Status Report on

Ownbey's thistle

(*Cirsium ownbeyi*)

in Southwest Wyoming

Prepared for the Bureau of Land Management
Wyoming State Office

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Abstract

Cirsium ownbeyi (Ownbey's thistle) is a regional endemic of northeastern Utah, northwestern Colorado, and southwestern Wyoming and was formerly a Category 2 candidate for listing under the Endangered Species Act. Prior to 1998, it was known from only two locations in Wyoming and was considered a high priority species of special concern. Surveys in 1998 relocated both known occurrences and resulted in the discovery of five new populations. The state population is currently estimated at 56,000-74,000 plants in about 100 acres of occupied habitat. *C. ownbeyi* typically occurs in sparsely vegetated openings on slopes and ridgetops within a matrix of sagebrush grasslands on whitish to reddish limey slate derived from the Green River Formation. Although most populations are secure at present, some sites could be negatively impacted by heavy recreation use by off-road vehicles or weed control programs using broadleaf herbicides. Five populations are found on BLM lands in Sweetwater County, including two on designated ACECs. Although not recommended for federal listing under the Endangered Species Act, *C. ownbeyi* is restricted enough in its habitat requirements and range that it should be considered "sensitive" during BLM resource management planning.

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I. INTRODUCTION

Cirsium ownbeyi (Ownbey's thistle) was first discovered by Dr. Stanley Welsh in Uintah County, Utah in 1955. The species remained undescribed, however, until 1982, when Welsh named the species in honor of Dr. Gerald Ownbey, an expert on the genus *Cirsium* and the first person to recognize the plant as a distinct species (Welsh 1982). *Cirsium ownbeyi* was thought to be endemic to northeastern Utah until it was discovered in northwest Colorado in 1987 (Colorado Native Plant Society 1997) and southwest Wyoming in 1988. Due to its apparent rarity, *Cirsium ownbeyi* was designated a Category 2 candidate for listing under the Endangered Species Act in 1985 (US Fish and Wildlife Service 1985).

In 1998, the Bureau of Land Management (BLM) Wyoming State Office contracted with the Wyoming Natural Diversity Database (WYNDD) on a cost-share basis to conduct field surveys and evaluate the status of *Cirsium ownbeyi* on BLM lands in southwest Wyoming. The objective of this report is to summarize existing data on the biology, distribution, habitat, population size, and potential threats of *C. ownbeyi* to be used in determining its conservation status and management needs in Wyoming.

II. METHODS

Information on the habitat and distribution of *Cirsium ownbeyi* was obtained from secondary sources, including WYNDD files and computer databases, specimens from the Rocky Mountain (RM) herbarium, scientific literature, and knowledgeable individuals. USGS topographic maps, geologic maps (Love and Christiansen 1985), and BLM land status maps were used to identify areas of potential habitat for ground survey.

Field surveys were conducted from mid June to early July 1998 (survey routes and collection sites are indicated in Appendix C). Data on the biology, habitat, population size, and management needs of this species were collected using WYNDD plant survey forms. Locations of occurrences were mapped on 7.5 minute USGS topographic maps. If populations were sufficiently large, voucher specimens were collected for deposit at the RM and Rock Springs District herbarium. Color photographs were taken of plants and their habitat at each site. Information gathered in the field was entered into the computerized Element Occurrence database at WYNDD.

Three permanent demographic monitoring transects were established following the protocol of Lesica (1987). These transects consisted of a single belt 1 meter x 20-30 meters long, subdivided into 1 meter x 1 meter plots. Within each plot, individual plants were counted and assigned to one of four age classes: seedling, vegetative (non-reproductive), reproductive, and dead. The number of stems and flowering heads was also counted. This technique generated quantitative data on population size, density, age distribution, and reproductive potential. Data from these transects are included in Appendix B.

III. SPECIES INFORMATION

A. CLASSIFICATION

1. SCIENTIFIC NAME: *Cirsium ownbeyi* Welsh (Welsh 1982). Type specimen: USA: Utah: Uintah County: Horse Trail Canyon, T4S R24E, S4, juniper-sagebrush community, 1678 m elev., 2 July 1955, Welsh 343 (BRY).

2. SYNONYMS: None.

3. COMMON NAMES: Ownbey's thistle; Ownbey thistle.

4. FAMILY: Asteraceae or Compositae (aster family).

5. SIZE OF GENUS: Cronquist (1994) estimates that the genus *Cirsium* contains as many as 200 species in the Northern Hemisphere, with about 70 native to North America. Dorn (1992) lists 18 species and 4 varieties in Wyoming.

6. PHYLOGENETIC RELATIONSHIPS: *Cirsium ownbeyi* is most closely related to *C. eatonii* (Welsh 1982). These species are part of the *Cirsium hookerianum* complex, a group of primarily Rocky Mountain thistles characterized by short to moderate height, unbranched stems, a loosely compacted inflorescence of heads, small corollas, and phyllaries of equal length with interconnecting pubescence (Moore and Frankton 1965). The group is thought to have arisen in the Southern Rocky Mountains and has expanded into deglaciated areas of northwest Wyoming, western Montana, and western Canada since the Holocene (Moore and Frankton 1965).

B. PRESENT LEGAL OR OTHER FORMAL STATUS:

1. NATIONAL:

a. LEGAL STATUS: *Cirsium ownbeyi* was formerly a C2 candidate for listing under the Endangered Species Act (US Fish and Wildlife Service [USFWS] 1993). The C2 list included species that might have warranted listing as Threatened or Endangered, but for which the USFWS lacked sufficient biological data to support a listing proposal. In February 1996, the USFWS revised its candidate policy and eliminated the C2 designation (US Fish and Wildlife Service 1996). *C. ownbeyi* is designated as a "Special Status" plant species by the BLM Rock Springs District (Amidon 1994), but has no other formal legal status in Wyoming at the present time.

The species is listed as Sensitive by the BLM Vernal District (Atwood *et al.* 1991) and BLM Colorado State Office (Spackman *et al.* 1997).

b. HERITAGE RANK: *Cirsium ownbeyi* is ranked G3 by The Nature Conservancy's Natural Heritage network system. This indicates that the species is "rare or local throughout its range or found locally in a restricted range (21-100 occurrences)" (Fertig 1997).

2. STATE:

a. WYOMING

i. LEGAL STATUS: None.

ii. HERITAGE RANK: *Cirsium ownbeyi* was formerly ranked S1, indicating that it was "critically imperiled because of extreme rarity, with 5 or fewer known extant occurrences or very few remaining individuals" (Fertig 1997). Surveys in 1998 resulted in the discovery of 5 new and often sizeable occurrences, prompting a change in rank to S2. Species ranked S2 are "imperiled because of rarity or because of other factors demonstrably making the species vulnerable to extinction" and are typically known from 6-20 extant occurrences (Fertig 1997).

b. UTAH:

i. LEGAL STATUS: None.

ii. HERITAGE RANK: Ranked S1 (Ben Franklin, Utah Natural Heritage Program, personal communication).

c. COLORADO:

i. LEGAL STATUS: None.

ii. HERITAGE RANK: Ranked S2 (Spackman *et al*. 1997).

C. DESCRIPTION

1. GENERAL NON-TECHNICAL DESCRIPTION: Ownbey's thistle is a perennial taprooted herb with stems 50-70 cm high (Figures 1-2). The stems are lightly pubescent (although often glabrate below the inflorescence) and spiny-winged along the internodes. Leaves are green, glabrous, and twice to thrice pinnately compound with finely divided, spiny

Figure 1. Line drawing of *Cirsium ownbeyi* by Kaye H. Thorne (Fertig *et al.* 1994).

lobes. Flower heads are located at the tip of the stem and are not densely clustered. The involucre is 1.8-2.5 cm long and composed of spine-tipped bracts with lightly pubescent margins. Hairs on the bracts often lack cross walls or are very slender. Flowers are white to rose pink (Atwood *et al.* 1991; Cronquist 1994; Fertig *et al.* 1994; Spackman *et al.* 1997; Welsh 1982).

2. TECHNICAL DESCRIPTION: Perennial herbs from caudex and taproot, the caudex with marcescent dark brown leaf bases; leaves of basal rosettes 5-13 cm long, 1.5-3 cm wide, tripinnatifid, green on both sides, sparingly tomentose along lower side of midrib; cauline leaves with vesture and lobing like the basal; stems 5-7 dm tall, winged-decurrent, sparingly tomentose; involucres 1.8-2.5 cm high, 1.5-2.5 cm wide, the outermost bracts more or less pinnately spinose, lance-attenuate, smooth medially, the dorsal ridge not well developed, not scabrous, sparingly tomentose along margins, the inner more or less contorted apically; spines 3-8 mm long; corollas rose-pink, 16-20 mm long; style tip 3.5-4.5 mm long (Cronquist 1994; Welsh 1982; Welsh et al. 1993).

3. LOCAL FIELD CHARACTERISTICS: *Cirsium ownbeyi* can be recognized by its bright green, essentially glabrous, twice or thrice pinnately divided spiny foliage, spiny stems, terminal cluster of white to pinkish flowers, and sparse pubescence on the involucre bracts (Fertig *et al.* 1994).

4. SIMILAR SPECIES: *Cirsium eatonii* (including *C. tweedyi*) differs in having densely cobwebby-pubescent involucre bracts, pubescent upper leaves, and woolly upper stems. The hairs of *C. eatonii* and *C. hookerianum* typically have prominent cross-walls and are flatter and broader than those of *C. ownbeyi* (Dorn 1992; Fertig *et al.* 1994).

D. GEOGRAPHICAL DISTRIBUTION

1. RANGE: *Cirsium ownbeyi* is a regional endemic of northeast Utah, southwest Wyoming, and northwest Colorado (Fertig *et al*. 1994). In Wyoming it is restricted to the Green River Basin on the east side of Flaming Gorge Reservoir in Sweetwater County (Figure 3). Populations in Utah are limited to the east flank of the Uinta Mountains in Daggett and Uintah counties, while those in Colorado are restricted to the Uinta Basin in Moffatt County (Atwood *et al.* 1991; Spackman *et al.* 1997).

2. EXTANT SITES: Prior to 1998, *Cirsium ownbeyi* was known from only 2 occurrences in Wyoming. Both of these populations were relocated and five additional sites were newly discovered during surveys in 1998. Rangewide, the species is known from 15-20 locations (Atwood *et al.* 1991; Spackman *et al.* 1997).

Exact locations of extant populations are listed in Table 1. More detailed information is provided in the Element Occurrence Records and maps in Appendix A.

3. HISTORICAL SITES: No historical sites are known from Wyoming.

4. SITES WHERE PRESENT STATUS NOT KNOWN: Welsh *et al.* (1993) report a questionable specimen from the House Range (Millard County, Utah) that may represent this taxon.

5. UNVERIFIED/UNDOCUMENTED REPORTS: One of the two original *Cirsium ownbeyi* populations in Wyoming was collected by Sherel Goodrich and Duane Atwood "between Current [*sic*] Creek and Lowe Canyon, T14N R107W S27" in 1988 (Occurrence # 001). This population could not be relocated in 1998, nor could the "white marly shale knoll" habitat and associated species. According to Goodrich (personal communication, January 1999), the original specimen label is in error and should read T15N, making this location the same as Occurrence # 003.

6. AREAS SURVEYED BUT SPECIES NOT LOCATED: Potential habitat was surveyed in the Little Colorado Desert area east of La Barge (Lincoln and Sublette counties), the Opal area (Lincoln County), Ross Butte (Sublette County), White Mountain, Whalen Butte, Wilkins Peak, and The Glades/Minnies Gap area (Sweetwater County), but no additional populations were located in 1998.

7. AREAS OF UNSURVEYED POTENTIAL HABITAT: Additional potential habitat may occur in the low mountains at the head of Middle Firehole Canyon, on the ridge system east of Little Bitter Creek, the flanks of Flattop Mountain, the northwest slope of Little Mountain, and sandstone outcrops along the west side of Flaming Gorge (near the Green River airport).

Figure 2 (page 11). Photograph of *Cirsium ownbeyi* on semi-barren, bleached slate flats just north of the Currant Creek Road, Sweetwater County, WY (Occurrence # 003). WYNDD photo by W. Fertig, 14 June 1998.

Figure 3. Wyoming distribution of *Cirsium ownbeyi*.

E. HABITAT

1. ASSOCIATED VEGETATION: In Wyoming, *Cirsium ownbeyi* is found primarily on semi-barren rims or steep slopes of broken gray slate below shaley cliffs (Figure 4). Populations are usually found in sparsely vegetated openings (cover typically 3-15%) within a matrix of big sagebrush (*Artemisia tridentata*), spiny saltbush (*Atriplex confertifolia*), green rabbitbrush (*Chrysothamnus viscidiflorus*), bitterbrush (*Purshia tridentata*), Utah juniper (*Juniperus osteosperma*), true mountain mahogany (*Cercocarpus montanus*), or western serviceberry (*Amelanchier alnifolia*) shrublands and grasslands. Most occurrences are found on sandy-clay soils covered by bleached and broken whitish, red, or bluish-gray limey-slate fragments derived from the Eocene Green River Formation. In some sites rock chips may form a layer 15-17.5 cm (6-7 inches) thick and provide nearly 80% of the ground cover. *C. ownbeyi* may be locally common on some steep slopes, forming a conspicuous part of communities dominated by Utah greasebush (*Glossopetalon spinescens*), spiny saltbush, mountain snowberry (*Symphoricarpos oreophilus* var. *utahensis*), ocean-spray (*Holodiscus dumosus*), or turpentine spring-parsley (*Cymopterus terebinthinus*). On slate flats and rimtops, *C. ownbeyi* may occur in low forb or cushion plant communities dominated by mat prickly-phlox (*Leptodactylon caespitosum*), thrift goldenweed (*Haplopappus armerioides*), stemless hymenoxys (*Hymenoxys acaulis*), stunted green rabbitbrush, and bearded wheatgrass (*Elymus trachycaulus*). Populations may also be found on roadcuts or road edges, especially if the surrounding shrub and graminoid cover is low and slate gravel is exposed on the surface.

   Elsewhere in its range, *Cirsium ownbeyi* may occur in sagebrush, juniper, or riparian communities (Atwood *et al.* 1991; Welsh *et al.* 1993). In Colorado, it is often found in alcove seeps, canyons, and abandoned stream channels on gravelly alluvium, talus, or sandy slopes (Colorado Native Plant Society 1997; O'Kane 1988; Spackman *et al.* 1997).

   Cirsium ownbeyi is remarkable for the number of other uncommon plant species with which it may co-occur in Wyoming, including Rollins' cat's-eye (*Cryptantha rollinsii*, G4/S1), Utah greasebush (*Glossopetalon spinescens* var. *meionandrum*, G5T3/S1), Payson beardtongue (*Penstemon paysoniorum*, G3S3), Garrett's beardtongue (*Penstemon scariosus* var. *garrettii*, G4T3/S1), and western phacelia (*Phacelia incana*, G3/S1).

2. FREQUENTLY ASSOCIATED SPECIES:

   Astragalus diversifolius var. *campestris* (Lesser rushy milkvetch)
   Astragalus spatulatus (Spoonleaf milkvetch)

Table 1. Location information for known populations of *Cirsium ownbeyi* in Wyoming.

Occurrence # 002
County: Sweetwater.
Legal Description: T16N R107W S24 (W2 of SW4 of NW4).
Latitude: 41° 21' 22" N (centrum).
North: 41° 21' 27" N.
South: 41° 21' 18" N.
Longitude: 109° 25' 31" W (centrum).
East: 109° 25' 26" W.
West: 109° 25' 35" W.
Elevation: 6680-6700 ft (2035-2040 m).
USGS 7.5' Quad: Sage Creek Basin.
Location: Firehole Canyon, on the southwest side of South Chimney Rock and saddle between South Chimney Rock and Point 6992 to the northeast, ca 1-1.2 miles NE of Firehole Canyon Campground.

Occurrence # 003
County: Sweetwater.
Legal Description: T15N R107W S28 (N2 of SE4SE4 & S2 of NE4 of SE4).
Latitude: 41° 14' 54" N (centrum).
North: 41° 14' 57" N.
South: 41° 14' 50" N.
Longitude: 109° 28' 00" W (centrum).
East: 109° 27' 53" W.
West: 109° 28' 05" W.
Elevation: 6440-6480 ft (1960-1975 m).
USGS 7.5' Quad: Sugarloaf Basin.
Location: Low ridge on west side of county road ca 0.15 miles north of junction with Currant Creek Road, ca 3.5 air miles east of Flaming Gorge Reservoir and 6 air miles east of Buckboard Crossing. This population includes former Occurrence # 001 (see page 10).

Occurrence # 004
County: Sweetwater.
Legal Description: T17N R106W S14 (S2 of SE4 of NW4 & N4 of NE4 of SW4).
Latitude: 41° 27' 10" N (centrum).
North: 41° 27' 14" N.
South: 41° 27' 06" N.
Longitude: 109° 20' 27" W (centrum).
East: 109° 20' 17" W.
West: 109° 20' 37" W.
Elevation: 6900-7100 ft (2100- 2615 m).
USGS 7.5' Quad: Wilkins Peak.
Location: Head of unnamed draw draining into Davis Bottom from the east side of the Green River and mouth of Slippery Jim Canyon, ca 0.5 miles west of the Little Firehole Road, ca 3 miles south of the Wilkins Peak radio tower.

Occurrence # 005
County: Sweetwater.
Legal Description: T17N R106W S34 (E2 of NW4 of SW4).
Latitude: 41° 24' 22" N (centrum).
North: 41° 24' 25" N.
South: 41° 24' 19" N.
Longitude: 109° 21' 49" W (centrum).
East: 109° 21' 46" W.
West: 109° 21' 52" W.
Elevation: 6800-6977 ft (2070- 2125 m).
USGS 7.5' Quad: Wilkins Peak.
Location: East end of east-west trending ridge forming the divide between Little and Middle Firehole canyons on the west side of the Little Firehole Canyon Road, ca 2.5 miles east of the Green River and 3 miles west of WY Highway 373.

Occurrence # 006
County: Sweetwater.

Legal Description: T14N R107W S2 (center).
Latitude: 41° 13' 26" N.
Longitude: 109° 26' 09" W.
Elevation: 6740 ft (2055 m).
USGS 7.5' Quad: Sugarloaf Basin.
Location: West side of County Road 33 between Currant Creek and the Currant Creek Ridge Road on the north slope of Currant Creek Ridge, ca 0.6 miles south of Currant Creek Ranch, ca 6 air miles east of Flaming Gorge Reservoir.

Occurrence # 007
County: Sweetwater.
Legal Description: T13N R106 W S2 (S2 of SE4), 11 (E4 of NE4NE4 & SE4 of NW4 of SE4), 14 (SE4 of NW4, NE4NE4 of SW4, W4 of NW4 of SE4, & SW4 of NE4).
Latitude: 41° 07' 50" N (centrum).
North: 41° 07' 58" N.
South: 41° 06' 10" N.
Longitude: 109° 18' 59" W (centrum).
East: 109° 18' 45" W.
West: 109° 19' 32" W.
Elevation: 8200-8400 ft (2500-2560 m).
USGS 7.5' Quads: Big Ridge and Hawks Nest.
Location: Southwest end of Currant Creek Ridge along the Currant Creek Ridge Road and slopes to the west from the head of the main stem of Sugarloaf Marsh Creek south ca 2 miles to the Hawk's Nest and the northeast rim of Buckskin Basin at the head of Washam Wash. Ca 1 mile west of Little Mountain and 10.2 miles east of Flaming Gorge Reservoir.

Occurrence # 008
County: Sweetwater.
Legal Description: T14N R105W S19 (E2 of W2 of NE4 & NE4 of NW4 of SE4).
Latitude: 41° 10' 55" N (centrum).
North: 41° 11' 08" N.
South: 41° 10' 40" N.
Longitude: 109° 16' 44" W (centrum).
East: 109° 16' 39" W.
West: 109° 16' 47" W.
Elevation: 7960-8200 ft (2425- 2500 m).
USGS 7.5' Quad: Big Ridge.
Location: North-south trending ridge on east side of Spring Creek, ca 0.8 miles west of Ramsey Peak and 1.5-2 miles south of Coyote Spring, 13 air miles east of Flaming Gorge Reservoir.

Camissonia scapoidea (Naked-stemmed evening-primrose)
Castilleja flava (Yellow paintbrush)
Chrysothamnus viscidiflorus (Green rabbitbrush)
Cryptantha sericea (Silky cryptantha)
Cymopterus terebinthinus (Turpentine spring-parsley)
Draba oligosperma (Few-seeded draba)
Elymus trachycaulus (Bearded wheatgrass)
Eriogonum brevicaule (Shortstem buckwheat)
Haplopappus armerioides (Thrift goldenweed)
Hymenoxys acaulis (Stemless hymenoxys)
Leptodactylon caespitosum (Mat prickly-phlox)
Linum lewisii (Blue flax)
Minuartia [*Arenaria*] *nuttallii* (Nuttall's sandwort)
Oenothera cespitosa (Tufted evening-primrose)
Penstemon humilis (Lowly beardtongue)
Physaria acutifolia (Sharp-leaved twinpod)
Poa secunda (Sandberg bluegrass)

3. TOPOGRAPHY: Populations of *Cirsium ownbeyi* in Wyoming may occur on flat ridgetops, upper slopes of gentle saddles, and on steep talus slopes of all aspects (Figure 5). In flat areas, *C. ownbeyi* is often restricted to small concavities or other areas of gently-dipping micro-relief. Populations may also occur on moderate to very steep slopes (ranging from 10-45%). Known occurrences in Wyoming range in elevation from 6440-8400 feet (1960-2560 m). Utah and Colorado populations occur at slightly lower elevations (5500-6200 feet/1675-1890 m) (Atwood *et al.* 1991).

4. SOIL RELATIONSHIPS: Wyoming populations of *Cirsium ownbeyi* are found primarily on dry, rocky aridisols and entisols. Most occurrences are on fine, brownish, tan or grayish sandy clay soils covered by small fragments of red, orange, whitish, or bluish-gray limey-slate derived from the Green River Formation (Love and Christiansen 1985). Colorado populations are often on sandstone or limestone substrates derived from the Weber and Morgan formations (O'Kane 1988; Spackman *et al.* 1997).

5. REGIONAL CLIMATE: In Wyoming, the average annual precipitation within the range of *Cirsium ownbeyi* varies from 8-10 inches (20-25 cm).

Figure 4 (page 17). Habitat of *Cirsium ownbeyi* on semi-barren whitish slate fragments on saddle just east of South Chimney Rock, Sweetwater County, WY (Occurrence # 002). WYNDD photo by W. Fertig, 13 June 1998.

Figure 5. Topographic position of *Cirsium ownbeyi* on the landscape. Top: Shale barrens and flats on ridgetops and saddles (Occurrence # 002). Bottom: Steep slate talus below cliffs (Occurrence # 008). Illustration by W. Fertig.

The average annual temperature ranges from 40-42º F (4.4-5.5º C). Mean minimum and maximum temperatures in January are 6º F (- 14.4º C) and 32º F (0º C), while in July mean minimum and maximum temperatures are 50º F (10º C) and 84-86º F (28.8-30º C) (Martner 1986).

6. LOCAL MICROCLIMATE: *Cirsium ownbeyi* occurs primarily on light-colored substrates in sparsely vegetated openings that may be exposed to higher winds and more intense solar radiation than adjacent, highly vegetated areas.

F. POPULATION BIOLOGY AND DEMOGRAPHY

1. PHENOLOGY: Flowering occurs primarily from late June to early August, while fruiting occurs from July to September (Spackman *et al.* 1997).

2. POPULATION SIZE AND CONDITION: In Wyoming, *Cirsium ownbeyi* is currently known from 7 extant occurrences (divided into 13 subpopulations). Based on surveys in 1998, the total population of *C. ownbeyi* in Wyoming is estimated at 56,000-75,300 plants in an area of less than 100 acres (Table 2).

Individual populations of *C. ownbeyi* range in size from fewer than 10 to nearly 40,000 plants. Colonies typically consist of scattered clumps of 1-10 individuals. Density may vary from 1-2 plants per square meter along roadsides to 6-11 plants per square meter in more favorable microsites (Appendix B). Most populations consist of a mix of size and age classes, including seedlings, non-flowering vegetative rosettes, and multi-branched reproductive plants. Vegetative plants often outnumber flowering and fruiting plants by a ratio of at least 2.5:2.

Demographic data collected in 1998 are summarized in Table 2 and Appendix B.

3. REPRODUCTIVE BIOLOGY:

a. TYPE OF REPRODUCTION: *Cirsium ownbeyi* reproduces primarily by seed. Large clumps may also form by vegetative spread.

b. POLLINATION BIOLOGY: The flowers of *Cirsium ownbeyi* are pollinated by bees, wasps, and butterflies. At least four different pollinators were observed in 1998: orange-brown speckled butterflies, mid-sized black bees with silvery-hairy sides and abdomens, large bumblebees with yellow and black striped abdomens, and large hornet-like wasps with white faces and a black and white striped abdomen.

Table 2. Demographic information for Wyoming populations of *Cirsium ownbeyi*

Occurrence # 002 (2 subpopulations)
Area: 2 + acres.
Number of Plants: 83 reproductive, 27 vegetative, and 8 seedling plants observed in 1998. Total population estimated at 150-200 plants (with additional, unsurveyed habitat on private lands to the northeast).
Density: Occurs singly or in clumps of up to 8 plants. Clumps often widely spaced.
Evidence of Reproduction: Observed in bud and flower on 15 June 1988. Seedlings also observed.
Evidence of Expansion/Contraction: Population was discovered in 1988, and relocated in 1994 (Refsdal 1996) and 1998.

Occurrence # 003
Area: 5 acres.
Number of Plants: 167 plants observed in 1998 survey (89 reproductive, 71 vegetative, and 7 seedlings). Total population estimated at 300-400 plants.
Density: Total density in demographic plots ranges from 1.2-1.8 plants per square meter. Seedling density is 0.4-1.2 per square meter and reproductive plant density ranges from 0.3 to 1 per square meter.
Evidence of Reproduction: Observed in flower and bud on 14 June and 4 July 1998. Seedlings also documented.
Evidence of Expansion/Contraction: Population has been known since 1988 and is presumed to be stable.

Occurrence # 004 (2 subpopulations)
Area: 10 acres.
Number of Plants: 1373 plants observed in 2 main colonies in 1998. Total population estimated at 6500-8500 plants.
Density: 5-6 plants per square meter observed on slopes and 11 plants per square meter on summit flats in favorable sites (average density lower).
Evidence of Reproduction: Mix of age and size classes observed in 1998, suggesting good reproduction. Rosettes outnumber reproductive plants by ratio of 3:2.
Evidence of Expansion/Contraction: Not known, population was first discovered in 1998.

Occurrence # 005
Area: 5 acres.
Number of Plants: 532 plants observed in 1998 survey. Total population estimated at 1500-2000.
Density: 5-6 plants per square meter in favorable sites (average density lower).
Evidence of Reproduction: Mix of size classes present, suggesting good reproduction. Flowering, vegetative, and seedling plants present.
Evidence of Expansion/Contraction: Not known, population was first discovered in 1998.

Occurrence # 006
Area: 0.1 acres.
Number of Plants: 3 plants observed on 4 July 1998.
Density: 3 plants observed along 10 foot section of road.
Evidence of Reproduction: 1 plant in flower and 2 vegetative.
Evidence of Expansion/Contraction: Not known, population was first discovered

in 1998. This may be a new, but ephemeral population that has colonized a disturbed roadcut.

Occurrence # 007 (5 subpopulations)
Area: 40 + acres.
Number of Plants: Total population estimated at 17,600-24,200 plants in 5 main subpopulations on 4 July 1998.
Density: Ranges from 2-3 plants per square meter along roadsides to 6-11 plants per square meter on gentle slopes in favorable sites. 4 plants per square meter observed in demographic plots (1.2 seedlings, 1.8 rosettes, and 0.9 reproductive plants).
Evidence of Reproduction: Plants observed in flower, bud, vegetative, and seedling conditions. Vegetative rosettes outnumber reproductive plants by ratio of 2.5:2.
Evidence of Expansion/Contraction: Population was first discovered in 1998.

Occurrence # 008
Area: 27 + acres.
Number of Plants: Total population estimated at 30,000-40,000 plants on 5 July 1998.
Density: 6-10 plants per square meter observed on mid slopes and 1 plant per square meter on uppermost rims in favorable sites.
Evidence of Reproduction: Ca 40% of population reproductive (in flower or bud) and 60% vegetative or seedlings.
Evidence of Expansion/Contraction: Not known, population was first discovered in 1998.

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c. SEED DISPERSAL AND BIOLOGY: The single-seeded, indehiscent fruits (achenes) of *Cirsium ownbeyi* have a pappus of feathery plumose bristles adapted for wind dispersal. Seed germination requirements are not known, but it is likely that germination and establishment are dependent on adequate moisture. Recruitment may be episodic.

G. POPULATION ECOLOGY:

1. GENERAL SUMMARY: Populations of *Cirsium ownbeyi* are typically found on semi-barren openings within a matrix of sagebrush grasslands on sandy clay soils with a surface layer of bleached whitish to red slate fragments of the Green River Formation. These openings may occur on windswept ridgecrests and saddles, gentle to steep slate talus slopes, or semi-disturbed roadsides. Individual plants may be clumped or widely dispersed, depending on habitat suitability. Colonies range in size from less than 10 plants to several thousand. This species appears to be adapted to open, dry habitats where competition for resources is low. It may be capable of colonizing recently disturbed areas that expose suitable slate covered soils with low vegetative cover.

2. COMPETITION: *Cirsium ownbeyi* is largely restricted to sparsely vegetated openings where competition for light, nutrients, and scant water is low. It is not typically found in areas with dense shrub or grass cover or where a shaded canopy has developed.

3. HERBIVORY: No evidence of herbivory by livestock or native grazers was observed in 1998 surveys. Seedlings, vegetative rosettes, and mature reproductive plants appear to be adequately protected from leaf and stem herbivory by large animals due to their copious, sharp-tipped spines. Some insect or rodent herbivory may occur to flower heads and seeds.

4. HYBRIDIZATION: *Cirsium ownbeyi* may co-occur with *C. undulatum* in disturbed, roadside habitats, but there is no evidence of hybridization between the taxa in Wyoming.

H. LAND OWNERSHIP:

1. BLM: All or part of five occurrences of *Cirsium ownbeyi* in Wyoming are found on lands managed by the BLM Rock Springs District (Green River Resource Area). Two of these populations (Occurrence #s 003 and 006), and part of a third (Occurrence # 007) are within the Currant Creek Area of Critical Environmental Concern (ACEC) (USDI Bureau of Land Management 1997). Another population on state lands (Occurrence # 008) is within the BLM Sage Creek ACEC (Fertig *et al.* 1998). All other occurrences in the Rock Springs District (#s 004, and 005) are on lands managed for multiple use.

2. US FOREST SERVICE: One occurrence (# 002) is found in Flaming Gorge National Recreation Area, managed by Ashley National Forest.

3. STATE: One occurrence (# 008) is completely on state lands, while a second population (# 007) occurs partly on state and BLM lands.

4. OTHER: Outside of Wyoming, *C. ownbeyi* is found on lands managed by the BLM Vernal and Craig districts and Dinosaur National Monument (Atwood *et al.* 1991; Spackman *et al.* 1997).

IV. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. POTENTIAL THREATS TO CURRENTLY KNOWN POPULATIONS: A small geographic range and high habitat specificity makes this species potentially vulnerable to extirpation. The following potential threats were observed in 1998 field surveys or have been reported in the literature:

1. RECREATION: Low-lying populations or those near roadsides are

potentially threatened by impacts from intensive off-road vehicle (ORV) recreation. Vehicles can cause mortality directly through dislodgement or compaction of plants, or indirectly through increased soil erosion. Under present management, ORV and other vehicle use is moderate to low in the most vulnerable areas of *C. ownbeyi* habitat. Other areas are sufficiently inaccessible to be minimally threatened under current levels of use. ORV use is restricted to existing roads in most of the habitat of *C. ownbeyi* in the Greater Red Creek area (USDI Bureau of Land Management 1997). Populations do not appear to be impacted by other recreational activities on BLM or USFS lands.

2. EXOTIC PLANTS/WEED CONTROL: *Cirsium ownbeyi* can occur along roadsides where semi-barren slate outcrops have been exposed. These populations are marginal in quality, but are potentially threatened by competition from exotic plants. Along one roadside, *C. ownbeyi* is only present where *Malcolmia africana* and *Cardaria* are absent (Occurrence # 006). Use of broadleaf herbicides to control these and other weedy species (especially exotic thistles like *Cirsium arvense, C. vulgare,* and *Carduus nutans*) could have deleterious impacts on *C. ownbeyi* plants. Release of biocontrol insect species that target exotic thistles could also have negative effects on this species.

3. GRAZING: Due to its spiny foliage, *Cirsium ownbeyi* is not preferred forage for livestock and no evidence of herbivory was observed during 1998 surveys. Cattle utilize some areas of *C. ownbeyi* habitat, as evidenced by dried dung observed in 1998. Use appears low, however, due to the absence of water, low amounts of forage, and rugged terrain of most *C. ownbeyi* sites. One exception was Occurrence # 007, which was near an existing water tank. The area immediately surrounding the tank was dominated by dense cover of weedy species (*Malcolmia africana* and *Monolepis nuttalliana*) and had compacted soils. Adjacent areas with exposures of barren slate fragments had a large *C. ownbeyi* population. At current stocking rates, livestock use appears to be compatible with populations of *C. ownbeyi*.

4. MINERAL DEVELOPMENT: Populations of *Cirsium ownbeyi* could potentially be impacted by surface disturbances associated with mineral exploration and development. Most of the range of *C. ownbeyi* in Wyoming occurs on public lands that are open to mineral leasing with some restrictions. Populations in the Greater Red Creek area are partially protected by seasonal occupancy restrictions associated with big game winter ranges and watershed management (USDI Bureau of Land Management 1997). Many *C. ownbeyi* populations occur on steep, unstable slopes that are unsuitable for roads, pipelines, or well pads.

B. MANAGEMENT PRACTICES AND RESPONSE: No experimental data exist on the response of *Cirsium ownbeyi* to most management actions.

C. CONSERVATION RECOMMENDATIONS

1. RECOMMENDATIONS REGARDING PRESENT OR ANTICIPATED ACTIVITIES: Precautions should be taken on the control of exotic plant species (particularly non-native species of *Cirsium* and *Carduus*) through broadleaf herbicides or the release of biocontrol insects within the habitat of *Cirsium ownbeyi*. Proposed surface disturbing activities should be evaluated on a case by case basis within the known range of *C. ownbeyi*. Care should be taken in the siting of pipelines, well pads, new roads, or other structures within this species' habitat to ensure that semi-barren openings with high cover of slate fragments are maintained. The proliferation of additional two-track routes in fragile habitats should be discouraged.

2. AREAS RECOMMENDED FOR PROTECTION: Fertig *et al.* (1998) recommended that the Little Firehole Canyon area (including *Cirsium ownbeyi* Occurrence # 005) be considered for possible special management status due to its unusual biological attributes. Occurrence # 008 on state lands may also be worthy of special management attention as important winter range for ungulates and as habitat for this species.

D. STATUS RECOMMENDATIONS: Despite its limited geographic range, *Cirsium ownbeyi* is sufficiently abundant at present to not warrant listing under the federal Endangered Species Act. Populations in Wyoming range from small to locally abundant, and are subject to low to moderate threats under present management. At least two populations in the state occur within designated ACECs, although one of these is a roadside occurrence of marginal quality. Elsewhere in its range, *C. ownbeyi* is protected in Dinosaur National Monument. Although its current status appears secure, *C. ownbeyi* may still be vulnerable to extirpation if its management needs are not incorporated into the BLM's land use planning. For this reason, it may still warrant recognition as a "Sensitive" species by the BLM.

V. SUMMARY: *Cirsium ownbeyi* is a regional endemic of northeast Utah, northwest Colorado, and southwest Wyoming. Worldwide, the species is known from 15-20 locations, 7 of which are found in Sweetwater County, Wyoming. Individual populations in Wyoming range from less than 10 to nearly 40,000 individuals. The state population is currently estimated at 56,000-73,500 plants in a total area of less than 100 acres. *C. ownbeyi* typically occurs in sparsely vegetated openings within a matrix of denser sagebrush grasslands. Nearly all populations in Wyoming are found on exposures of whitish to reddish limey-slate fragments derived from the Eocene Green River Formation. Populations may be found on ridgetops, saddles, steep talus slopes, and occasionally along semi-disturbed roadsides. Although most populations are not threatened at present, some sites could be negatively impacted by heavy recreational use by off-road vehicles or by weed control programs. Five populations are found on BLM lands in Wyoming, of which 2 are currently managed within an ACEC. Surveys in 1998 found *C. ownbeyi* to be more widespread and abundant in Wyoming than previously recognized. The habitat and

management requirements of this species still need to be considered by the BLM during planning to ensure that *C. ownbeyi* remains unthreatened.

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Appendix A.

Element Occurrence Records and Population Maps

for *Cirsium ownbeyi*

Appendix B.

Demographic Monitoring Data for *Cirsium ownbeyi*

Transect Locations:

Transect # 1

County: Sweetwater.
Occurrence: # 003.
Legal Description: T15N R107W S28 SE4 of NE4 of SE4.
Orientation: 238° WSW. (30 meters).
USGS Quad: Sugarloaf Basin.
Directions: The origin of the transect is located on the side of a small washlet about 20 paces from the rim of the knoll and runs parallel to the county road for 30 meters. Both the origin and end point are marked by orange-tipped re-bar and a small pile of stones.
Habitat: Community of stunted *Chrysothamnus viscidiflorus, Leptodactylon caespitosum,* and *Elymus trachycaulus* on white shale clay covered by flakes of bleached white, gray, or light brown slate chips.

Transect # 2

County: Sweetwater.
Occurrence: # 003.
Legal Description: T15N R107W S28 SE4 of NE4 of SE4.
Orientation: 226° SW. (20 meters).
USGS Quad: Sugarloaf Basin.
Directions: In same general location as Transect # 1, but located farther south. Transect parallels the straight section of the county road and is 7 paces from the rim. The origin of the transect is at the NE end of the line.
Habitat: Community of stunted *Chrysothamnus viscidiflorus* and *Ribes cereum* on white shale clay covered by flakes of bleached white, gray, or light brown slate chips. Less *Leptodactylon caespitosum* than at site 1.
Comments: Population ends after 20 meters.

Transect # 3

County: Sweetwater.
Occurrence: # 007.
Legal Description: T13N R106W S2 SE4.
Orientation: 255° W. (20 meters).
USGS Quad: Big Ridge.
Directions: Transect is parallel to the north side of the two-track road heading from the main county road past the water tank to the fourth semi-barren patch on the east-west trending slope. The transect originates at the east end near the middle part of the blow-out.

Habitat: Gentle, west-dipping slopes of semi-barren deposits of tan clay soil covered by small, bleached limey-slate fragments in opening within matrix of *Artemisia tridentata/Purshia tridentata* grassland.

Comments: Population larger than Sites 1 and 2.

Sampling Method: Three permanent 20 to 30 x 1 meter belt transects were established following the protocol of Lesica (1987). Starting points were marked by re-bar and low rock piles. For each transect, 20 or 30 1 x 1 meter plots were framed by meter sticks and read from the left side of the baseline tape. In each plot, data were collected on percent vegetative cover and number of individual plants in each of four age/size classes: Seedlings (non-flowering rosettes with 2-4 leaves all smaller than 3 inches in diameter), Vegetative (non-flowering rosettes usually with 5 or more basal leaves all of which are larger than 3 inches, and no erect stems), Reproductive (flowering or fruiting plants with at least 1 erect stem), and Dead (dead plants of any size class). Numbers of flowering and fruiting heads and stems were recorded for all reproductive plants and the relative position of each was recorded on a mapped grid.

Summary of Results: All three transects have a mix of size and age classes, suggesting that reproduction is taking place. Total density ranges from 1.2-3.9 plants per square meter, with higher densities observed at higher elevation sites. Seedling density varies from 0.4-1.2 plants per square meter, while vegetative rosettes range from 0.3-1.8 plants per square meter. Reproductive plants range from 0.3-1.0 plants per square meter. Because this is the first year of sampling, no estimates of population trend can be made.

Recommendations: Plots of 1 square meter are a good size to quickly monitor density of *C. ownbeyi* populations. These plots should be re-measured on an annual or biennial until a trend is established, at which time monitoring could be less frequent. Establishment of additional transects would be desirable.

Cirsium ownbeyi
Transect # 1 Census Data

Date: 4 July 1998.
Surveyor: Walter Fertig

Plot #	Total #	# Seedlings	# Vegetative	# Reprod.	# Dead	% Veg Cov
1	2	0	1	1	0	25 %
2	1	0	0	1	0	<5 %
3	0	0	0	0	0	20 %
4	0	0	0	0	0	25 %
5	1	1	0	0	0	<3 %
6	0	0	0	0	0	5 %
7	1	1	0	0	0	15 %
8	0	0	0	0	0	5-10 %
9	0	0	0	0	0	60 %
10	1	1	0	0	0	3-5 %
11	0	0	0	0	0	30 %
12	1	1	0	0	0	10 %
13	2	1	0	1	0	3 %
14	3	1	1	1	0	5-10 %
15	2	0	2	0	0	3 %
16	0	0	0	0	0	<3 %
17	1	0	1	0	0	10-15 %
18	0	0	0	0	0	5 %
19	0	0	0	0	0	3-5 %
20	0	0	0	0	0	3 %
21	0	0	0	0	0	10 %
22	1	0	0	0	1	5-10 %
23	3	1	1	1	0	5-10 %
24	9	2	5	2	0	20 %
25	3	1	0	2	0	5-10 %
26	2	0	2	0	0	20 %
27	2	1	0	1	0	10 %
28	1	1	0	0	0	20 %
29	0	0	0	0	0	15 %
30	1	0	1	0	0	25 %
TOTAL	**37**	**12**	**14**	**10**	**1**	**Ave 13%**

Seedlings per square meter: 0.4
Vegetative rosettes per square meter: 0.47
Reproductive plants per square meter: 0.33
Total # of plants per square meter: 1.2

Cirsium ownbeyi
Transect # 2 Census Data

Date: 4 July 1998.
Surveyor: Walter Fertig

Plot #	Total #	# Seedlings	# Vegetative	# Reprod.	# Dead	% Veg Cov
1	1	0	0	1	0	5-10 %
2	5	3	1	1	0	25 %
3	2	1	0	1	0	5 %
4	1	0	0	1	0	3-5 %
5	1	1	0	0	0	3 %
6	0	0	0	0	0	<3 %
7	4	3	0	1	0	5-10 %
8	3	1	1	1	0	10 %
9	1	0	0	1	0	30 %
10	0	0	0	0	0	40 %
11	0	0	0	0	0	10 %
12	3	0	0	3	0	5 %
13	0	0	0	0	0	5 %
14	3	0	3	0	0	5-10 %
15	2	0	1	1	0	25 %
16	2	1	0	1	0	5 %
17	1	0	0	1	0	20 %
18	2	0	0	2	0	25 %
19	3	0	0	3	0	45 %
20	2	0	0	2	0	3 %
TOTAL	**36**	**10**	**6**	**20**	**0**	**Ave 14.3%**

Seedlings per square meter: 0.5
Vegetative rosettes per square meter: 0.3
Reproductive plants per square meter: 1.0
Total # of plants per square meter: 1.8

Cirsium ownbeyi
Transect # 3 Census Data

Date: 4 July 1998.
Surveyor: Walter Fertig

Plot #	Total #	# Seedlings	# Vegetative	# Reprod.	# Dead	% Veg Cov
1	9	1	6	2	0	30 %
2	9	3	4	2	0	15-20 %
3	6	2	1	3	0	5-10 %
4	2	1	1	0	0	3 %
5	2	1	0	1	0	<3 %
6	3	2	1	0	0	3-5 %
7	9	1	8	0	0	40 %
8	4	3	1	0	0	3-5 %
9	5	2	2	1	0	5 %
10	5	2	3	0	0	25 %
11	2	0	0	2	0	<3 %
12	6	1	2	3	0	5 %
13	2	2	0	0	0	5-10 %
14	0	0	0	0	0	15-20 %
15	3	1	2	0	0	35 %
16	1	0	1	0	0	15 %
17	1	0	1	0	0	30 %
18	3	0	0	2	1	15-20 %
19	4	1	2	1	0	25-30 %
20	3	0	2	1	0	35-40 %
TOTAL	**79**	**23**	**37**	**18**	**1**	**Ave 16.5%**

Seedlings per square meter: 1.15
Vegetative rosettes per square meter: 1.85
Reproductive plants per square meter: 0.9
Total # of plants per square meter: 3.95