs do occasionally venture off the existing track and the area is at risk for hill climbing on the soft and more erosive lower slopes. The adjacent private landowner limits access to the Mill Creek road and this reduces the number of vehicles in the area.

Navarre Creek (007): The area is within an active livestock grazing allotment and heavily grazed. The adjacent creek bottom was highly degraded and non-functioning, but the upland benches supporting Welsh's buckwheat were impacted as well. Pugging of the clay soil was common and heavy utilization of grasses has led to grass pedestals, local loss of bunchgrass, and erosion problems. Welsh's buckwheat, however, does not appear to be grazed by cattle and apparently suffers only minimal short-term mechanical damage. Excessive cattle use may eventually decrease Welsh's buckwheat survival through accelerated erosion, but this needs confirmation by monitoring. A 4 x 4 road through a sub-population has likely destroyed some buckwheat habitat (though plants persist on and adjacent to the track). No OHV tracks were observed in the immediate population area, but potential for off road travel is high. An old mining adit is immediately below the population and numerous mining claims are scattered in the surrounding foothills. The area is at risk for further mining development.

North of Summit Creek Research Natural Area (014): The occurrence is within a livestock grazing allotment, but cattle use was generally light. Numerous OHV tracks and dirt roads cross the alluvial fan, but none have traveled through the population area. The area is easily accessible by OHVs and their tracks are noticeable up the barren finger ridges in the general area (the compact ground and lack of shrubs make for easy traveling). A dirt road 75 meters below the population, leads to a radio facility on top of an adjacent foothill. An old water diversion ditch exists about 0.5 miles northeast of the population area. A small, but inactive, gravel quarry is

located about 0.75 miles west-southwest of the population in similar alluvial bench habitat. Expansion of gravel mining is a potential threat to alluvial fan habitat in this area.

Pahsimeroi Road (Donkey Creek) (001): Cattle use on the unproductive butte slopes and ridgetops supporting Welsh's buckwheat was low. One faint OHV track goes through the occurrence area, but no erosion or other impacts were noticeable. Dirt roads, water developments and diversions, and heavier cattle grazing all occur on the alluvial flats below the butte.

South of Mud Flats (009): Livestock grazing commonly occurs throughout the alluvial fan habitat supporting Welsh's buckwheat. Cattle impacts were noticeable where use during the wet season had formed trails and pugged the clay-loam soil. Associated activities, such as salt block clearings, road construction, and water pipeline developments, also occur within occupied habitat. Additional ranching related road building and water pipeline development on finger ridges and flats may locally threaten Welsh's buckwheat. A gravel quarry (for road building) exists at the southeast end of the population and has likely destroyed buckwheat habitat in the past. Developed gravel roads cross the meta-population, both destroying habitat and, apparently, creating habitat where topsoil has been disturbed by dozers. Numerous OHV tracks and minor dirt roads cross alluvial fan habitat. OHVs commonly venture off the existing roads and are the main threat to Welsh's buckwheat populations in this area. The area is easily accessible by OHVs and their tracks are noticeable up the barren finger ridges (the compact ground and lack of shrubs make for easy traveling). Occasional hill climbing also occurs. Repeated OHV use causes long-lasting trails devoid of vegetation (including buckwheat) that are susceptible to erosion. Most damage to the soil occurs during the moist season. The clay loam soil dries very hard and is resistant to compaction and erosion in the summer. Hill climbing by OHVs has caused severe erosion, but Welsh's buckwheat is not usually observed on the steeper mid and toeslope sites where this occurs. Expansion of gravel mining is a potential threat to habitat in this area.

Willow Creek: This occurrence was not re-located in 2001. No threat information is available.

Table 4. Threats and activities in occupied Welsh's buckwheat habitat at all confirmed occurrences.

| Occurrence (#) | Livestock Activity | Off-Highway Vehicle Activity | Mining Activity |
|---|---|--|--|
| Barney Creek Foothills (010) | trace use | one track through population | none observed |
| Burma Road-North of Corral Creek Summit (003) | moderate to locally heavy use; salt blocks | occasional use; at least two tracks & a road in population | high risk area; numerous claims |
| Chilly Buttes (011) | none observed | one peripheral track | risk unknown; one old adit |
| Dry Creek (012) | overall light use | none observed; present in surrounding area | moderate risk area; numerous claims |
| Elkhorn Creek (013) | cattle trough; mostly light use | one peripheral track | none observed |
| Mill/Big Creek Confluence North (008) | locally moderate use (horse & cow) | none observed; present in surrounding area | none observed |
| Navarre Creek (007) | heavy use | one road through population; no off road use | high risk area; numerous claims; old adits |
| North of Summit Creek Research Natural Area (014) | overall light use | none observed; present in surrounding area | risk unknown; old gravel quarry in area |
| Pahsimeroi Road (Donkey Creek) (001) | overall light use | one track through population | none observed |
| South of Mud Flats (009) | moderate use; troughs, pipelines, salt blocks | widespread, high use; numerous roads & tracks through population | risk unknown; active gravel quarry |

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

General assessment of conservation status: Welsh's buckwheat is known from 10 confirmed occurrences, one probable occurrence, and two historical occurrences. The total population size is greater than what was known prior to this year's surveys, however, this buckwheat is still only known from an area about 40 miles in diameter. Threats are widespread and imminent, but their impact on the short-term, range-wide conservation of Welsh's buckwheat appears minimal. "Element Occurrence Ranks" were assigned for each confirmed occurrence. Element occurrence ranks are used by the network of Natural Heritage Programs and Conservation Data Centers to help prioritize occurrences for conservation planning (The Nature Conservancy 1999). The ranks represent 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. The Mill/Big Creek Confluence North (008), Navarre Creek (007), and Pahsimeroi Road (Donkey Creek) (001) occurrences were all 'B' ranked, while the remaining occurrences were 'A' or 'A/B' ranked. No occurrence was in immediate danger of extirpation.

Recommendations to federal agencies: Throughout its limited range, there are widespread and chronically occurring threats to the habitat of Welsh's buckwheat. These threats, mainly OHV use (which is probably increasing in the general region), cattle grazing (and associated activities), and mining, are common, but have so far caused only localized loss of Welsh's buckwheat and its habitat. However, if disturbances associated with these activities intensify, the long-term, cumulative threat to the species could be high. Welsh's buckwheat should remain on the sensitive species lists of both Region 4, USFS and the Idaho BLM. At this time, there are no recommended actions for the U. S. Fish and Wildlife Service to take regarding this species.

In areas supporting Welsh's buckwheat, the Challis Resource Area of the BLM and the Salmon-Challis National Forest should limit all OHV travel to existing roads and designated trails. OHV use should be monitored in the Summit Creek area for its impact to Welsh's buckwheat and other resources. Future vehicle travel, water developments, or other activities (e.g., gravel and mineral mining), should be limited to existing roads or other currently disturbed areas in or near occupied Welsh's buckwheat habitat. The risk of *Bromus tectorum* (cheatgrass) invasion is minimal, so there is no need for seeding *Agropyron cristatum* (crested wheatgrass) in fire-disturbed areas. In the foothills of the White Knob Mountains, livestock impacts to soil and vegetation are locally high. To prevent further resource damage, the area should be more closely monitored for compliance with allotment standards and guidelines.

All Welsh's buckwheat occurrences should be re-visited within the next two to four years to update population, threats, and other conservation information. Vegetation sampling and photo-monitoring should be conducted during these occurrence visits at previously established stations. If necessary at other occurrences, new photo-monitoring stations should be established. Additional searches for Welsh's buckwheat could be done in the Lemhi River and Birch Creek Valleys and elsewhere in areas of suitable habitat.

Recommendations to Heritage Network: There is currently no recommendation to NatureServe or the Idaho CDC to change the global or state rank of Welsh's buckwheat.

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APPENDIX 1

Element Occurrence Records for Welsh's buckwheat

APPENDIX 2

Maps of the locations of Welsh's buckwheat

APPENDIX 3

Maps of searched areas where no Welsh's buckwheat was found in 2001

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