

Status Report on  
*Lesquerella carinata* var. *carinata*  
in Northwest Wyoming

Prepared for Bridger-Teton National Forest

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## I. INTRODUCTION

*Lesquerella carinata* (Keeled bladderpod) was first recognized as a distinct species by Rollins (1950) based on the study of five herbarium specimens from a small area of eastern Idaho. During the next three decades, 4-6 additional populations were discovered in northwestern Wyoming (Rollins and Shaw 1973) and southwestern Montana (Lackschewitz 1976; Schassberger 1991). Due to its small range and low number of populations, *L. carinata* was proposed for listing as Threatened under the Endangered Species Act in the late 1970s (Henderson et al. 1977). Subsequent surveys in the Lost River and Lemhi ranges of east-central Idaho lead to the discovery of nearly two dozen large populations of *L. carinata* (Henderson et al. 1977, 1979; Henderson 1978), prompting the US Fish and Wildlife Service (USFWS) to eventually drop this species as a candidate for listing (US Fish and Wildlife Service 1985).

Although considered secure in Idaho, *Lesquerella carinata* is extremely uncommon elsewhere in its range. As recently as 1996, this species was known from only 2 extant occurrences in Wyoming (Marriott 1990), and 3-4 locations in Montana (Schassberger 1991). Concerns over the long-term survival of this species in Wyoming and Montana prompted the Wyoming Field Office of USFWS to propose upgrading the status of *L. carinata* from Category 3C to Category 2 (C2) candidate status in 1991. This proposal was accepted in the revised 1993 candidate list, despite the previous recommendations of Idaho botanists (US Fish and Wildlife Service 1993).

When *Lesquerella carinata* was listed as a C2 candidate in 1993, it was known from a single historical report on Bridger-Teton National Forest (NF). Although not listed as Sensitive, Bridger-Teton NF officials were interested in determining its status and possible management needs on the Forest. In 1995, Bridger-Teton NF contracted with the Wyoming Natural Diversity Database (WYNDD) on a cost-share basis to conduct field surveys and evaluate the status of this species on Forest Service lands. The objective of this report is to summarize existing data on the biology, distribution, habitat, population size, and potential threats of *L. carinata* to be used in determining its conservation status and potential management needs.

## II. METHODS

Information on the habitat and distribution of *Lesquerella carinata* was obtained from secondary sources, including WYNDD files and computer databases, specimens from the Rocky Mountain Herbarium (RM), 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 by the author in mid June 1996 (survey routes and collection sites are indicated in Appendix C). Data on biology, habitat, population size, and management needs were collected using WYNDD plant survey forms (Appendix B). Population locations were mapped in the field on 7.5 minute USGS topographic maps. If population sizes were sufficiently large, voucher specimens were collected for deposit at the RM and the BTNF herbarium in Jackson. Color slides were taken of *Lesquerella carinata* plants and their habitats

at each site. Information gathered in the field was entered into the computerized Element Occurrence database of WYNDD.

### III. SPECIES INFORMATION

#### A. CLASSIFICATION

1. SCIENTIFIC NAME: *Lesquerella carinata* Rollins var. *carinata* (Rollins 1950; 1993). Type specimen: USA, Idaho, Lemhi County, dry hill, Birch Creek, Range 29 East, Township 11 North, Davis 3801 (GH).
2. SYNONYMS: None.
3. COMMON NAMES: Keeled bladderpod.
4. FAMILY: Brassicaceae or Cruciferae (mustard family).
5. SIZE OF GENUS: The genus *Lesquerella* contains about 95 species, mostly restricted to North America (Rollins 1993). Ten species and 3 varieties are recognized in Wyoming (Dorn 1992).
6. PHYLOGENETIC RELATIONSHIPS: *Lesquerella carinata* appears to be most closely related to *L. paysonii*, another localized endemic of western Wyoming and eastern Idaho. Both species are atypical within the genus in having siliques that are strongly compressed at right angles to the partition. Payson (1922) used this feature to define the section *Enantiocarpa*, in which he placed three taxa from Texas, Mexico, and Venezuela (*L. carinata* and *L. paysonii* had not yet been discovered when Payson wrote his monograph). Rollins (1950) questioned the merit of including *L. carinata* and *L. paysonii* in section *Enantiocarpa*, noting the strong similarities in growth habit, pubescence, leaf shape, and flower morphology between these new species and the *Lesquerella wardii*-*L. occidentalis* group. Additional study has shown that the species in this latter group show a progression from unflattened to clearly compressed fruits, with *L. carinata* and *L. paysonii* merely representing extremes at one end of the series (Rollins and Shaw 1973).

In 1990, voucher specimens of *L. carinata* from Montana were sent to Reed Rollins for confirmation (Schassberger 1991). Rollins observed several consistent morphological and habitat differences separating the Montana material from that of Idaho and Wyoming. In 1993, he described the Montana plants as variety *languida*, which differs from the typical variety (var. *carinata*) in having styles over 4 mm long, 2-3 (4) ovules per locule, and elongate and lax fruiting stalks (Rollins 1993). As a result of this taxonomic revision, *L. carinata* var. *carinata* is no longer

recognized as occurring in Montana.

## B. PRESENT LEGAL OR OTHER FORMAL STATUS

### 1. NATIONAL:

- a. LEGAL STATUS: *Lesquerella carinata* was formerly a C2 candidate for listing under the Endangered Species Act (US Fish and Wildlife Service 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). As a result, *L. carinata* currently has no legal status.
- b. HERITAGE RANK: *Lesquerella carinata* is ranked G3G4 in The Nature Conservancy's Natural Heritage network system. This rank indicates that the full species is apparently secure (G4), but quite restricted in range (G3). Variety *carinata* is ranked T3, indicating that this taxon is rare or local throughout its range, or found in a restricted geographic area (usually with 21-100 extant populations).

### 2. STATE:

#### a. WYOMING

- i. LEGAL STATUS: None.
- ii. HERITAGE RANK: *L. carinata* var. *carinata* is ranked S1, indicating that this taxon is critically imperiled because of extreme rarity in the state (5 or fewer occurrences, or very few remaining individuals), or because of factors of its biology making it vulnerable to extinction (Fertig 1997 a).

#### b. IDAHO

- i. LEGAL STATUS: None.
- ii. HERITAGE RANK: *Lesquerella carinata* is no longer tracked by the Idaho Conservation Data Center (1994) and is not currently ranked.

## C. DESCRIPTION

1. GENERAL NON-TECHNICAL DESCRIPTION: Keeled bladderpod is a densely pubescent perennial herb with decumbent stems to 15 cm long (Figures 1-2). The stem and basal leaves are silvery-pubescent and spoon-shaped. The 4-petaled flowers are yellow, 7.5-10 mm long, and arranged in a compact inflorescence. The pubescent fruits are oval, 5-9 mm long, flattened, and strongly keeled along the margins and partition, making them appear diamond-shaped in cross-section (Rollins 1950, 1993; Rollins and Shaw 1973; Marriott 1990; Fertig et al. 1994).
2. TECHNICAL DESCRIPTION: Short-lived perennial; densely pubescent throughout; trichomes sessile or on a short-stalk, finely granular, the rays numerous, distinct or slightly fused toward their bases, forked and sometimes bifurcate; stems 0.5-1.5 dm long, decumbent and usually unbranched, arising from a simple caudex; basal leaves 1.5-3 (4) cm long, 5-15 mm wide, the blades elliptic to broadly obovate or round, narrowing abruptly to the slender petiole; cauline leaves few, 0.5-1.5 cm long, 2-5 mm wide, oblanceolate to obovate, sessile or on a narrowed base; inflorescences compact, the buds ellipsoid; sepals 4-6.5 mm long, oblong to broadly elliptic, boat-shaped, the lateral saccate; petals yellow, 7.5-10 mm long, 3-4 mm wide, spathulate; filaments slender, not dilated; paired stamens 5.5-7 mm long, single stamens 5-6 mm long; glandular tissue pentagonal around the single stamens and subtending the paired but absent between the latter; infructescences loose and elongated, often secund; pedicels 4-10 mm long, straight to loosely sigmoid, ascending or divaricately spreading; siliques 5-9 mm long, sessile to substipitate, elliptic and strongly obcompressed, the valves sharply keeled, pubescent on the exterior and interior; septum entire, the funicles attached 1/3 to 1/2 their lengths; styles 2-4.5 mm long, slender, the stigmas capitate; ovules 4-7 per locule; seeds 2-2.5 mm long, suborbicular or oblong, only slightly flattened, reddish-brown, neither margined nor winged; cotyledons accumbent, as long as or shorter than the radicle (Rollins and Shaw 1973).
3. LOCAL FIELD CHARACTERISTICS: *Lesquerella carinata* var. *carinata* can be recognized by its decumbent growth form, basal cluster of silvery-gray, spoon-shaped to elliptic leaf blades, and flattened fruits with strongly keeled faces and margins that appear diamond-shaped in cross view (Fertig et al. 1994). This species can be very difficult to observe in

Figure 1. Line drawing of *Lesquerella carinata* var. *carinata*. Illustration by W. Fertig (Fertig et al. 1994).

the field due to its small size, low stature, and gray-brown color that blends in with the surrounding substrate. Mature fruits are needed to reliably distinguish *L. carinata* from *L. paysonii*.

4. SIMILAR SPECIES: *Lesquerella paysonii* has flattened fruits with rounded (non-keeled) margins and faces. *L. fremontii* has recurved fruit stalks and smaller flowers and styles. Other *Lesquerella* species in Wyoming differ in having inflated fruits. *Physaria* species can be distinguished by their two-parted, balloon-like fruits, more rounded leaf blades, and typically more robust size (Dorn 1992; Fertig et al. 1994).

#### D. GEOGRAPHICAL DISTRIBUTION

1. RANGE: *Lesquerella carinata* var. *carinata* is a regional endemic of east-central Idaho (Butte, Clark, Custer, and Lemhi counties), and northwestern Wyoming (Teton County) (Henderson et al. 1977; Fertig et al. 1994). In Wyoming, it is known only from the Jackson Hole valley and the adjacent foothills of the Gros Ventre and Teton ranges (Figure 3).

All known populations of *Lesquerella carinata* from Montana are now considered to belong to variety *languida* (Rollins 1993; Heidel 1996).

2. EXTANT SITES: Prior to 1996, *Lesquerella carinata* var. *carinata* was known from only two extant locations in Wyoming, both in Grand Teton National Park (Marriott 1990). 1996 surveys on Bridger-Teton NF, the National Elk Refuge, and Grand Teton National Park resulted in the discovery of three new populations and the relocation of one known site. Surveys in Idaho during the past two decades have resulted in the discovery of over 24 extant populations (Henderson et al. 1977, 1979; Henderson 1978).

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

3. HISTORICAL SITES: Two historical records of *Lesquerella carinata* var. *carinata* are known from the west slope of the Teton Range near South Teton Canyon and Teton Pass (Rollins and Shaw 1973; Markow and

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Figure 2 (page 11). Photograph of *Lesquerella carinata* var. *carinata* showing prominently keeled fruits. This plant is found on whitish sandy-clay soils with a surface layer of limey sandstone gravel and cryptogam crusts on the slopes below Curtis Canyon Overlook (EO # 005). WYNDD photograph by W. Fertig, 16 June 1996.



Figure 3. Distribution of *Lesquerella carinata* var. *carinata* in Wyoming.

Table 1.

Location Information for Known Populations of  
*Lesquerella carinata* var. *carinata* in Wyoming

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Occurrence # 001.

County: Teton.

Legal Description: T42N R115W S1 (W2 & NE4); S2 (E2).

Latitude: 43° 37' 53" North (centrum).

Longitude: 110° 36' 00" West (centrum).

Elevation: 6800-7100 ft (2070-2165 m).

USGS 7.5' Quad: Shadow Mountain.

Location: Jackson Hole: hill east of Kelly Warm Springs and north of the Gros Ventre River, ca 1 mile north-northeast of Kelly.

Occurrence # 002.

County: Teton.

Legal Description: T43N R117W S4 or S5 (approximate).

Latitude: 43° 43' 10" North (approximate).

Longitude: 110° 54' 05" West (approximate).

Elevation: 8200 ft (2500 m).

USGS 7.5' Quad: Mount Bannon.

Location: Teton Range: southwest side of South Teton Canyon at top of Lower Devils Staircase, ca 16 miles east of Driggs, Idaho.

Occurrence # 003

County: Teton.

Legal Description: T41N R118W S24 (approximate).

Latitude: 43° 29' 48" North (approximate).

Longitude: 110° 57' 14" West (approximate).

Elevation: 8400 ft (2560 m).

USGS 7.5' Quad: Teton Pass.

Location: Teton Range: Teton Pass.

Occurrence # 004

County: Teton.

Legal Description: T42N R115W S5 (W2); S6 (E2)

Latitude: 43° 38' 05" North (centrum).

Longitude: 110° 41' 35" West (centrum).

Elevation: 6800-7650 ft (2070-2330 m).

USGS 7.5' Quad: Moose.

Table 1 (continued)

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Location: Jackson Hole: south end of Blacktail Butte, ca 1.25 miles east of US Highway 26/89/187, ca 1.5 air miles south-southeast of Moose Junction.

Occurrence # 005

County: Teton.

Legal Description: T41N R115W S8 (S2 of SE4 of SE4); S9 (SW4 of SW4); S16 (NW4 of NW4); S17 (SE4 of SE4).

Latitude: 43° 31' 20" North (centrum).

Longitude: 110° 39' 40" West (centrum).

Elevation: 6600-6800 ft (2010-2070 m).

USGS 7.5' Quad: Gros Ventre Junction.

Location: Jackson Hole: ridge system on north and south side of Curtis Canyon below Curtis Canyon Overlook, just east of USFS Road 30440, ca 5 air miles northeast of Jackson.

Occurrence # 006

County: Teton.

Legal Description: T41N R116W S13 (S2 of SW4); S23 (NE4 of NE4); S24 (NW4 of NW4).

Latitude: 43° 30' 34" North (centrum).

Longitude: 110° 43' 00" West (centrum).

Elevation: 6500-6775 ft (1980-2065 m).

USGS 7.5' Quad: Gros Ventre Junction.

Location: Jackson Hole: Miller's Butte near summit of saddle between north and south summits and extending to north end of Butte, ca 2 air miles north-northeast of Jackson.

Occurrence # 007

County: Teton.

Legal Description: T42N R115W S22 (W2 of NE4, N2 of SW4, & NW4) S26 (N2 of NW4 of NW4); S27 (SE4 of NW4 & S2 of NW4 of NE4); S35 (E2 of NE4); S36 (NW4).

Latitude: 43° 35' 30" North (centrum).

Longitude: 110° 37' 55" West (centrum).

Elevation: 6800-7500 ft (2070-2290 m).

USGS 7.5' Quad: Gros Ventre Junction and Blue Miner Lake.

Location: Jackson Hole/Western foothills Gros Ventre Range: ridge system on south side of Gros Ventre River and on north side of Long Hollow, ca 4 air miles south-southeast of Blacktail Butte and ca 5 air miles southwest of Lower Slide Lake. Also on same ridge system on the west side of Sheep Mountain, ca 4.5 miles south of Kelly.

Fertig 1993). Neither population was relocated during recent floristic studies in the Teton Range (Markow 1994) nor during surveys in 1996 for this project.

4. SITES WHERE PRESENT STATUS NOT KNOWN: The Teton Pass population of *Lesquerella carinata* var. *carinata* has not been observed since first being reported by Ripley and Barneby in the 1940s (Rollins and Shaw 1973). This location also contains an extensive population of *L. paysonii*, and is the only site in Wyoming where both species are suspected to co-occur (Fertig 1997 b). In 1995, Stuart Markow of Targhee National Forest resurveyed this area and confirmed the presence of *L. paysonii*, but failed to locate any individuals of *L. carinata*. This area was revisited by Fertig in mid-June 1996, but all of the *Lesquerella* plants at the site were in flowering condition and could not be positively determined to species (Fertig 1997 b). Additional surveys are needed at this site to verify if *L. carinata* is still present.
5. UNVERIFIED/UNDOCUMENTED REPORTS: A flowering specimen of *Lesquerella* collected by Robert Lichvar from the vicinity of Lower Slide Lake in the Gros Ventre River valley has been attributed to *L. paysonii*, but could also represent *L. carinata* var. *carinata* (Fertig 1997 b). This area needs to be resurveyed when the plants are in fruit to confirm which taxon is present.
6. AREAS SURVEYED BUT SPECIES NOT LOCATED: No populations of *Lesquerella carinata* var. *carinata* have been located during recent surveys of potential habitat in the Gros Ventre and Mount Leidy Highlands areas (Hartman 1996), the west slope of the Teton Range (Markow 1994), nor the Buffalo Fork area of Grand Teton National Park (Marriott 1990).
7. AREAS OF UNSURVEYED POTENTIAL HABITAT: Additional suitable habitat for *Lesquerella carinata* var. *carinata* may occur along the low calcareous-sandstone ridges surrounding Jackson Hole, including East and West Gros Ventre buttes west of Jackson, the foothills of the Gros Ventre Range between Snow King Mountain and Hoback Junction, and the ridges northwest of Peterson Springs on the National Elk Refuge.

## E. HABITAT

1. ASSOCIATED VEGETATION: In Wyoming, *Lesquerella carinata* var. *carinata* is found primarily on sparsely vegetated outcrops of fine, pale whitish clay-sandy soil with a surface layer of grayish calcareous gravel

and rubble on slopes and ridgecrests (Figure 4). These sites are often occupied by communities of scattered cushion plants and bunchgrasses, including spike fescue (*Leucopoa kingii*), bluebunch wheatgrass (*Elymus spicatus*), and Sandberg bluegrass (*Poa secunda*) (Figure 5). Mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*), bitterbrush (*Purshia tridentata*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and other shrubs may also be present in these communities, but usually shrubs are conspicuously absent from microsites inhabited by *L. carinata*. Total vegetative cover in these habitats ranges from 5-40%, with the average being 20%.

## 2. FREQUENTLY ASSOCIATED SPECIES:

*Antennaria microphylla* (Small-leaved pussytoes)  
*Arenaria nuttallii* [*Minuartia nuttallii*] (Nuttall's sandwort)  
*Artemisia cana* (Silver sagebrush)  
*Artemisia frigida* (Fringed sagebrush)  
*Artemisia tridentata* var. *vaseyana* (Mountain big sagebrush)  
*Astragalus terminalis* (Railhead milkvetch)  
*Castilleja angustifolia* (Narrowleaf paintbrush)  
*Castilleja flava* (Yellow paintbrush)  
*Chaenactis douglasii* (Douglas' dustymaiden)  
*Chrysothamnus nauseosus* (Rubber rabbitbrush)  
*Chrysothamnus viscidiflorus* (Green rabbitbrush)  
*Comandra umbellata* (Pale bastard toadflax)  
*Elymus spicatus* (Bluebunch wheatgrass)  
*Eriogonum ovalifolium* (Cushion buckwheat)  
*Hackelia patens* (Pale stickseed)  
*Haplopappus acaulis* (Stemless goldenweed)  
*Ipomopsis spicata* (Spike gilia)  
*Koeleria macrantha* (Junegrass)  
*Leptodactylon pungens* (Sharp prickly-phlox)  
*Leucopoa kingii* (Spike fescue)  
*Linum lewisii* (Blue flax)  
*Oryzopsis hymenoides* (Indian ricegrass)  
*Penstemon procerus* (Small-flower beardtongue)  
*Phacelia hastata* (Silverleaf phacelia)  
*Phlox hoodii* (Hood's phlox)  
*Poa secunda* (Sandberg bluegrass)

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Figure 4 (page 17). Habitat of *Lesquerella carinata* var. *carinata* on east and southeast-facing slopes of ridge system south of the Gros Ventre River on the National Elk Refuge (EO # 007). This species is found predominantly on the whitish-gray "stripes" of sandy limestone gravel with little to no cover of sagebrush. WYNDD photograph by W. Fertig, 17 June 1996.



*Purshia tridentata* (Bitterbrush)  
*Senecio canus* (Woolly groundsel)  
*Stipa comata* (Needle-and-thread grass)  
*Tetradymia canescens* (Gray horsebrush)  
*Townsendia nuttallii* (Nuttall's Easter-daisy)

3. TOPOGRAPHY: Populations of *Lesquerella carinata* var. *carinata* in Wyoming typically occur on gentle to steep (0-30%) mid to upper slopes and ridgetops. Colonies may occur on all aspects, but are most common on west and south-facing slopes.

Wyoming populations occur at elevations of 6800-8400 feet (2070-2560 m). The species shows a much broader elevation range in Idaho, where it may be found from 6000-10,000 feet (Henderson et al. 1979). In Wyoming, *L. carinata* var. *carinata* is typically replaced by *L. paysonii* at both higher and lower elevations.

4. SOIL RELATIONSHIPS: *Lesquerella carinata* var. *carinata* populations are found primarily on pale, whitish-gray soils derived from calcareous or sedimentary substrates. Soils are usually a mixture of fine textured clays and coarser sand with a surface layer of coarse limey-sandstone or shale chips, flakes, and gravel. The cover of surface rock may be as high as 40%. Soils may also have a high cover of cryptogam crusts. At many locations, soils show evidence of disturbance from snowmelt and gopher activity.
5. REGIONAL CLIMATE: In Wyoming, the average annual precipitation within the range of *Lesquerella carinata* var. *carinata* varies from 15.2 inches (386 mm) in Jackson Hole to 60 inches (1524 mm) on the west slope of the Teton Range (Martner 1986). Over most of this area, peak precipitation occurs from May-June and December-January. Mean annual temperature ranges from less than 32° F (0° C) in the high mountains to 38° F (3.3° C) in Jackson Hole. Mean maximum and minimum temperatures in January in the plant's range are 24 to 26° F (-4.4 to -3.3° C) and -2 to 2° F (-18.8 to -16.6° C). In July, mean maximum

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Figure 5 (page 19). Habitat of *Lesquerella carinata* var. *carinata* on slopes at the mouth of Curtis Canyon on the east rim of Jackson Hole (EO # 005). Plants occur in patches among grey-brown limey sandstone gravel on slopes dominated by bunchgrasses (especially *Leucopoa kingii*, *Elymus spicatus*, and *Poa secunda*) and scattered low shrubs. Sagebrush is notably absent at this and most other sites inhabited by this species. WYNDD photograph by W. Fertig, 16 June 1996.



and minimum temperatures are 74 to 78° F (23.3 to 25.5° C) and 36 to 40° F (2.2 to 4.4° C) (Martner 1986).

6. LOCAL MICROCLIMATE: *Lesquerella carinata* var. *carinata* occurs on upper slopes and ridgecrests where snow accumulation and moisture deposition are low. Microsites inhabited by this species may also be drier than surrounding areas due to reflection of sunlight and heat from the light colored soils. Low vegetative cover and exposure to winds may make slope habitats cooler than surrounding sites.

## F. POPULATION BIOLOGY AND DEMOGRAPHY

1. PHENOLOGY: Flower and fruit production may occur from late May to July. Flowering appears to occur earlier on exposed ridgecrests and later on more sheltered slopes.
2. POPULATION SIZE AND CONDITION: There are currently 5 extant occurrences of *Lesquerella carinata* var. *carinata* in Wyoming. Individual populations range in size from 1500-30,000 plants and cover 25-200 acres. The total Wyoming population is currently estimated at 50,000-60,000 plants in an area of 445 acres.

Individual plants are often densely clustered, although clusters themselves may be widely scattered and patchy. Densities may be as high as 20-29 plants per square meter in favorable microsites. Populations observed in 1996 were found to contain a wide range of age and size classes, suggesting that reproduction is successfully taking place. At one site reproductive individuals were observed to outnumber vegetative rosettes and seedlings by a ratio of 4:1. Demographic data from extant occurrences in Wyoming are summarized in Table 2.

Long-term quantitative trend data are not available for Wyoming populations of *L. carinata*. Short-term studies at two sites in Grand Teton National Park suggest that populations are currently stable (Marriott 1990).

3. REPRODUCTIVE BIOLOGY:
  - a. TYPE OF REPRODUCTION: *Lesquerella carinata* var. *carinata* reproduces only by seed. Individuals are capable of producing as many as 25 fruits per plant, with each fruit containing 6-8 seeds.

Table 2. Demographic Information for Extant Populations of *Lesquerella carinata* var. *carinata* in Wyoming.

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Occurrence # 001.

Area: 25 acres.

Number and Age of Plants: Population estimated at several thousand plants in 1990 (Marriott (1990)). Approximately 10% of all plants in flower and 75% with mature fruit on June 10.

Density: Not reported.

Population Trend: Population has been known since 1971.

Occurrence # 004.

Area: 200 acres.

Number and Age of Plants: Population in west half of occurrence estimated at 4000-6000 individuals by Fertig in 1996 survey. Plants in flower and fruit on June 16.

Density: Individuals often densely clustered, with as many as 21 plants per square meter. Clusters themselves may be widely distributed and the overall distribution is patchy.

Population Trend: Population first surveyed by Marriott (1990), who estimated the total population as "several thousand".

Occurrence # 005.

Area: 30 acres.

Number and Age of Plants: Total population estimated at 20,000 plants by Fertig in 1996. Plants in flower and fruit on June 16. Vegetative rosettes and seedlings observed to be locally abundant. Population divided into 3 main colonies.

Density: Locally abundant, but distribution patchy. Density may be as high as 22 plants per square meter in favorable microsites.

Population Trend: Population first discovered in 1996.

Occurrence # 006.

Area: 40 acres.

Number and Age of Plants: Total population estimated at 1500-2000 plants by Fertig in 1996. Plants in fruit and vegetative condition on June 17. Variety of age and size classes Present indicating good reproductive activity.

Density: Colonies may be locally dense, but are often widely scattered. Density may be as high as 29 plants per square meter in favorable microsites.

Population Trend: Population first discovered in 1996.

Occurrence # 007.

Area: 150 acres.

Number and Age of Plants: Total population estimated at 23000-30000 individuals in at least 7 large colonies. Plants observed in flower, fruit, and vegetative condition, with reproductive individuals outnumbering vegetative rosettes by 4:1.

Density: Plants exhibit a clumped distribution pattern, with individual clumps often widely scattered. Density as high as 20-24 plants per square meter in favorable microsites.

Population Trend: Population first discovered in 1996.

- b. POLLINATION BIOLOGY: Most species of *Lesquerella* are cross-pollinated by bees and flies (Rollins and Shaw 1973). The specific pollinator of *L. carinata* var. *carinata* is not known.
- c. SEED DISPERSAL AND BIOLOGY: Dispersal distances appear to be short for this and other low-growing species of *Lesquerella* (Fertig 1997 b). Demographic studies of var. *languida* suggest that local seedbanks are an important source of annual recruitment (Greenlee 1994).

## G. POPULATION ECOLOGY

1. GENERAL SUMMARY: Populations of *Lesquerella carinata* var. *carinata* in Wyoming usually have a clumped distribution pattern, with individual clumps often widely scattered and patchy. Densities may be locally high, especially in microsites with suitable habitat. Studies in Montana of var. *languida* suggest that population size and vigor may vary from season to season in response to moisture availability (Schassberger 1991; Greenlee 1994). Survival of large rosettes and reproductive individuals appears to be the critical link in the life cycle of var. *languida* (Greenlee 1994).
2. COMPETITION: *Lesquerella carinata* var. *carinata* is typically found in sites with low vegetative cover and little to no canopy. It does not appear to compete well in areas with dense or tall vegetation and is largely absent from shaded sites. Periodic disturbances, such as gopher activity or erosion from snowmelt, may be important in maintaining open habitats. Studies of var. *languida* in Montana suggest that competition from *Centaurea* spp. can have a negative short-term impact on the survival of seedling *Lesquerella* plants (Greenlee 1994).
3. HERBIVORY: There is little evidence of herbivory on this species by large ungulates or domestic livestock. Fruits and inflorescences have been observed to be grazed by insects or small rodents in the Jackson Hole area.
4. HYBRIDIZATION: There is no evidence of hybridization between this and other species of *Lesquerella*.

## H. LAND OWNERSHIP

1. US FOREST SERVICE
  - a. BRIDGER-TETON NATIONAL FOREST: Portions of 2 extant populations of *Lesquerella carinata* var. *carinata* (occurrence #s

005 and 007) are found on lands managed by Bridger-Teton NF. Both of these occurrences extend onto the National Elk Refuge. An historical population from Teton Pass occurs along the boundary of the Bridger-Teton and Targhee National Forests (occurrence # 003). All of the Bridger-Teton NF populations are found on lands managed for multiple use.

b. TARGHEE NATIONAL FOREST: Two historical populations (occurrence #s 002 and 003) are known or suspected from Targhee NF. The occurrence from Teton Pass (# 003) is located along the boundary of the Targhee and Bridger-Teton National Forests. None of the Targhee NF populations occur in areas managed for multiple use.

2. US FISH AND WILDLIFE SERVICE: Three extant occurrences of *L. carinata* var. *carinata* are found within the National Elk Refuge in Jackson Hole (#s 005, 006, and 007). Two of these (#s 005 and 007) also extend onto adjacent lands managed by Bridger-Teton NF. Occurrence #s 006 and 007 occur in areas of the Refuge that are closed to the public.

3. NATIONAL PARK SERVICE: Two extant populations (occurrence #s 001 and 004) are protected in Grand Teton National Park (Marriott 1990).

#### IV. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. POTENTIAL THREATS TO CURRENTLY KNOWN POPULATIONS: The restricted geographic range and narrow ecological amplitude of *Lesquerella carinata* var. *carinata* make this taxon vulnerable to large scale habitat degradation and loss. The following potential threats have been reported in the literature or were identified during 1996 surveys:

1. RECREATION: Soil compaction and erosion from hikers are a potential threat at several sites in Grand Teton National Park and Bridger-Teton NF. Occurrences at Kelly Warm Springs (# 001), Blacktail Butte (# 004), and Curtis Canyon (# 005) are in the vicinity of popular recreation areas, but the actual habitat utilized by *L. carinata* var. *carinata* appears to receive little direct use. The Teton Pass population (#003), however, occurs in an area that may receive high recreation use during the summer. Soil disturbance from off-road vehicles and widening of roads are also potential threats at some National Forest sites.
2. GRAZING: Although there is little evidence to suggest that livestock feed on *L. carinata*, grazing can potentially have a negative impact on this species due to associated trampling, soil erosion, and introduction of noxious weeds (Schassberger 1991; Greenlee 1994). In Wyoming, these

impacts appear to be relatively low at the present time due to the lack of livestock grazing at most known sites.

3. COMPETITION FROM EXOTIC PLANTS: Cheatgrass (*Bromus tectorum*) is becoming established and choking out other vegetation (including *L. carinata*) at one disturbed site on the Bridger-Teton NF (occurrence # 007). Seedling establishment in populations of var. *languida* in Montana has been found to be negatively affected by competition from knapweed (*Centaurea* spp.) (Greenlee 1994).
4. WILDLIFE: Trampling by wildlife may be a potential threat at certain sites in Grand Teton National Park and the National Elk Refuge. Mule deer appear to use *L. carinata* habitat on Blacktail Butte as a bedding area and could have a negative impact if their population density increases. Elk use of *L. carinata* habitat on the National Elk Refuge appears to be low during the spring and summer flowering period, but could become significant during the winter when these animals are more concentrated in the Jackson Hole area. Populations of *L. carinata* adjacent to compacted game trails appear to be less abundant than colonies in adjacent, undisturbed sites.
5. MINERAL DEVELOPMENT: Quarrying for limestone gravel is suspected to have lead to the extirpation of at least one population of *L. carinata* var. *languida* in Montana (Schassberger 1991). Although the threat of mining activity is low at currently known sites, some potential habitat of var. *carinata* in Wyoming could be at risk.
6. OTHER: Studies of related taxa of *Lesquerella* suggest that population size may fluctuate from year to year following patterns of moisture availability (Greenlee 1994; Fertig 1997 a). Long-term drought, coupled with other disturbances, could result in localized extinction of colonies of *L. carinata* var. *carinata*.

B. MANAGEMENT PRACTICES AND RESPONSE: No experimental data exist on the response of this taxon to most management actions.

C. CONSERVATION RECOMMENDATIONS:

1. RECOMMENDATIONS REGARDING PRESENT OR ANTICIPATED ACTIVITIES: All five extant occurrences of *Lesquerella carinata* var. *carinata* are found partly or wholly within special management areas. The existing land use plans for Grand Teton National Park and the National Elk Refuge place an emphasis on the protection and enhancement of habitat for wildlife. In most cases, these management goals are consistent with the needs of *L. carinata*. Any significant increases in the use of

*Lesquerella* habitat by game species, however, could have an impact on the plants through compaction or loss of soil and trampling. Recreation use of National Park and National Forest lands could also have inadvertent negative impacts, especially if trails, parking areas, or other associated developments are placed in *Lesquerella* habitat. Managers of lands occupied by this taxon should be made aware of its presence and management needs when land use plans are being developed.

2. AREAS RECOMMENDED FOR PROTECTION: Current management and levels of protection are probably adequate for colonies of *L. carinata* var. *carinata* on lands managed by Grand Teton National Park and the National Elk Refuge. Special area designation should be considered for the Curtis Canyon area (occurrence # 005) on the Bridger-Teton NF. This area receives high recreation use from hikers and climbers, but also provides habitat for several Forest Sensitive and rare species, including boreal draba (*Draba borealis*) and railhead milkvetch (*Astragalus terminalis*) (Fertig and Marriott 1993). Other populations on Bridger-Teton and Targhee NF can probably be adequately conserved through management actions rather than special area designation.

- D. STATUS RECOMMENDATIONS: *Lesquerella carinata* var. *carinata* was formerly listed as a Category 2 candidate by the USFWS, but was recently dropped following changes in the candidate listing process (US Fish and Wildlife Service 1996). Although locally abundant in Idaho, this species is uncommon in Wyoming and of management interest on the Bridger-Teton NF under general biodiversity regulations associated with the National Forest Management Act. While listing this taxon as Sensitive at the regional level is not appropriate, it may warrant Sensitive designation on the Bridger-Teton NF. Any change of status for *L. carinata* var. *carinata* should probably wait until revisions in the nationwide US Forest Service Sensitive plant policy are completed.
- E. SUMMARY: *Lesquerella carinata* var. *carinata* is a regional endemic of east-central Idaho and northwestern Wyoming. Rangewide, the species is known from about 30 extant populations, of which only five are found in Wyoming (all in the Jackson Hole/Teton Range area of Teton County). The total Wyoming population is currently estimated at 50,000-60,000 plants in an area of 445 acres. *L. carinata* var. *carinata* typically occurs on sparsely vegetated slopes and ridgetops on pale whitish clay-sandy soil with a surface layer of calcareous gravel and cryptogam crusts. These habitats are potentially threatened by trampling and soil erosion associated with recreation activity and grazing and by competition from exotic plants. All or part of all extant Wyoming occurrences are found on protected lands in Grand Teton National Park and the National Elk Refuge. Populations on Bridger-Teton and Targhee National Forests occur on lands managed for multiple use. This species was formerly listed as a category 2 candidate for listing under the Endangered Species Act, but does not currently

have any legal protection. Due to its limited range and narrow ecological amplitude, *L. carinata* var. *carinata* may warrant Sensitive status on Bridger-Teton NF.

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Appendix A.  
Element Occurrence Records  
and  
Population Maps  
for *Lesquerella carinata* var. *carinata*