

Status of  
*Lesquerella multiceps* (Western Bladderpod)  
and Status Update of  
*Lesquerella prostrata* (Prostrate Bladderpod)  
in Southwest Wyoming



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## ABSTRACT

*Lesquerella multiceps* (western bladderpod) was designated a sensitive species by the Bureau of Land Management (BLM) in Wyoming (2001, 2002) when it was known in Wyoming only from two historic records. The information on *L. multiceps* had previously been highlighted in a report on the status of local and regional endemic species in southwest Wyoming, prepared by Walter Fertig, Laura Welp and Stuart Markow (Fertig et al. 1998). Potential distribution models were subsequently developed for BLM sensitive species (Fertig and Thurston 2003) including this species. The objectives of this study were to relocate the historic collection site on BLM lands, to test potential distribution models, and to report on field results and all other available species status information.

The taxon was relocated in near the 1964 collection site on the Bear River Divide, where the model did not work at a small scale for identifying potential habitat. A second model was developed based on calcareous parent material and tested in 2004. It served to significantly expand the Bear River Divide population and locate a new population on Crawford Mountains.

Collections and photographs produced from this survey were later scrutinized in the herbarium. All survey material from southern Lincoln County was re-determined to be *Lesquerella prostrata* (prostrate bladderpod), a closely-related sensitive species. The historic specimen on which the original record was based is at Utah State University and is in flower, and though it is treated as *L. multiceps*, a determination cannot be made with complete certainty. The provisional interpretations drawn from this field study in southern Lincoln County are that *L. multiceps* is known in Wyoming only from one historic collection at montane elevations in the Snake River Range, and is not appropriate for consideration as a BLM sensitive species in Wyoming. The new survey data fills gaps in the distribution of *L. prostrata*.

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Cover photo: *Lesquerella prostrata* on Bear River Divide, by B. Heidel

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## INTRODUCTION

The primary purpose of this project was to survey for *Lesquerella multiceps* Maguire (western bladderpod) and determine its status. Prior to this study, *L. multiceps* was known from only known from two historical records in Wyoming, and was designated a sensitive species by the Bureau of Land Management in Wyoming in 2001. The information on *L. multiceps* had previously been highlighted in a report on the status of local and regional endemic species in southwest Wyoming, prepared by Walter Fertig, Laura Welp and Stuart Markow (Fertig et al. 1998). Potential distribution models were subsequently developed for BLM sensitive species (Fertig and Thurston 2003) including this species. In order to assess the conservation status of this taxon, the Bureau of Land Management contracted with the University of Wyoming - Wyoming Natural Diversity Database (WYNDD) to conduct field surveys, test the potential distribution models, and to report on field results and all other available species status information.

What is near or equivalent to be the historical collection site of *Lesquerella multiceps* on BLM lands in Wyoming was relocated and the numbers expanded. Collections and photographs produced from this survey were later scrutinized in the herbarium. All survey material from southern Lincoln County was re-determined to be *L. prostrata* (prostrate bladderpod), a closely-related sensitive species. The historic specimen on which the original record was based is at Utah State University and is in flower, and though it is treated as *L. multiceps*, a determination cannot be made with complete certainty (Michael Piep personal communication to B. Heidel 2005). Under the circumstances, WYNDD is provisionally recognizing *L. multiceps* as known in Wyoming only from one historic collection at montane elevations in the Snake River Range. By this interpretation, it is not appropriate for consideration as a BLM sensitive species in Wyoming. The new survey data fills gaps in the distribution of *L. prostrata*.

## METHODS

Prior to the field season, information on the known habitat and distribution of *Lesquerella multiceps* in Wyoming was reviewed, and information from adjoining states was checked. The most significant of these was a survey that was conducted in 2002 in the Bear Lake Mountains that resulted in a recommendation the species no longer be tracked as an Idaho species of concern (Mancuso 2003). Specimens were reviewed at the Rocky Mountain Herbarium (RM). A potential distribution model based on known distribution and negative distribution data was applied (Fertig and Thurston 2003), and the polygons of potential habitat were overlain on BLM-administered lands. The polygons of potential habitat spanned eight counties but survey was conducted only in Lincoln and Uinta counties as part of this project.

The polygons of potential habitat were based on imprecise historical collection records. Fruiting material provisionally identified as *Lesquerella multiceps* in the field was found in two areas of potential habitat that were four miles apart, but the historical collection could not be relocated in the section where it was originally collected. To extrapolate from the information at the places where it was found, two additional approaches were pursued to locate *Lesquerella multiceps* populations. Its association with *Physaria condensata*, another calciphile, was tested

unsuccessfully as a basis for finding new populations in 2003. Finally, an alternate habitat model based on calcareous bedrock was used for surveys of *Lesquerella multiceps* in Lincoln and Uinta counties in 2004. All WYNDD surveys were conducted June 27-29, 2003 and June 12-15, 2004. A total of 41 sections of potential habitat in nine U.S. Geological Survey quad (7.5') maps were surveyed for *Lesquerella multiceps* along ridgelines, outcrop slopes and knolls.

After the field season, collections and photograph vouchers were reviewed at the Rocky Mountain Herbarium using the literature. All collections and photographs were redetermined as *Lesquerella prostrata*, a closely-related sensitive species. This led to the consultation of Utah State University staff on the disposition of the original voucher specimen, represented by duplicate specimens. The response is that the specimens have been annotated and re-annotated between these two species, that the flowering stage of phenology is not suited for definitive determination, and that comparison with other specimens indicates that it is *L. multiceps* (discussed in further detail with the history of the taxon, and species description; Michael Piep personal communication to B. Heidel 2005).

## SPECIES INFORMATION

### Classification

Scientific Name: *Lesquerella multiceps* Maquire (Maquire 1942). Holotype: Cache County: Tony Grove Lake of Bear River Range, 4 Aug 1938, Maquire 16030 (UT).

Common Name: Western bladderpod

Family: Brassicaceae (mustard family)

Synonyms: None.

Phylogenetic Relationships: The genus *Lesquerella* contains about 95 species, mostly restricted to North America (Rollins 1993). Fourteen taxa (13 species and two varieties) are recognized in Wyoming by Dorn (2001), of which 11 are state or regional endemics.

History of the Taxon: *Lesquerella multiceps* was first collected by Charles Piper Smith in 1910 on Logan Peak in Cache County, Utah.

The first collection of *Lesquerella multiceps* in Wyoming was made by Edwin Payson and George Armstrong in 1923 on Ferry Peak (also called Sheep Mountain) in the Snake River Range northeast of Afton. A monograph of the *Lesquerella* genus had been written earlier by Payson (1922) and this specimen was originally identified by him as *Lesquerella utahensis* (Rollins 1973), following a polymorphic treatment. *Lesquerella multiceps* was first recognized as a discrete species in the revisionary treatment of Maquire (1942), who split out *L. multiceps* from *L. utahensis* and a suite of four other related taxa and annotated the Payson specimen.

The second reported collection of *Lesquerella multiceps* in Wyoming was made by Eugene H. Cronin in 1964 on the Bear River Divide, southwest of Kemmerer. The duplicate voucher specimens were deposited at Utah State University. All recent Bear River Divide surveys conducted for this project (2003-04) documented *Lesquerella prostrata* rather than *L. multiceps* (Heidel #). Michael Piep at Utah State University provided corroboration of the original determination of the Wyoming collection by comparing the material with specimens of both *L. multiceps* and *L. prostrata*. It was annotated as *L. prostrata* by Reed C. Rollins in 1970 and annotated as *L. multiceps* by Richard Shaw in 1989. Piep concluded that:

"...the collection is closer to *L. multiceps* than to *L. prostrata*. The leaf shape is somewhat intermediate (but then a number of collections from Utah of *L. multiceps* are the same), it lacks the usual purple tints in the upper 1/3 of the petals that many of the Utah and Idaho collections also have (but descriptions of the tinting also mention that it is not always present in all populations), and the beautiful stellate hairs are more like what would be found in *L. multiceps* based on what I could see and the descriptions. ...Unfortunately the collection was entirely in flower, so I have no fruit in which to look at which would give a much more definitive answer."

This information wasn't available until after the field season, but an interpretation is drawn that it was unlikely to overlook other species of *Lesquerella* on the Bear River Divide. Since it is vouchered by specimens in fruit, that key out to *L. prostrata*, all new occurrence information has been treated as *L. prostrata*. The original Cronin collection is incorporated in the Bear River Divide occurrence of *L. prostrata* noting this measure of uncertainty. It is also cross-referenced in manual files for *L. multiceps*.

As a result of this project, the historical collection on the Bear River Divide is provisionally treated as representing *Lesquerella prostrata*. Thus, *L. multiceps* is not known to occur on BLM-administered lands in Wyoming, and all of the additional field data gathered in this project applies to *L. prostrata*. The following pages of the report treat both species until the sections on survey results, including habitat and population characteristics, that address *L. prostrata*.

### Legal Status

*Lesquerella multiceps* is listed as sensitive by the Bureau of Land Management in Wyoming (USDI BLM 2001, 2002). It has no other legal protection at the federal or state level and has not previously been considered for listing under the Endangered Species Act.

The information provided in this report provides the basis for withdrawing sensitive species designation from *L. multiceps* in Wyoming because it is not known from BLM lands. This report also adds to the information base for *L. prostrata* in carrying out the goals of existing policies.

## Natural Heritage Rank

### Global:

NatureServe (formerly the heritage division of The Nature Conservancy) and the network of state natural heritage programs has assigned *Lesquerella multiceps* a rank of G3, indicating that it is “vulnerable” throughout its range.

### State:

*Lesquerella multiceps* was identified in the first list of rare and endangered species in Wyoming (Dorn 1977), and has been tracked as a Wyoming species of concern ever since. It was noted in the flora of Targhee National Forest (Markow and Fertig 1993). Its rank was changed from SH (historical in the state) to S1 (critically imperilled in the state) in 2003 after collections were made as part of this study (Keinath et al 2003).

The final results of this survey document that the historical collection in southern Lincoln County and the two extensive extant occurrences are in fact *L. prostrata*. In other words, it is known in Wyoming only from the 1923 collection record in the Snake River Range of northern Lincoln County, and its state rank of SH is reinstated. All field data collected updates the status of *L. prostrata*. The Wyoming occurrence represents the northern and eastern range extent of the species as found in the Snake River Range, an outlier from all other known occurrences, and if it is extant, it has a medium Wyoming contribution rank.

*Lesquerella multiceps* has its center of distribution in the Bear River Range of northern Rich and Cache counties, Utah and adjacent Bear Lake County, Idaho (Rollins 1973). It has not been tracked as a plant species of concern in Utah, where it is known from at least 31 specimens collected mainly in the Bear River Range (Franklin personal communication to Fertig 1995) with a state rank of S2. In Idaho, it also has a state rank of S2 as a result of survey made in the Bear River Range in 2002. Botanists determined that *Lesquerella multiceps* does not warrant special conservation concern by the Caribou-Targhee NF, nor by the Idaho Native Plant Society (Mancuso 2003). It appears to be common in the Idaho portion of the Bear River Range, and occupied habitats secure from any discernable large-scale or high-magnitude threats (Mancuso 2003).

Note: The state rank of *Lesquerella prostrata* warrants revision to S2 (imperiled in the state) based on the number of extant occurrences (eight), which includes at least three populations of over 1000 plants. It has a high Wyoming contribution rank.

## Description

*Lesquerella multiceps* is a low-growing, caespitose perennial herb 2-25 cm tall and densely pubescent with tiny star-like hairs imparting a grayish cast. The flowering stems are 0.3-2 (2.5) dm long, and are often multicipital (branched; more than one head). Leaf blades are elliptic to ovate, 2-4 cm long, and gradually narrowed to slender petioles. Flowers are small (5-10 mm long) and yellow. Fruits are 3.5-5 mm long, dry, globose, with appressed hairs and a prominent style. They are elevated on s-shaped pedicels 3-10 mm long, on fruiting stalks that are sprawling, elongated, and can be many-headed (Welsh 1993, Rollins 1993); (Figure 1).

*Lesquerella multiceps* flowers in late June- early July, and fruits are present in late July-August.

Figure 1. *Lesquerella multiceps* (scanned from xerox copy of Payson and Armstrong 3466)



#### Similar Species

*Lesquerella prostrata* has siliques that are at least slightly longer than wide, acutish at the apex, and densely pubescent with loose spreading trichomes. It also has leaf blades that are rhombic or deltoid in outline and abruptly narrowed to the petiole (more pronounced on leaves early in the season than later) and a less-divided caudex (Maquire 1942). Illustrations and photographs of *L. multiceps* are not available, but a xerox copy of the 1923 specimen is included for reference (Figure 1, above). All photographs included in this report otherwise represent *L. prostrata* as taken in the Bear River Divide population.

*L. alpina* var. *alpina* has narrow, linear leaves and elongate, non-globose fruits. *L. macrocarpa* has fruits on recurved pedicels. All other Wyoming species of *Lesquerella* have either flattened fruits or recurved pedicels (Rollins 1993, Dorn 2001).

*Lesquerella multiceps* is in a group of species having general affinities (Rollins and Shaw 1973) that include all members of the "*utahensis*" group of Payson (1922). Of the latter, Payson wrote:

"The group as a whole is characterized by the dense rosettes, the suborbicular basal leaves, the short stems, and the pubescent, globose or obcompressed pods. Our interest centers chiefly in *L. utahensis* [*sensu lato*] because it is believed that from it or from some similar form has been developed the genus *Physaria*. ..."

Figure 1. *Lesquerella prostrata* in fruit, by B. Heidel



Note the contrast in leaf shape of the plant above with that on the cover. Closer inspection indicates this varies at least in part with phenology.

Figure 2. *Lesquerella prostrata* in flower, by B. Heidel



Table 1. Characteristic features of *Lesquerella multiceps*, *L. prostrata* and *L. utahensis*<sup>1</sup>

Species	Fruit shape	Styles (mm)	Pedicels	Leaf shape, pubescence	Growth form	Distribution notes
<i>Lesquerella multiceps</i>	Siliques globose 3-4 mm long; sparsely pubescent	4-5	5-8 (12) mm long, spreading and strongly upwardly sigmoid-curved	Elliptical to obovate, entire or shallowly dentate (Rollins and Shaw 1973); stellate pubescence	Loosely multicapital, frequently numerous flowering stems, prostrate or ascending from a branched caudex with loosely flowered racemes	Regional endemic of ID, UT, WY; peripheral in WY in northern Lincoln County
<i>Lesquerella prostrata</i>	Siliques slightly longer than broad, with acutish apex; (4) 6-9 (10) mm long; densely pubescent	3-6	5-10 mm long, and sigmoid-curved to erect	Diamond, arrowhead, deltate, or elliptic; pubescence of forked hairs (Rollins and Shaw 1973); reported as stellate (Nelson 1899, Payson 1922)	Prostrate to decumbent flowering stems (or ascending according to Payson 1922), from a simple or sparsely branched caudex with loosely flowered racemes	Regional endemic of ID, UT, WY; core in WY in Lincoln and Uinta counties
<i>Lesquerella utahensis</i>	Siliques globose, 3.4-4.5 (6) mm long; sparsely pubescent	4-5.5 (6.5)	3-10 mm long, and sigmoid-curved to ascending	Deltoid or orbicular to elliptic; stellate pubescence	Prostrate flowering stems from a simple or sparsely branched caudex with somewhat dense racemes	Endemic to Utah

<sup>1</sup> The information draws from Fertig (2000), Welsh (1993), Maquire (1942), Rollins and Shaw (1973), and Payson (1922). Any characteristics that is not repeated by all authors has the citation behind it. Note the differences of description of leaf pubescence for *Lesquerella multiceps* and *L. prostrata* as used in reviewing the Utah State University material.

Figure 3. Wyoming distribution of *Lesquerella multiceps*.

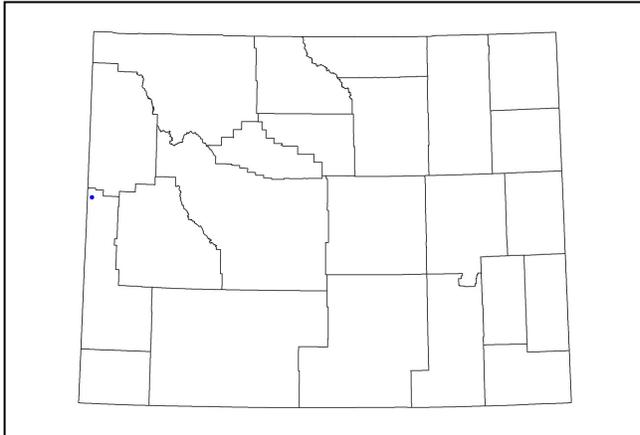
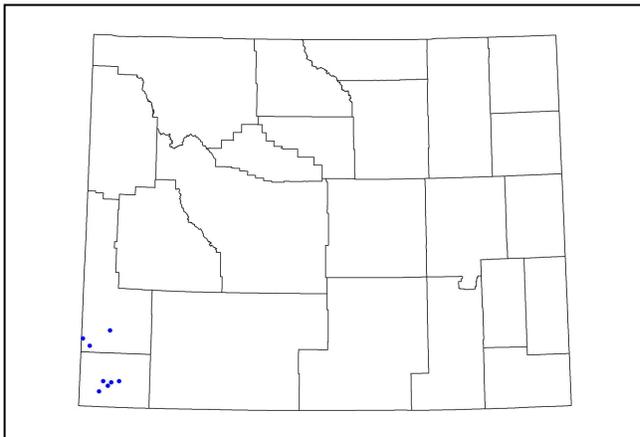


Figure 4. Wyoming distribution of *Lesquerella prostrata*



### Geographic Range

*Lesquerella multiceps* is a regional endemic of northeastern Utah, southeastern Idaho, and southwestern Wyoming (Welsh 1993). It is currently known from four counties in Utah and two in Idaho, in addition to Lincoln County, Wyoming. In Wyoming, it is known only from the Snake River Range (historical); (Figure 3, Table 2). Previous reports of a southern occurrence in Lincoln County are based on a historical specimen that has been redetermined as *L. prostrata*.

*Lesquerella prostrata* is also a regional endemic of northeastern Utah, southeastern Idaho and southwestern Wyoming (Welsh 1993, Fertig 2000a, b). Prior to this study, it was only known from one collection in Lincoln County. It is only known from the southern Overthrust Belt and this study filled gaps between Uinta County records and the isolated Lincoln County record (Figure 4; Table 3).

Table 2. Location of *Lesquerella multiceps* in Wyoming

EO #	County	Ownership	USGS Quad Name	Township/Range/ Section
#1	Lincoln	USFS	Alpine, and/or Ferry Peak	T37N R118W or T38N R88W

Table 3. Locations of *Lesquerella prostrata* in Wyoming

EO #	Locale	Ownership	USGS Quad Name	Township/Range/ Section
#1	Uinta	BLM	Fort Bridger	T15N R116W Sec 15
#2	Uinta	BLM	Piedmont Reservoir	T14N R117W Sec 6
#3	Lincoln	BLM	Fossil	T21N R117W Sec 12
#4	Uinta	BLM	Leroy	T15N R117W Sec 22
#5	Uinta	BLM, pvt	Piedmont Reservoir, Ragan, Sulphur Creek Reservoir	T15N R118W Sec 22, 28, 32
#6	Uinta	BLM	Sulphur Creek Reservoir	T14N R118W S30
#7	Lincoln	BLM, state	Sawtooth Mountain, Windy Point	T20N R120W Sec 7, 18, 20, 21; and T20N R121W Sec 13
#8	Lincoln	BLM	Rex Peak, Windy Point	T19N R119W Sec 7, 19, 30, 31; T19N R120W Sec. 13, 21, 23, 25; 36; and T20N R119W Sec. 29, 32

### Extent of Surveys in Wyoming

Systematic surveys of *Lesquerella multiceps* were initiated in Lincoln County in 2003 to relocate the historic record and expand known distribution using a model of potential distribution (Fertig and Thurston 2003). It was not found in the section where it was originally reported but what was originally thought to represent the species was found in two areas of the Bear River Divide ca. 4 miles apart on extremely exposed calcareous bedrock. This habitat did not closely correspond with the potential distribution model.

An alternate model was used for surveys of *Lesquerella multiceps* in Lincoln and Uinta counties in 2004 to focus on calcareous bedrock. In total, there were 16 sections where it was found in Lincoln County, and 25 sections where it was not found in Lincoln or Uinta counties. The Bear River Divide population was widely scattered and extended as far west as Red Eye Basin. The Crawford Mountains population may extend across the stateline into Utah.

The field determinations were corrected in the Rocky Mountain Herbarium and all past and present records from southern Lincoln County were redetermined as *Lesquerella prostrata*. The historic occurrence of *Lesquerella multiceps* is presented in Appendix A and the newly-documented occurrences of *L. prostrata* are presented in Appendix B. Negative survey results are presented in Appendix C.

## Potential Distribution in Wyoming

The criteria used in the original classification tree model of potential habitat for *Lesquerella multiceps* included the following combination of characteristics (Fertig and Thurston 2003). In the pair of attributes below, the first refers to the foothills elevation along the Bear River Divide, and the second refers to the subalpine elevation conditions in the Snake River Range. This model identified potential habitat at the foothills of the Wind River Range, and at higher elevations in the southern Absaroka Mountains, Salt Range, and Wyoming Range, based on the characteristics that follow:

Bedrock Geology: Early Eocene; ALSO Early Paleozoic

Land Cover: Mountain big sagebrush; ALSO Alpine bare rock and soil

Soil: Typic haplocryalfs, typic dsytocryepts and typic haplocryolls, loamy-skeletal and Histic Cryaquepts, fine-loamy over sandy or sandy-skeletal; ALSO Rock Outcrop and Lithic Cryorthents, loamy-skeletal

Surface Geology: Landslide mixed with scattered deposits of slopewash, residuum, Tertiary landslides and bedrock outcrops; ALSO Bedrock and glacial bedrock including hot spring deposits and volcanic necks; mixed with scattered deposits of eolian, grus, slopewash, colluvium, residuum, glacial, and alluvium

The areas of potential habitat for *Lesquerella multiceps* were in 11 different areas. Almost all of the potential habitat for the Kemmerer Field Office is represented on maps 10 and 11 (lower lefthand corner of Figure 4). These areas were projected with GIS information to determine which areas of potential habitat occurred on BLM-administered lands. The areas of potential habitat along the Bear River Divide, corresponding with map 11, are shown in Figure 5. Habitat was also surveyed on a ridgeline located immediately north of Fossil Butte National Monument, where *Physaria condensata* is extensive (Fertig 2002).

During 2003 surveys, what was originally determined as *Lesquerella multiceps* was found on distinctly calcareous outcrops at opposite ends of Bear River Divide ca. 4 miles apart. Also during the course of 2003 survey, it was found that the habitat of *Lesquerella multiceps* overlapped with *Physaria condensata* in one of the two newly-documented areas. The latter is also a BLM sensitive species, and information on *Physaria condensata* distribution was consulted as reference. The 2003 survey was expanded to calcareous outcrops in the area beyond polygon boundaries. Additional populations of *Physaria condensata* were found, but not *Lesquerella multiceps*.

Finally, an alternate habitat model based on calcareous bedrock was used for surveys of *Lesquerella multiceps* in Lincoln and Uinta counties in 2004. The formations that contain limestone and dolomite in Lincoln County were used as a framework for re-directing surveys. A GIS map was prepared that merged the calcareous formations into a single shapefile (Figure 6). It was overlain on a managed area layer to locate those large areas of calcareous bedrock on BLM-administered lands.

Figure 4. Potential distribution model for *Lesquerella multiceps* (from Fertig and Thurston 2003)

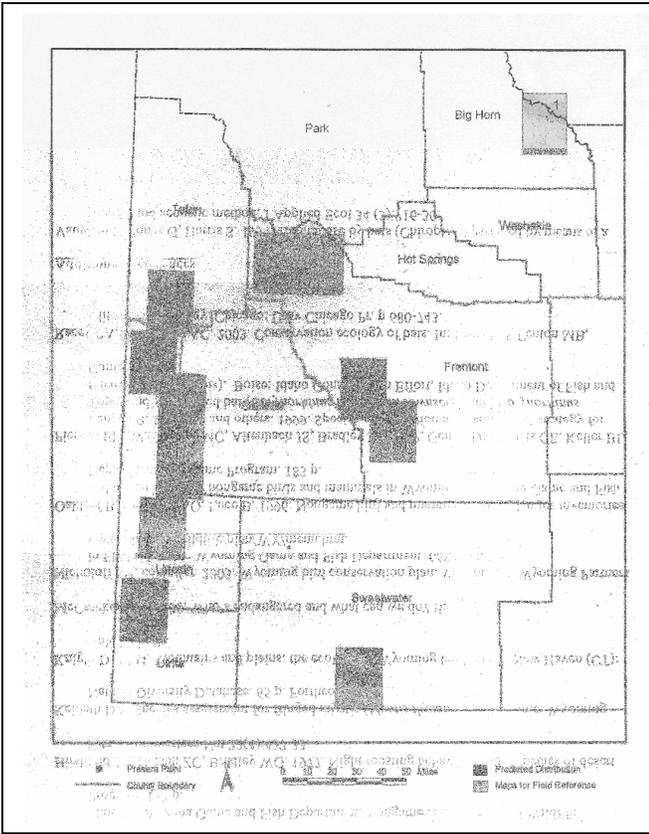
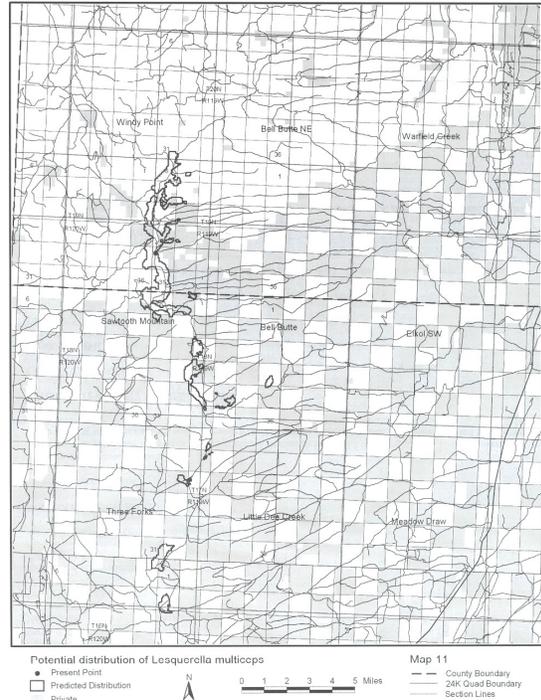
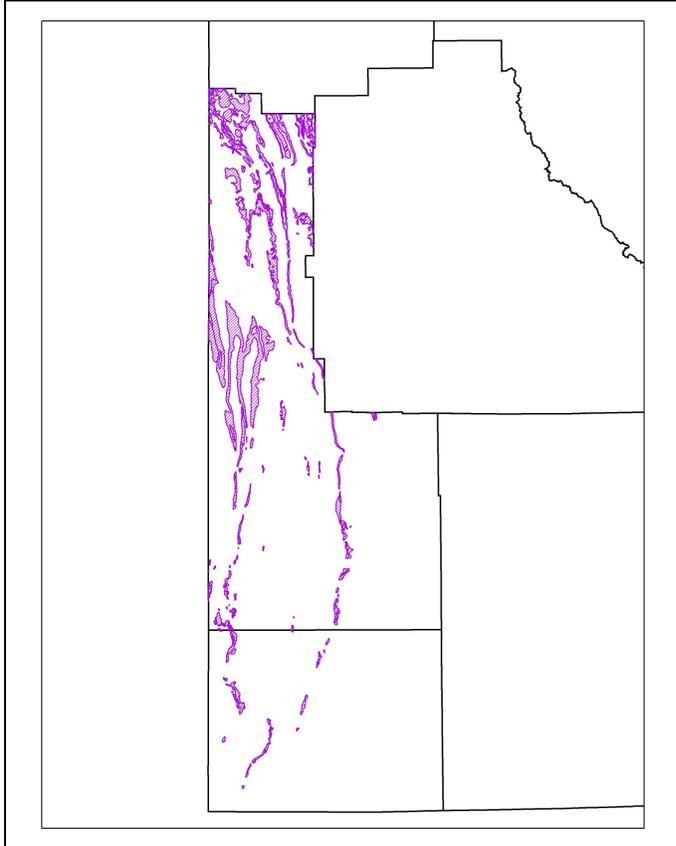


Figure 5. Enlargement map - potential distribution model for *Lesquerella multiceps* (based on Fertig and Thurston 2003)



The second approach is represented by a map on the following page. It is not a predictive distribution model in the strict sense, but provided a framework for focused surveys using known habitat requirements, with the technological advances of super-imposing GIS information layers over public land maps to set priorities. It is noteworthy that there is over twice as much calcareous bedrock in the northern half of Lincoln County as there is in the southern half and Uinta County combined. There was not overlap between calcareous bedrock with BLM lands in the northern half of Lincoln County, and this area was not included in surveys. The eastern band of calcareous bedrock did overlap with BLM lands in places, and limited-scale surveys were conducted, but without finding *Lesquerella multiceps*.

Figure 6. Calcareous bedrock areas of Lincoln and Uinta counties, Wyoming



The *Lesquerella* genus is widely associated with calcareous substrates (Rollins 1993). Four bedrock geology units in Lincoln and Uinta counties are mapped by Love and Christiansen (1985) as having calcareous members, including:

- Gannet Group – includes Draney Limestone and Peterson Limestone
- Nugent sandstone, and Chugwater and Dinwoody Formations
- Madison Limestone and Darby Formation
- Madison Limestone or Group

In southern Lincoln County, there was mainly the Gannet Group, or to a lesser extent, Madison Limestone Group.

Only after fieldwork was completed did the question arise about the determination for one of the two specimens on which models were based.

## Habitat

Across its range, *Lesquerella multiceps* is found on limestone ridges, damp open slopes, soil pockets among rocks, crevices of rocks, and decomposed calcareous rocks (Rollins 1993). Extensive survey on the Bear River Range in Idaho documented the species to be found on both calcareous and occasionally, what appeared to be, non-calcareous parent material. It occurred on both open as well as wooded, partially shaded sites, on both flat ridge crests to steep slope positions, and on both fractured bedrock to gravelly, zonal pockets (Mancuso 2003).

In Wyoming, *Lesquerella multiceps* was originally reported from "stony upper slopes" in northern Lincoln County (Payson and Armstrong 3466) and on "red sand" (Cronin s.n.). However, the specimen found at the latter location actually represents *L. prostrata*. All ensuing field data in this report pertains to *L. prostrata*.

*Lesquerella prostrata* was previously reported as west to south or southeast-facing slopes and rims of whitish to reddish or gray dry limey clays and soft sandstones with a surface layer of fine gravel at elevations of 7200-7700 feet (2195-2350 m) (Fertig 2000b). This survey also documented it on dry, gravelly limestone ridges and west to south slopes at elevations of 6630-7700 ft (2020 - 2350 m).

On Crawford Mountains, the species was exclusively on gravelly, level ridge tops (Figure 7), while in foothills settings below Crawford Mountains and on the Bear River Divide, it was usually on ridge rims (Figure 8), knolls, and a variety of slope outcrops. All habitat was in upland settings and not associated with incised landforms or low topographic positions. There are shallow soils and susceptibility to wind and water erosion that maintain the sparse vegetation and low competition. In one slope segment on Bear River Divide, it was more common near a

Figure 7. Typical ridge top habitat of *Lesquerella prostrata* on Crawford Mountains, by B. Heidel



trail than away from it (Figure 9), but the trail the trail intersected the suitable habitat, rather than the species being associated with the trail. The suitable ridge top and ridge rim settings that have limestone and dolomite are highly localized on the landscape, despite the ubiquity of rocky slopes. On the Bear River Divide, many of the subpopulations are on finger ridges (Figure 10) where available habitat is limiting.

Figure 8. Typical ridge rim habitat of *Lesquerella prostrata* on Bear River Divide, by B. Heidel

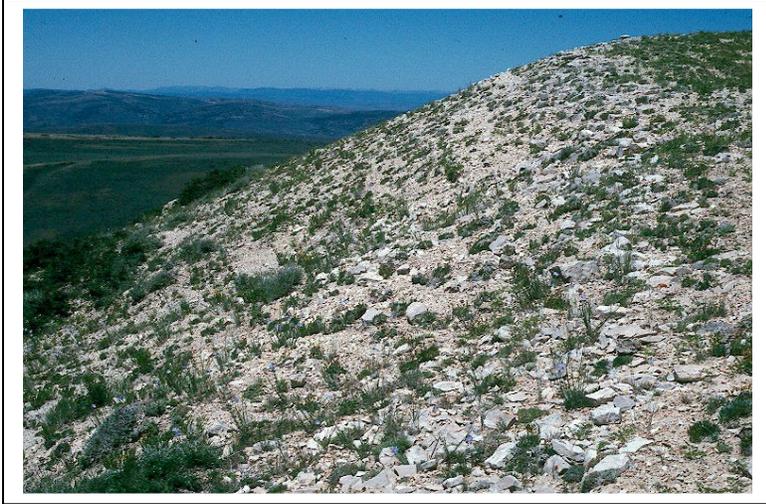


Figure 9. Marginal slope habitat of *Lesquerella prostrata* on Bear River Divide, by B. Heidel  
(central foreground)



Figure 10. Localized finger ridge habitat of *Lesquerella prostrata* on Bear River Divide  
(right of center)



The flat ridges of Crawford Mountains provide the largest areas of suitable habitat (Figure 7). The sloping habitats were consistently west or south-facing (1%-25% slope). Soils were inceptisols that were usually but not always derived from limestone or dolomite. Locally, the species did extend onto red sand substrate, as described on the original 1964 collection label (Cronin s.n.).

The vegetation of *Lesquerella prostrata* habitat is sparsely-vegetated and typically comprised of bunch grasses and cushion plants. Species typically associated with *Lesquerella prostrata* are presented in Table 2; species in parentheses are well-represented at one or more subpopulations but not characteristic of the locale in general.

Table 2. Plant species commonly associated with *Lesquerella prostrata* in Wyoming

Scientific Name	Common Name	Growth Form	In Fertig (2000)	Bear R Divide	Crawford Mts
<i>Achnatherum hymenoides</i>	Indian ricegrass	Perennial grass	X		(X)
<i>Amelanchier utahensis</i>	Utah serviceberry	Shrub	X	X	
<i>Artemisia arbuscula</i>	Bud sage	Subshrub		X	
<i>Artemisia frigida</i>	Fringed sage	Subshrub		(X)	X
<i>Artemisia tridentata</i> var. <i>wyomingensis</i>	Wyoming big sagebrush	Shrub	X		
<i>Astragalus jejunus</i>	Starveling milkvetch	Perennial forb	X	X	(X)
<i>Astragalus spatulatus</i>	Tufted milkvetch	Perennial forb	X	X	X
<i>Astragalus vexilliflexus</i>	Bent-flower milkvetch	Perennial forb	X		X
<i>Chaenactis douglassii</i>	Hoary dustymaiden	Perennial forb	X	X	
<i>Chrysothamnus viscidiflorus</i>	Green rabbitbrush	Shrub	X	X	
<i>Cryptantha caespitosa</i>	Tufted cryptantha	Perennial forb	X		
<i>Cymopterus longilobus</i>	Henderson's wavywing	Perennial forb		X	
<i>Cymopterus terebinthus</i>	Turpentine wavywing	Perennial forb		X	
<i>Elymus lanceolatus</i>	Thickspike wheatgrass	Perennial grass		(X)	
<i>Elymus spicatus</i>	Bluebunch wheatgrass	Perennial grass	X	X	X
<i>Eremogone hookeri</i>	Hooker's sandwort	Perennial forb	X	X	
<i>Erigeron nanus</i>	Dwarf fleabane	Perennial forb			X
<i>Eriogonum brevicaulis</i> var. <i>laxifolium</i>	Shortstem wild buckwheat	Perennial forb	X	X	X
<i>Gutierrezia sarothrae</i>	Broom snakeweed	Subshrub		(X)	
<i>Hymenoxys richardsonii</i>	Colorado rubberweed	Perennial forb		X	X
<i>Ipomopsis congesta</i>	Ballhead gilia	Perennial forb	X	X	
<i>Ipomopsis spicata</i>	Spicate gilia	Perennial forb	X	X	
<i>Juniperus osteosperma</i>	Utah juniper	Shrub/Tree	X		
<i>Linum lewisii</i>	Wild blue flax	Perennial forb		X	
<i>Machaeranthera grindelioides</i>	Rayless tansy-aster	Perennial forb		X	X
<i>Oxytropis sericea</i>	White locoweed	Perennial forb	X		
<i>Petrophyton cespitosum</i>	Rocky Mt rockmat	Perennial forb			X
<i>Phlox hoodii</i>	Hood's phlox	Perennial forb	X		
<i>Phlox multiflora</i>	Rocky Mt phlox	Perennial forb			X
<i>Physaria condensata</i>	Tufted twinpod	Perennial forb	X	(X)	
<i>Poa cusickii</i>	Cusick's bluegrass	Perennial grass			X
<i>Poa secunda</i>	Sandberg bluegrass	Perennial grass	X	X	
<i>Senecio canus</i>	Woolly groundsel	Perennial forb	X		
<i>Stanleya pinnata</i>	Golden prince's plume	Perennial forb		X	
<i>Stenotus acaulis</i>	Stemless mock goldenweed	Perennial forb		X	
<i>Streptanthus cordatus</i>	Heart-leaf jewel flower	Perennial forb		X	
<i>Tetraneuris acaulis</i>	Stemless 4-nerve daisy	Perennial forb	X	X	
<i>Trifolium andinum</i>	Intermountain clover	Perennial forb		(X)	X

The five taxa listed as associates with *Lesquerella prostrata* on the 1964 collection label were all shrubs: *Artemisia tridentata* (big sagebrush), *Symphoricarpos* spp. (wolfberry), *Amelanchier* spp. (juneberry), and *Chrysothamnus* spp. (rabbitbrush). While these shrubs are ubiquitous on the Bear River Divide landscape, only *Amelanchier utahensis* is sporadically present on open slopes occupied by *Lesquerella prostrata*, and woody vegetation is generally not associated with the species.

*Physaria condensata* (tufted twinpod), another BLM sensitive species, is associated with *Lesquerella prostrata* (Table 3). The latter has been noted as much more difficult to observe in surveys (Walford, in Fertig 2000b) because it is smaller, presumably because its loose sprawling growth form and silvery leaves blend in more with the barren habitat, and it is often less common. They were found together at the northern end of the Bear River Divide where their distribution seemed to converge; but all other new sites for both species were separate.

In the sparsely-vegetated habitat occupied by *Lesquerella prostrata*, individual plants were often in isolation from all other plant life (e.g., Figure 1), but were sometimes rooted at the base of or in dense mats of other plants (e.g., Figure 2). The latter "facultative nurse plant phenomenon" has been demonstrated with other short-lived species of *Lesquerella* in periods of drought, in which other species like *Elymus spicatus* (bluebunch wheatgrass) may be both competitors and facilitators, depending on climate (Greenlee and Callaway 1996, Thomas 1996). These interchangeable facilitation/competition relationships with surrounding vegetation are particularly important for short-lived perennials with fluctuating populations, and have been viewed as making a case for maintaining habitat heterogeneity (Greenlee and Callaway 1996, Thomas 1996). This may be a particularly important matter in times of drought. It appeared as though many of the cushion-forming plants on Crawford Mountains were dead, including large mounds of *Astragalus spatulatus* that had died from drought.

### Population size and trends

*Lesquerella prostrata* is known from eight extant occurrences in Wyoming. There were two occurrences spanning 16 sections where it was found in Lincoln County (Appendix A). In all places where *Lesquerella prostrata* was found on the Bear River Divide, it was in low density over limited areas. Despite the extensiveness of the population in at least eleven sections, it is conservatively estimated at 400+ plants. On two flat limestone ridgetops in the Crawford Mountains it was locally common, with density of at least 5 plants per m<sup>2</sup>, and conservatively estimated at 1600+ plants. All of the 2003 and 2004 estimates may be low in representing the populations under "normal" conditions if the population numbers are suppressed by drought conditions. The adjusted total numbers are estimated at 6,700-13,000+ plants, adding to the figures presented by Fertig (2000).

Long-term trends of *Lesquerella prostrata* numbers are unknown, though some populations have been known for over a century. It seems likely that they have been adversely affected by drought conditions over the short-term. It is not known whether the species has a persisting seedbank that might foster rebounds in population numbers under favorable conditions. The three baseline *Lesquerella prostrata* monitoring plots established in 1999 (Fertig 2000b) have not been re-read.

The short-term trends are likely to show decline with drought, as inferred from the recent surveys that included observations of fruit abortion, low numbers of flowering stems, and signs of stress in surrounding vegetation.

### Population biology and ecology

The longevity and mean lifespan of *Lesquerella prostrata* are not known. Many other species of *Lesquerella* are relatively short-lived perennials. Demographic baseline plots were established for *L. prostrata* in 1999 but have not been re-read. Demographic monitoring studies among other members of the genus have demonstrated that numbers fluctuate widely from year-to-year.

During the surveys, very few vegetative plants were noted. It may be that the species flowers in its second growing season, but nonflowering plants were in the minority. This is consistent with baseline monitoring in which reproductive plants accounted for 50-90% of all individuals (Fertig 2000b). There is no basis for determining whether this is typical or indication of low recruitment in previous years.

Based on two seasons of observations, it appears that *Lesquerella prostrata* flowers in Lincoln County from mid May to mid June (perhaps prolonged later under normal conditions) and produces fruit from mid June through July. Fertig (2000) reports the flowering period of the species to extend from mid April to late June, depending on spring moisture conditions. The phenology of the Crawford Mountains population was as much as a week earlier than that at Bear River Divide. *Lesquerella prostrata* produces flowers along most of the length of its flowering stems. Flowering is indeterminate, i.e., starting at the base of the stem and progressing upward. At many of the Bear River Divide subpopulations, it appeared that flowering began almost at the tip of the flowering stem and that the lower flower buds on the stem had aborted.

In general, the Crawford Mountains population had many times more flowers per stem and flowering stems per plant than the Bear River Divide population. The Crawford Mountains site lies almost on the Utah state line, and the plants there more closely match the descriptions of this species as many-branched and profusely flowering. All close-up photos in this report were taken at the Bear River Divide population, and represent the species in low vigor states.

There is no information available on seed germination and biology of *Lesquerella prostrata*. Dispersal vectors and seed predators for *Lesquerella prostrata* are not known either. No evidence of herbivory was observed.

Pollination biology of *Lesquerella prostrata* has not been researched. There were no signs of browsing, grazing or any herbivory noted.

## Current management

All known populations are on public lands managed for multiple use in the BLM Kemmerer Field Office and on lands managed by the State of Wyoming.

In 2004, there were numerous patches of prescribed burns located in the sections where the species occurs. Most of these appeared to have been placed within shrub vegetation, so direct affects to the species were limited. The fire carried down-slope into one area of *Lesquerella prostrata* habitat. The species is present in low numbers on the unburned slope segment, but it is not known whether its absence in the burned area was due to fire or not. The possible indirect affects of fire are discussed in the following section.

## Existing and potential threats

Development activity was generally considered to be low in the habitats occupied by *Lesquerella prostrata* (Fertig et al. 1998, Fertig 2000b) where populations were often found on steep slopes or unstable soils making the sites less suitable for well siting and pipeline/ road construction. Increased oil and gas development in its habitat were cited as potential threats. Results of this project corroborate the earlier evaluation and provide cases of potential indirect threats along the Bear River Divide.

The Bear River Divide ridge top is widely accessible and traversed by a road, with major industrial facilities on top. A gas plant lies on the Divide south of the Lincoln-Uinta county line. The grounds of the plant stop abruptly at the county line though power stations, transmission lines, pipelines, and other support structures are on the Bear River Divide ridge top extend into Lincoln County. Only transmission poles are known to be in the immediate vicinity of *Lesquerella prostrata* habitat. Any expansion of facilities and ancillary development may pose a threat. In addition, there are also potential threats from indirect affects of development such as slope destabilization or exotic species encroachment.

*Lesquerella prostrata* may be threatened by quarrying. The Crawford Mountains ridges have deep limestone bedrock and is located close to state and county roads. Similar finger ridges of limestone in the county are being removed in large-scale quarrying.

The affects of prescribed burns are not known, but a profusion of *Bromus tectorum* (cheatgrass) was noted in the Crawford Mountains prescribed burn that took place in 2003 directly adjoining occupied habitat. This potentially fosters the spread of cheatgrass over the landscape. *Bromus tectorum* was not noted in Bear River Divide prescribed burns, but at one site above the Red Eye Basin, *Lesquerella prostrata* was absent from a prescribed burn that extended into *Lesquerella prostrata* habitat. The numbers of *Lesquerella prostrata* were so low and density so sparse outside the burn area that it could not be inferred whether fire was likely to have been the likely reason it was absent from the small burn area. Under no circumstances is seeding recommended in prescribed burns, particularly as it could introduce exotic species into the landscape.

All Bear River Divide subpopulations are almost all on the western side of the ridge, and the allotment fence runs along the top of the ridge, generally reducing the risk of concentrated livestock use on upper slopes. The small, scattered areas where the species is present on the Bear River Divide ridge top are locally affected by livestock where use is concentrated (e.g., in proximity to powerline poles used for rubbing).

There are subpopulations that are located close to established roads, though not in or along right-of-ways. It is possible that habitat was lost to road development. Those subpopulations in proximity of established roads could be affected by indiscriminate herbicide spraying on one hand or exotic weed establishment and expansion along roadways on the other. Noxious weeds were not observed in the Bear River Divide road right-of-ways. Other short-lived species that persist on dry, exposed habitat could become direct competition with *Lesquerella prostrata*. Three such species are present in the vicinity that become competitors, including *Alyssum desertum* (alyssum), *Bromus tectorum* (cheatgrass; as already discussed in association with fire), and *Malaccolmia africana* (blue mustard). Any planting of *Melilotus* spp. (sweetclover) and *Medicago sativa* (alfalfa) in road right-of-ways and other corridors are also potential threats insofar as these species shift nutrient conditions and vegetation succession. The latter was noted in a local transmission line corridor planting.

## SUMMARY

*Lesquerella multiceps* and *L. prostrata* are regional endemics of southwest Wyoming, northeast Utah and adjoining Idaho. This report expands the baseline information available for *L. prostrata* and provides the evidence that there is not a basis to expect *L. multiceps* on BLM-administered lands in Wyoming. *Lesquerella multiceps* is only known in Wyoming from one historic collection in the Snake River Range and appears to be a montane species in the rest of its range.

The new Wyoming distribution data for *Lesquerella prostrata* fills in gaps. It is still only known in the state from the southern Overthrust Belt in Uinta and Lincoln counties. Wyoming populations of the latter have been adjusted to 6700-13,000 individuals, though still occupying less than 100 acres of occupied habitat. Quarrying and exotic species invasion are potential threats at the new populations, in addition to the previously-cited vulnerability of this species to surface disturbances from road and pipeline construction associated with mineral exploration, and from habitat loss due to off-road vehicle recreation.

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