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1990 status of
Lesquerella
humilis

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REPORT ON THE CONSERVATION STATUS OF
Lesquerella humilis, A CANDIDATE THREATENED SPECIES

Taxon Name: Lesquerella humilis Rollins

Common Name: Few-seeded bladderpod, Bitterroot bladderpod

Family: Brassicaceae (= Cruciferae)

States Where Taxon Occurs: U.S.A.: Montana

Current Federal Status: USFWS Notice of Review, Category 2

Recommended Federal Status: USFWS Notice of Review, Category 2

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Original Date of Report: 20 December 1990

Date of Most Recent Revision: N/A

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I. SPECIES INFORMATION

1. Classification and nomenclature

A. Species

1. Scientific Name

- a. **Binomial:** Lesquerella humilis Rollins.
- b. **Full bibliographic citation:** Rollins, R.C. 1984. Studies in the Cruciferae of western North America II. Contr. Gray Herb. 214: 1-18.
- c. **Type specimen:** United States, Montana, Ravalli County: on steep hillside of metamorphosed rocks and detritus, approach to and near summit of St. Mary's Peak, Bitterroot Range, July 17, 1983, Reed C. & Kathryn W. Rollins 83300, with Klaus H. Lackschewitz, Peter Lesica & Aileen G. Roads. Holotype: Gray Herbarium, Harvard University.

2. **Pertinent synonyms:** None.
3. **Common Names:** Few-seeded bladderpod, Bitterroot bladderpod.
4. **Taxon codes:** PDBRA1N1Y0 (The Nature Conservancy); 8152, LESHUM (U.S. Forest Service, Region 1).
5. **Size of genus:** Lesquerella humilis is one of approximately 75 species in the genus in North America; of these, most are concentrated in the southwestern United States, Mexico, and the Rocky Mountain and intermontane basin regions of the western United States (Rollins and Shaw 1973). In Montana, L. humilis is one of six species reported for the genus (Dorn 1984; Rollins 1984). Within the genus, the nearest relative to L. humilis is L. hemiphysaria. The ranges of the two species are allopatric; L. humilis is restricted to the Bitterroot Range in Montana, and L. hemiphysaria is confined to central Utah (Rollins 1984).

B. Family classification

1. **Family name:** Brassicaceae.

2. Pertinent family synonym: Cruciferae.
 3. Common names for the family: Mustard Family.
- C. Major plant group: Dicotyledoneae.
- D. History of knowledge of taxon: Lesquerella humilis is a recently described species (Rollins 1984). It was first discovered on St. Joseph Peak in the Bitterroot Range in 1966, by Klaus H. Lackschewitz and Tor Fageraas (Lackschewitz (117, MONTU)). This first specimen, and other early collections, were variously labeled as Lesquerella alpina, Physaria didymocarpa, or P. geveri, but Dr. Reed Rollins ultimately determined that they represented a previously undescribed species. The type specimen (83300, GH) was collected in 1983 by Reed C. and Kathryn W. Rollins, with Lackschewitz, Peter Lesica, and Aileen G. Roads, near the summit of St. Mary Peak, also in the Bitterroot Range.

Lesquerella humilis was collected by Klaus Lackschewitz from East St. Joseph Peak in 1970 (2126, MONTU) and from St. Mary Peak in 1974 (4560, MONTU, GH). The species was subsequently recollected on St. Mary Peak in 1974 by Lackschewitz and Schaack (4944, GH) and by Woodland and Arno (1077, MONTU), and in 1983 by Rollins et al. as noted above.

In 1990, the Montana Natural Heritage Program, under contract to the U.S. Fish and Wildlife Service (Section 6 Project Agreement No. SE-5-P-1), conducted status surveys of L. humilis in the Bitterroot Range. Populations were relocated at the three previously known sites and two more subpopulations were located on East St. Joseph Peak. Two other possible sites (Lolo Peak and Sweeney Peak) were searched but no L. humilis plants were found. Gash Point was unsuccessfully searched in 1987 for L. humilis. Thus, the species is known only from three locations in the Bitterroot Range of western Montana.

- E. Comments on current alternative taxonomic treatments: There are no known current alternative taxonomic treatments.

2. Present legal or other formal status

- A. International: None.

B. National**1. United States**

- a. Present designated or proposed legal protection or regulation: U.S. Fish and Wildlife Service: *Lesquerella humilis* is currently under notice of review for potential listing as a threatened species under the U.S. Endangered Species Act of 1973 (U.S. Department of Interior 1990) and is in Category 2 ("taxa for which there is some evidence of vulnerability, but not enough data to support listing proposals at this time").

U.S. Forest Service: *Lesquerella humilis* is currently included on the list of sensitive plant species for Region 1 (Northern Region) of the U.S. Forest Service (U.S. Department of Agriculture 1988, Reel et al. 1989). Sensitive species are "...those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by: a.) significant current or predicted downward trends in population numbers or density," and/or "b. significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (Reel et al. 1989). By its inclusion on the Region 1 sensitive species list, *L. humilis* has legal protection under U.S. Forest Service policies (W. Ruediger, pers. comm.).

- b. Other current formal status recommendations: *Lesquerella humilis* is currently listed by the Montana Natural Heritage Program (Shelly 1990) as "critically imperiled globally" owing to extreme rarity (5 or fewer occurrences; global rank = G1).

- c. Review of past status: No previous history of legal or formal status.

C. State

1. Montana

- a. Present designated or proposed legal protection or regulation: None.
- b. Other current formal status recommendations: The species is currently listed as "critically imperiled in Montana" (state rank = S1) by the Montana Natural Heritage Program (Shelly 1990).
- c. Review of past status: No previous history of legal or formal status.

3. Description

- A. General nontechnical description: Lesquerella humilis is a small, perennial herb with stems which are mostly about 1-2 inches tall. They lie flat on the soil surface, with the flower-bearing tips curved slightly upward. The flowers are yellow, with only three to six or so produced near the end of each stem. The petals are about 0.3 inches long. The basal leaves are clustered together at the top of the taproot, and are about 0.6 to 1 inch long. The stem leaves are smaller, being about $\frac{1}{4}$ inch long. The plants are generally in flower from late June to early July, with variation depending on exposure and weather conditions. Fruiting occurs from July into early August.
- B. Technical description: Perennial, densely pubescent and silvery from an encrustment of stellate trichomes; primary branches 5-6, free to base to slightly fused at center, forked or 3-branched, trichomes with 16-25 free ends, appressed on upper leaf surface, less appressed to somewhat flaring on lower leaf surface; caudex usually simple, thick, covered with old leaf-bases; stems prostrate, simple, one or two to several, arising below and among a terminal rosette of leaves, 2-5 cm (0.8-2.0 in.) long;

rosette leaves petiolate, entire, (1) 1.5-2.5 (3) cm ((0.4) 0.6-1.0 (1.2) in.) long, blade elliptical to broadly ovate or obovate, usually narrowed abruptly, 3-6 (7) mm (0.12-0.24 (0.28) in.) wide, 4-7 mm (0.16-0.28 in.) long, obtuse; cauline leaves 3-6, spatulate, cuneate at base, 3-7 mm (0.12-0.28 in.) long; inflorescences 3-5 flowered, scarcely elongating in fruit; sepals yellowish, oblong, densely pubescent, 4-5 mm (0.16-0.20 in.) long, 1.5-2 mm (0.06-0.08 in.) wide, outer pair slightly saccate, inner pair non-saccate; petals yellow, spatulate, retuse or rarely with a deeper sinus at apex, narrowed gradually from blade to claw, 7-8.5 mm (0.28-0.33 in.) long, 3-3.5 mm (0.12-0.14 in.) wide; stamens strongly tetradynamous; filaments of paired stamens ca. 4 mm (0.16 in.) long, anthers ca. 1 mm (0.04 in.) long; pedicels straight to slightly curved, nearly paralleling rachis, 3-4 mm (0.12-0.16 in.) high, 4-5 mm (0.16-0.20 in.) wide, valves densely pubescent on exterior with trichomes that have ascending to erect rays, sparsely pubescent on interior; replum oval to broadly oblong, acute at apex, 2.5-3.5 mm (0.10-0.14 in.) long; septum usually folded; styles 2-3 mm (0.08-0.12 in.) long; ovules 2 in each locule; seeds plump, wingless, slightly compressed, orbicular to semi-orbicular, ca. 2 mm (0.08 in.) in diameter; cotyledons accumbent, orbicular or nearly so (Rollins 1984).

- C. **Local field characters:** During field surveys in 1987, one other conspicuous member of the Mustard family, Smelowskia calycina (Alpine smelowskia), was observed growing with L. humilis. Smelowskia is distinguished in having white petals, which are sometimes purple-tinged, and pinnatifid or pinnate (lobed or divided) leaves. These are in contrast to the yellow petals and entire (smooth-margined) leaves of L. humilis. Several other species in the Mustard family have been reported from St. Mary Peak, including Arabis spp. and Draba spp. (Lackschewitz 1970). Members of Arabis in Montana have white to pink or purple petals and longer, narrow fruits; Draba species often have strongly flattened fruits which are flattened parallel to the septum (internal fruit partition), rather than being not, or only partially, flattened in Lesquerella.

- D. Identifying characteristics of material which is in interstate or international commerce or trade: No interstate or international commerce or trade known.
- E. Photographs and line drawings: Figure 1 is an illustration of Lesquerella humilis. The color slides included are duplicates of those taken at the sites indicated. Additional slides are on file at the Montana Natural Heritage Program office in Helena.

4. Significance

- A. Natural: Lesquerella humilis is a state endemic that is narrowly restricted to three peaks that are approximately six miles apart. It is well separated from its nearest relative, L. hemiphsaria which occurs in Utah. Thus, it is an important taxon for studies of biosystematics and the evolutionary biology of narrow endemics. Obligate relations with other species are unknown.
- B. Human: Lesquerella humilis is of scientific significance for biosystematic studies. It has potential, horticulturally, as a rock garden plant. Other agricultural, economic or other human uses or significance are not known currently.

5. Geographical distribution

- A. Geographical range: Lesquerella humilis is a state endemic, narrowly restricted to three sites in the Bitterroot Range in northwestern Ravalli County, Montana (Figure 2). All of these sites are on the Bitterroot National Forest, in Region 1 (Northern Region) of the U.S. Forest Service.

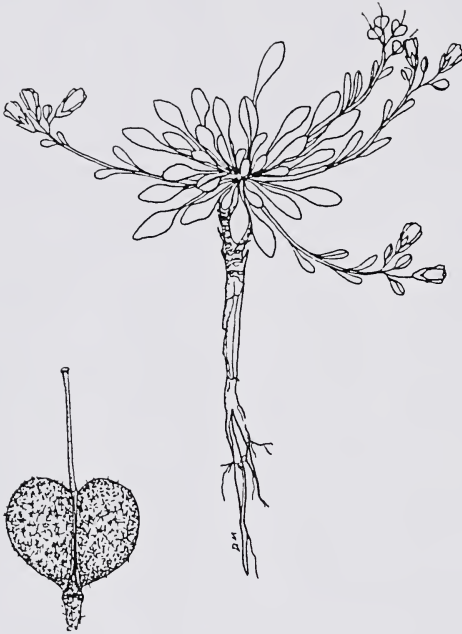


Figure 1.

Lesquerella humilis: habit of plant and fruiting capsule (drawing by Deborah McNeil).

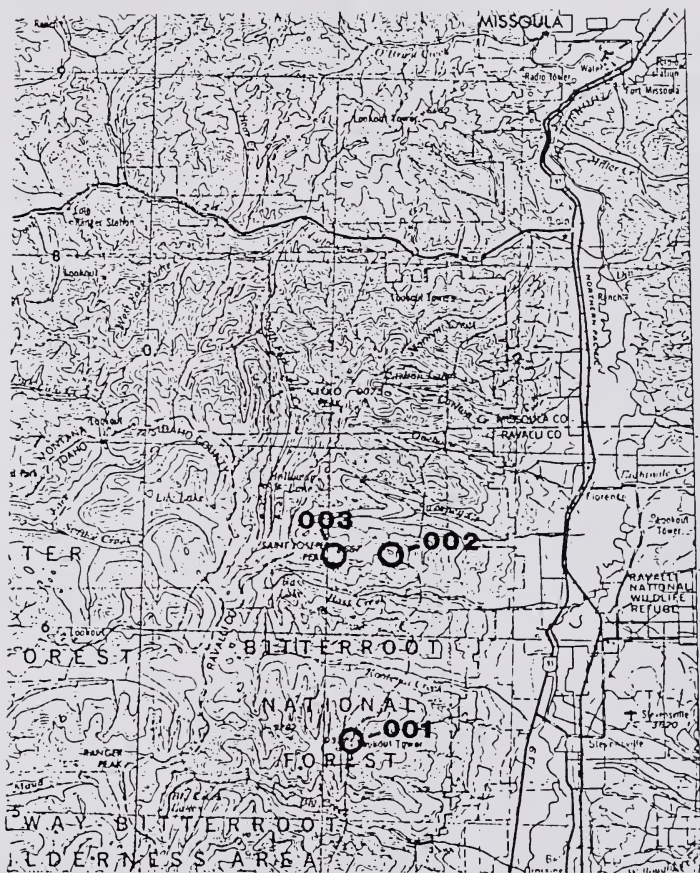


Figure 2. Geographic distribution of *Lesquerella humilis*, Ravalli County, Montana.

B. Precise occurrences

(In this report, three-digit occurrence numbers are listed in parentheses after site names to indicate the occurrence numbers provided in the tables, element occurrence listings and maps.)

1. **Populations currently known to be extant:**
Table 1 lists all populations currently known.
2. **Populations known or assumed extirpated:**
None.
3. **Historically known populations where current status is not known:** None.
4. **Locations not yet investigated believed likely to support additional natural populations:** The alpine and timberline flora in the Bitterroot Mountains has been exhaustively studied by Lackschewitz (1970, 1986). The major summits and areas explored in the earlier studies include Lolo, Sweeney, St. Mary, St. Joseph, East St. Joseph, Trapper, Bass, Ranger, Boulder, Bare, Watchtower, and West Como peaks, Pyramid Buttes, Gash Point, Glen Lake Mtn., Blodgett Mtn., Ward Mtn., Lost Horse Mtn., El Capitan, Chaffin Creek Headwater Basin, and Mt. Jerusalem. In discussing the possible locations where L. humilis might additionally be found, Lackschewitz (pers. comm.) recommended detailed surveys in two areas. In a note to the junior author, he wrote "...I suspect it to occur on Gash Point...but have never collected it anywhere s. of St. Mary's." He also suggested that Sweeney Peak should be surveyed. Sweeney Peak and Gash Point were studied in detail in 1987, and Sweeney and Lolo peaks were surveyed in 1990. All areas of suitable habitat were intensively searched but, as in the earlier field research, L. humilis was not located on or near any of these summits. Other peaks in the Bitterroot Range may support populations of L. humilis but considerable searching has not revealed any.
6. **Locations known or suspected to be erroneous reports:** None known.

Table 1. Lesquerella humilis locations, Ravalli County, Montana.(001) St. Mary Peak

Township and Range: 009N021W Section: 28
Subsection/Additional Sections: SE4NW4,NW4; 21,SW4SE4
Latitude: 463036 Longitude: 1141430 Elevation: 9200
USGS Quad: Saint Mary Peak
Location: approach to and near summit of St. Mary Peak,
Bitterroot Range.

(002) East St. Joseph Peak

Township and Range: 010N021W Section: 26
Subsection/Additional Sections: NW4NW4
Latitude: 463607 Longitude: 1141249 Elevation: 9000
USGS Quad: Saint Mary Peak
Location: "East St. Joseph Peak" (unnamed summit east of
St. Joseph Peak), Bitterroot Range and ridge to
west connecting to St. Joseph Peak.

(003) St. Joseph Peak

Township and Range: 010N021W Section: 28
Subsection/Additional Sections: NW4NW4
Latitude: 463603 Longitude: 1141513 Elevation: 9500
USGS Quad: Saint Joseph Peak
Location: St. Joseph Peak, Bitterroot Range.

- C. **Biogeographic and phylogenetic history:** Lesquerella humilis is possibly most closely related to a group of species that includes L. hemiphysaria, its nearest relative (Rollins 1984), L. cordifolia, L. kingii, L. palmeri, and L. peninsularis (Rollins and Shaw 1973). All of these other species occur in the Great Basin and adjacent Baja California. None are sympatric with L. humilis.

Lesquerella humilis occurs in high altitude sites (upper subalpine and alpine), a habitat that was probably more widespread during the late Pleistocene and during colder climatic periods more recently. However, the small geographic range of L. humilis may be related also to edaphic conditions as well as climate.

6. General environment and habitat description

- A. **Concise statement of general environment and habitat:** Lesquerella humilis occurs in sparsely vegetated areas in the upper subalpine krummholz zone, and in alpine fellfield areas above the upper treeline. On St. Mary Peak, the krummholz consists of wind-trimmed individuals of Pinus albicaulis (white-bark pine). The associated herbaceous vegetation is characterized by a mixture of species, including: Astragalus kentrophyta var. implexus (Thistle milkvetch), Dicentra uniflora (Steer's-head), Draba spp. (Draba), Dryas octopetala (White dryas), Erigeron simplex (One-flower fleabane), Eritrichium nanum (Pale alpine forget-me-not), Haplopappus lyallii (Lyll's goldenweed), Hulsea alqida (Alpine hulsea), Ivesia gordonii (Gordon's Ivesia), Pedicularis contorta (Coiled-beak lousewort), Sedum lanceolatum (Lance-leaved stonecrop), Smelowskia calycina (Alpine smelowskia), and Veronica cusickii (Cusick's speedwell).

The populations occur on coarse-textured soils (sandy or gravelly) derived from metamorphic rocks. The sites are on moderately steep slopes and ledges, and on level exposed areas at elevations of 2685 to 2925 m (8800 to 9590 ft.).

B. Physical characteristics

1. Climate

- a. **Koeppen climate classification:** Types Dfb (Canadian climate, snowy winters and moderately warm summers) in the subalpine and ET (tundra climate, the mean temperature of the warmest month above 0°C (32°F) but below 10°C (50°F)) in the alpine areas above timberline (Visher 1954).
- b. **Regional macroclimate:** The alpine areas of the Bitterroot Range are characterized by exposure to strong, erosive winds and low temperatures. The upper subalpine, timberline areas receive the highest snowpack accumulations and the open, alpine areas the least (Lackschewitz 1970).

From July 1967 to July 1969, a temporary weather station was established on St. Mary Peak by S. Arno and J. Habeck. Because of unusual heat and drought in the summer of 1967, only measurements from 1969 are considered nearly average (Lackschewitz 1970). The daily mean minimum temperature in January was -13.0°C (8.6°F); the daily mean maximum temperature in July was 14.7°C (58.5°F).

Data for precipitation are available for Lolo Pass (1740 m (5700 ft.) in elevation), approximately 32 km (20 mi.) northwest of St. Mary Peak (U.S. Department of Commerce 1982). Over 17 years, from 1948 to 1964, the average annual precipitation was 1320 mm (52 in.); the maximum amount was 1780 mm (70 in.), and the minimum amount was 790 mm (31 in.) (Lackschewitz 1970).

- c. **Local microclimate:** Lesquerella humilis occurs generally on open, exposed sites with a southerly or westerly aspect. These sites usually have low winter snow cover and, during the growing season, are warmer and drier relative to other microsites on these peaks.

2. **Air and water quality requirements:** Unknown.

3. **Physiographic province:** The range of Lesquerella humilis lies along the boundary of the Rocky Mountain and Idaho batholith provinces of the Rocky Mountain System (Hunt 1974).
4. **Physiographic and topographic characteristics:** The Bitterroot Range escarpment is a fault block at the eastern edge of the Idaho batholith. The latter is a granitic mass which is faintly gneissic in character.

The populations occur on level to moderately steep slopes at elevations of 2685 to 2925 m (8800 to 9590 ft.). The sites are on heights of land between tributary streams of the Bitterroot River within hydrologic unit 17010205 of the U.S. Geological Survey (1980).

5. **Edaphic factors:** Lesquerella humilis occurs on poorly developed, sandy or stony soils derived from metamorphic bedrock. No analyses of soil characteristics have been done. The St. Mary and St. Joseph massifs consist of high grade metamorphic rocks, mostly gneiss and schist, locally penetrated by granitic rocks (Lackschewitz 1970, 1986; Ross et al. 1955). Although appearing largely granitic in character, the rocks on St. Mary Peak are slightly reddish-orange in color, and the St. Joseph Peak massif is similarly colored. Lesquerella humilis is restricted to this area, but it is not known whether this restriction is strictly edaphic in nature.
6. **Dependence of this taxon on natural disturbance:** Lesquerella humilis is associated with open sites that are exposed to strong winds. Consequently, these sites are sparsely vegetated with little soil development. Steeper sites may also be subject to some disturbance from soil creep or solifluction.
7. **Other unusual physical characteristics:** None observed.

C. Biological characteristics

1. **Vegetation physiognomy and community structure:** Lesquerella humilis occurs in Pinus albicaulis (white-bark pine) krummholz and in sparse communities of low herbs and dwarf shrubs above timberline.
2. **Regional vegetation types:** The sites occupied by Lesquerella humilis occur in the ecotone between subalpine forest and alpine tundra, and often do not fit well into schemes that focus on larger, modal units. The sites occur in the Rocklands and Mixed High Elevation Vegetation unit of Ross and Hunter (1976). Daubenmire (1978) places the sites in the upper timberline portion of the Central Section, Picea engelmannii Province, Subarctic-Subalpine Forest Region. The lower altitude portions of the sites fit the Pinus albicaulis habitat type (Pfister *et al.* 1977). The sites also are within the Douglas-fir Section, Rocky Mountain Province of Bailey (1976), and the Alpine Meadows and Barren type of Kuchler (1964).
3. **Frequently associated species:** Frequently associated species include:

Antennaria rosea (Rosy pussy-toes)
Arenaria obtusiloba (Arctic sandwort)
Astragalus kentrophyta var. implexus
 (Thistle milkvetch)
Dicentra uniflora (Steer's-head)
Douglasia montana (Douglasia)
Draba spp. (Draba)
Dryas octopetala (White dryas)
Erigeron simplex (One-flower fleabane)
Eritrichium nanum (Pale alpine forget-me-not)
Geum rossii (Ross's avens)
Haplopappus lyallii (Lyall's goldenweed)
Hulsea algida (Alpine hulsea)
Ivesia gordonii (Gordon's Ivesia)
Ledum glandulosum (Labrador tea)
Pedicularis contorta (Coiled-beak lousewort)
Phlox hoodii (Hood's phlox)
Phlox pulvinata (Cushion phlox)
Phyllodoce empetriformis (Red mountain-heath)

Phyllodoce glanduliflora (Yellow mountain-heath)

Pinus albicaulis (White-bark pine)

Sedum lanceolatum (Lance-leaved stonecrop)

Smelowskia calycina (Alpine smelowskia)

Veronica cusickii (Cusick's speedwell).

4. **Dominance and frequency of the taxon:** The total rangewide population size of Lesquerella humilis is about 2400 plants, divided among three populations of 900, 800, and 700 plants each. The plants are generally sparsely distributed. Canopy cover of the populations is low and they occur in plant communities which also have low total cover.
5. **Successional phenomena:** Lesquerella humilis occurs in open communities that are relatively stable. Although these communities may be regarded as early successional, change will be slow over the next several decades and will not likely affect habitat suitability for L. humilis for a long time. Climatic change, such as global warming, or other changes that would increase vegetation cover on these sites, would probably affect the populations negatively.
6. **Dependence on dynamic aspects of biotic associations and ecosystem functions:** Unknown.
7. **Other endangered, threatened, rare, or vulnerable species occurring in habitat(s) of this taxon:** The following species occur in the vicinity of the St. Mary Peak site (001) for Lesquerella humilis in the Bitterroot Mountains:

Bryoria subdivergens (Dahl) Brodo & D. Hawksw. - a lichen listed as "imperiled globally" (G2) and "critically imperiled in Montana" (S1) by the Montana Natural Heritage Program (Shelly 1990).

Draba daviesiae (C.L. Hitch.) Rollins and Penstemon flavescens Pennell - both are of limited geographic distribution in Montana. They were formerly species of special concern in the state.

However, they have been found to be frequent and locally abundant within a limited geographic area in the Bitterroot Mountains.

7. Population biology of the taxon

A. **General summary:** The three known populations of Lesquerella humilis occur in the Bitterroot Mountains of western Montana and total about 2400 plants. The population on East St. Joseph Peak (002) is the largest with about 900 plants. The population on St. Mary Peak (001) contains about 800 plants and that on St. Joseph Peak (003) contains about 700 plants.

B. Demography

1. **Known populations:** The three known populations of Lesquerella humilis total about 2400 plants. All three were visited in 1990 and population size estimates were made.

2. General demographic details:

a. St. Mary Peak (001)

1. Area occupied by population: ca. 35 acres.
2. Estimated number of individuals: ca. 800.
3. Density: Sparsely scattered.
4. Presence of dispersed seeds: Unknown.
5. Evidence of reproduction: 5% of plants in flower and 85% fruiting on 17 July 1990.
6. Evidence of population expansion or decline: Currently reported population size and area are larger than previously reported in 1987. It is unlikely that the population has expanded that much in three years; the area and population size reported in 1987 was probably incomplete.

b. East St. Joseph Peak (002)

1. Area occupied by population: ca. 15 acres.

2. Estimated number of individuals: ca. 900 plants in 3 subpopulations.
 3. Density: Unknown.
 4. Presence of dispersed seeds: Unknown.
 5. Evidence of reproduction: Most plants flowering and fruiting on 28 August 1990.
 6. Evidence of population expansion or decline: Additional subpopulations located in 1990 raised the total number from 200-400 to 900 plants.
- c. St. Joseph Peak (003)
1. Area occupied by population: ca. 20 acres.
 2. Estimated number of individuals: ca. 700.
 3. Density: Sparsely scattered.
 4. Presence of dispersed seeds: Unknown.
 5. Evidence of reproduction: 5% of plants with mature fruit and 60% dispersing seed on 29 August 1990.
 6. Evidence of population expansion or decline: The 1971 estimate was ca. 1000 plants but it is unclear that the population has declined.

C. Phenology

1. Patterns: Lesquerella humilis is in bloom from late June to mid-July, with some variation depending on climatic conditions and exposure. Fruiting extends from early July through the end of August.
2. Relation to climate and microclimate: Details are unknown.

D. Reproductive biology

1. Types of reproduction: The flowers of L. humilis are chasmogamous (with conspicuous corollas, normally open for fertilization). Cross-pollination and self-incompatibility are the norm for the genus (Rollins and Shaw 1973), although self-compatibility is also present in at least some species. In an alpine species such as L. humilis, self-pollination may be more prevalent, owing to

the short growing season. Most populations of Lesquerella are in open habitats, with the plants aggregated together. No evidence of vegetative reproduction has been observed.

2. Pollination

- a. **Mechanisms:** Rollins and Shaw (1973) report that "(i)n the field, insects, mostly bees and flies, were repeatedly observed visiting the flowers" of Lesquerella. During field surveys, no insects have been observed visiting the few individuals of L. humilis that were flowering.
- b. **Specific known pollinators:** Unknown.
- c. **Other suspected pollinators:** Unknown.
- d. **Vulnerability of pollinators:** Unknown.

3. Seed dispersal

- a. **General mechanisms:** Each fruit of L. humilis is capable of producing four seeds, although usually only one ovule develops in each locule, resulting in two seeds per fruit (Rollins 1984). The seeds are wingless, and about 2 mm (0.08 in.) in diameter (Rollins 1984). There does not appear to be any mechanism that might aid in long-distance dispersal. Thus, it is likely that most seeds fall near the parent plants.
- b. **Specific agents:** None known.
- c. **Vulnerability of dispersal agents and mechanisms:** Unknown.
- d. **Patterns of propagule dispersal:** Unknown.

4. Seed biology

- a. **Amount and variation of seed production:** Details unknown. Field observations indicate vigorous fruit set, with an estimated 60-85% of plants producing and dispersing seed in 1990.

- b. Seed viability and longevity: Unknown.
 - c. Dormancy requirements: Unknown.
 - d. Germination requirements: Unknown.
 - e. Percent germination: Unknown.
5. Seedling ecology: Unknown.
6. Survival and mortality: Unknown.
7. Overall assessment of taxon's reproductive success: The large percentage of flowering and fruiting plants observed in 1990 suggests a good reproductive potential. The differences in plant numbers between 1987 and 1990 are due to the discovery of additional subpopulations and are also likely due to normal errors of estimation. Thus, the populations are probably stable, although continued monitoring will be needed to confirm this. The restriction of L. humilis to three locations, while other apparently suitable habitat exists in the immediate area, suggests that it does not disperse or establish new populations readily. However, this restriction may be related to edaphic factors as mentioned above (I.6.B.5).
8. Population ecology of the taxon
- A. General summary: Lesquerella humilis occurs in sparsely vegetated areas of upper subalpine krummholz and alpine tundra above upper treeline. Plant cover in these communities is low and there appears to be little intraspecific or interspecific interaction which suggests that L. humilis is intolerant of competition. No evidence of grazing, diseases or other negative interactions has been observed.
 - B. Positive and neutral interactions: None known.
 - C. Negative interactions
 1. Herbivores, predators, pests, parasites and diseases: None known.

2. Competition

- a. **Intraspecific:** Individual plants of Lesquerella humilis are usually sparsely distributed and thus, there is probably little competition among them.
- b. **Interspecific:** Lesquerella humilis grows in open areas with little vegetation cover or shade which suggests that it is largely intolerant of competition from other plants. In a few cases, however, plants were observed growing among small mats of associated vegetation. These situations may arise from the suitability of such microsites for seed germination.

D. Hybridization

1. **Naturally occurring:** None known.
2. **Artificially induced:** None known.
3. **Potential in cultivation:** Unknown.

E. Other factors of population ecology: None known.

9. Current land ownership and management responsibility

A. General nature of ownership: United States Government.

B. Specific landowners:

U.S. Department of Agriculture, Forest Service
Bitterroot National Forest
316 N. Third Street
Hamilton, MT 59840

C. Management responsibility: same as ownership above.

D. Easements, conservation restrictions, etc.: The three sites where Lesquerella humilis occurs are largely within the Selway-Bitterroot Wilderness Area which provides some protection from disturbance due to resource exploitation. The St. Mary Peak site (001) is within a proposed Special Interest Area (Evenden 1990). The primary purposes for the SIA "are 1) to provide public

education regarding the unique botanical features of the area, 2) to emphasize the potential of the area for research, observation and study, and 3) to provide additional administrative protection for the area" (Evenden 1990).

10. Management practices and experience

A. Habitat management

1. Review of past management and land use experience

- a. Lesquerella humilis: Recreational use probably is currently having an impact on L. humilis at the St. Mary Peak site (001). Trail #116 traverses the south-facing slope of St. Mary Peak through the southeastern portion of the population and then ascends to the summit, in a series of switchbacks, along the northeastern edge of the population. However, once the trail reaches an elevation of 2685 m (8800 ft.), which is the lowermost limit of the L. humilis population, some off-trail hiking directly to the summit is occurring. This use is possibly leading to impacts on the main portion of the population.

The East St. Joseph (002) and St. Joseph Peak (003) sites are not currently accessible via maintained trails. However, some recreational use undoubtedly occurs in these areas, which might lead to minor impacts on the populations. Other resource management impacts are not known at this time.

- b. **Related taxa:** None known.
- c. **Other ecologically similar taxa:** Not reviewed.
2. **Performance under changed conditions:** Not applicable.
3. **Current management policies and actions:** Lesquerella humilis is included on the U.S. Forest Service list of sensitive plants for Region 1 (Reel et al. 1989). As such, it

receives protection under U.S. Forest Service management policies. Additionally, all three sites occur within the Selway-Bitterroot Wilderness Area and the St. Mary Peak site (001) is included in a proposed botanical Special Interest Area (Evenden 1990).

4. **Future land use:** Current public use will likely continue. Designation of the St. Mary Peak site as a Special Interest Area would provide additional administrative protection.

B. Cultivation

1. **Controlled propagation techniques:** None known.
2. **Ease of transplanting:** Not known.
3. **Pertinent horticultural knowledge:** Not reviewed.
4. **Status and location of presently cultivated material:** No cultivated material known.

11. Evidence of threats to survival

- A. **Present or threatened destruction, modification, or curtailment of habitat or range**
 1. **Past threats:** Recreational use of the trail to the summit of St. Mary Peak has probably affected the population of L. humilis.
 2. **Existing threats:** Current recreational use by hikers is a threat to all three populations but is greatest on St. Mary Peak where a formal trail exists.
 3. **Potential threats:** Continued recreational use could further threaten the populations.
- B. **Overutilization for commercial, sporting, scientific, or educational purposes:** No threats known.
- C. **Disease, predation, or grazing:** No threats known.

D. **Inadequacy of existing regulatory mechanisms:**
There are currently no state laws that provide protection for rare or endangered plants in Montana.

E. **Other natural or man-made factors:** None known.

II. ASSESSMENT AND RECOMMENDATIONS

12. **General assessment of vigor, trends, and status:**
Lesquerella humilis is known from only three sites in a small area of the Bitterroot Mountains in western Montana. The total rangewide population size is about 2400 plants. Based on limited observations, the populations appear to be stable. Recreational use by hikers is probably affecting the St. Mary Peak population to some extent. No other threats are currently apparent.

13. Recommendations for listing or status change:

A. **Recommendations to U.S. Fish and Wildlife Service:**
On the basis of current information contained in this status report, it is recommended that Lesquerella humilis be retained in Category 2. Although the populations are not under immediate threat, the three populations are in a small area and the total rangewide population size (2400 plants) is not large. Population trends are not clear and continued monitoring is needed.

B. **Recommendations to other U.S. federal agencies:**
Lesquerella humilis has been placed on the sensitive species list for Region 1 of the U.S. Forest Service. This designation should be retained. The proposal for the botanical Special Interest Area on St. Mary Peak should be approved as soon as possible. Trail location and use on St. Mary Peak should be evaluated in terms of its impact on the populations of Lesquerella humilis, as well as the associated populations of Penstemon flavescens and Draba daviesiae.

C. Other status recommendations

1. **Counties and local areas:** No recommendations.

2. **States:** Lesquerella humilis should be retained on the Montana Natural Heritage Program list of plant species of special

concern and should retain its S1 rank ("critically imperiled in Montana because of extreme rarity") (Shelly 1990).

3. **Other nations:** Not currently pertinent.
4. **International:** Not currently pertinent.
14. **Recommended critical habitat:** No recommendation at this time.
15. **Conservation/recovery recommendations**

A. General conservation recommendations

1. **Recommendations regarding present or anticipated activities:** The impact of recreational use on the Lesquerella humilis populations should be monitored, especially on St. Mary Peak.
2. **Areas recommended for protection:** Lesquerella humilis currently receives some protection by being listed as a sensitive species for Region 1 of the U.S. Forest Service, and by occurring in the Selway-Bitterroot Wilderness Area. The proposed Special Interest Area for St. Mary Peak should be established to provide additional protection for that population.
3. **Management and recovery recommendations:** Any future proposed trail construction or other developments for St. Joseph Peak or East St. Joseph Peak should be carefully planned, to reduce or eliminate impacts to the populations of L. humilis. These locations should be checked every three to five years, in order to detect any major declines in population size, or impacts should recreational use of these areas increase.

Permanent monitoring transects (@.g. Lesica 1987) should be used to assess the impacts of recreational use on the population on St. Mary Peak (001). Plot studies in locations away from the trail, as well as within the area currently being used, could reveal any reduction in numbers that might be occurring.

4. **Publicity sensitivity:** Low.

5. **Other recommendations:** Little is known of many aspects of the population biology of Lesquerella humilis, including population size and reproductive trends, reproductive and pollination biology, and seed and seedling biology. Studies on these aspects should be done to better assess the status of this rare species (Menges 1986). Dara Newman, Division of Biological Sciences, University of Montana, has begun a graduate thesis project on Lesquerella humilis. She has established study transects on St. Mary and East St. Joseph peaks, and should be able to provide information on these inadequately-known aspects.

16. **Interested parties:**

U.S. Fish and Wildlife Service
ATTN: Dr. James Miller
Office of Endangered Species
P.O. Box 25486
Denver Federal Center
Denver, CO 80225

U.S. Fish and Wildlife Service
ATTN: Mr. Scott Jackson
Federal Building, 301 S. Park
P.O. Box 10023
Helena, MT 59626

U.S. Fish and Wildlife Service
ATTN: Dr. John Fay
Office of Endangered Species
Washington, D.C. 20240

U.S. Forest Service, Region 1
ATTN: Dr. Angela Evenden
Federal Building
P.O. Box 7669
Missoula, MT 59807

The Nature Conservancy
ATTN: Dr. Larry Morse
1815 North Lynn Street
Arlington, VA 22209

The Nature Conservancy
ATTN: Dr. Joan Bird
Montana Field Office
P.O. Box 258
Helena, MT 59624

Montana Natural Heritage Program
 State Library Building
 1515 East Sixth Avenue
 Helena, MT 59620

III. INFORMATION SOURCES

17. Sources of information

A. Publications

1. References cited in report: See Literature Cited.
2. Other publications/sources:

Shelly, J.S. 1988. Status review of Lesquerella humilis. Unpublished report to U.S. Forest Service - Region 1, Bitterroot National Forest, Montana. 30 pp.

- B. Museum collections: Specimens from the three populations are deposited at MONTU and GH. The following specimens are known from the three populations:

St. Mary Peak (001)

Lackschewitz (4560) - MONTU
Lackschewitz & Schaack (4944) - MONTU
Pavek (178) - MONTU
Rollins (833000) - GH
Shelly (1381) - MONTU
Woodland and Arno (1077) - MONTU

East St. Joseph Peak (002)

Lackschewitz (2126, #65828) - MONTU

St. Joseph Peak (003)

Lackschewitz (117, #60039) - MONTU
Lackschewitz (#69003) - MONTU

C. Fieldwork**1. Surveys conducted:**

J.S. Shelly (MTNHP): 21-23 July 1987 and 30-31 July 1987; field notes, population surveys, photographs, herbarium specimens.

D. Pavek (MTNHP contractor): 16-17 July 1990; field notes, population survey, herbarium specimen.

D. Newman (University of Montana): 28-29 August 1990; field notes, population survey.

D. Knowledgeable individuals

Klaus Lackschewitz
Division of Biological Sciences
University of Montana
Missoula, Montana 59812

Peter Lesica
Division of Biological Sciences
University of Montana
Missoula, Montana 59812

Dara Newman
Division of Biological Sciences
University of Montana
Missoula, Montana 59812

Diane Pavek
Division of Biological Sciences
University of Montana
Missoula, Montana 59812

Dr. Reed Rollins
The Gray Herbarium
Harvard University
22 Divinity Avenue
Cambridge, MA 02138

J. Stephen Shelly
U.S. Forest Service, Region 1
Federal Building
Box 7669
Missoula, Montana 59807

E. **Other information sources:** Additional information is on file at the Montana Natural Heritage Program office, Helena, MT.

18. **Summary of material on file:** Exact population locations are plotted on topographic maps at the Montana Natural Heritage Program. Field survey forms, field maps, and photographs are also located there. The MTNHP element file contains most of the references cited in the report. The type specimen is deposited at the Gray Herbarium (GH) at Harvard University; other vouchers are at the University of Montana herbarium (MONTU) and at Gray Herbarium.

IV. AUTHORSHIP

19. **Initial authorship:**

Peter L. Achuff
Montana Natural Heritage Program
1515 East Sixth Avenue
Helena, MT 59620
(406) 444-3009

J. Stephen Shelly
U.S. Forest Service, Region 1
Federal Building
Box 7669
Missoula, MT 59807
(406) 329-3041

20. **Maintenance of status report:** The Montana Natural Heritage Program will maintain current information and update the status report as needed. Should the taxon be listed as an endangered or threatened species by the U.S. Fish and Wildlife Service, the Service, through its Office of Endangered Species (Region 6), should maintain the primary information file, encourage others to provide new information, and distribute new findings as received, to the interested parties (sec. II.16).

V. NEW INFORMATION

21. **Record of revisions:** Not currently applicable.

LITERATURE CITED

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- Daubenmire, R. 1978. Plant geography with special reference to North America. Academic Press, New York. 338 pp.
- Dorn, R.D. 1984. Vascular Plants of Montana. Mountain Press Publishing, Cheyenne, Wyoming. 276 pp.
- Evenden, A.G. 1990. Memo to C. Joyner, subject: Proposed St. Mary's Peak Botanical Area. U.S. Forest Service, Missoula, Montana. 5 pp.
- Hunt, C.B. 1974. Natural regions of the United States and Canada. W.H. Freeman and Co., San Francisco, California. 725 pp.
- Kuchler, A.W. 1964. Potential natural vegetation of the conterminous United States. American Geographical Society Special Publication 36.
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- Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana. USDA General Technical Report INT-34. 174 pp.
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- Rollins, R.C. 1984. Studies in the Cruciferae of western North America II. Contr. Gray Herb. 214: 1-18.

- Rollins, R.C., and E.A. Shaw. 1973. The Genus Lesquerella (Cruciferae) in North America. Harvard University Press, Cambridge, Massachusetts. 288 pp.
- Ross, C.P., B.A. Andrews, and I.J. Witkind. 1955. Geologic map of Montana. U.S. Geological Survey, Washington, D.C.
- Ross, R.L., and H.E. Hunter. 1976. Climax vegetation of Montana based on soils and climate. USDA Soil Conservation Service, Bozeman, Montana. 64 pp.
- Shelly, J.S. 1988. Status review of Lesquerella humilis. Unpublished report to U.S. Forest Service - Region 1, Bitterroot National Forest, Montana. 30 pp.
- Shelly, J.S. 1990. Plant species of special concern. Montana Natural Heritage Program, Helena. 20 pp. (mimeo).
- U.S. Department of Agriculture. 1988. Sensitive plant field guide, Region 1. U.S. Forest Service, Northern Region: Range, Air, Watershed and Ecology Unit, Missoula, Montana.
- U.S. Department of Commerce. 1982. Monthly normals of temperature, precipitation, and heating and cooling degree days 1951-80. National Oceanic and Atmospheric Administration, Climatology of the United States No. 81. 23 pp.
- U.S. Department of Interior. 1990. Endangered and threatened wildlife and plants; review of plant taxa for listing as endangered or threatened species; notice of review. Fed. Reg. 50 CFR Part 17: 6184-6229.
- U.S. Geological Survey. 1980. Stream evaluation map, State of Montana. U.S. Government Printing Office, Washington. D.C. Two sheets.
- Visher, S.S. 1954. Climatic atlas of the United States. Harvard University Press, Cambridge, Massachusetts. 403 pp.

APPENDIX A: Element Occurrence Printouts and Maps

Lesquerella humilis

Occurrence number: 001

Global rank: G1 Forest Service status: SENSITIVE LIST
 State rank: S1 Federal Status: C2

Survey site name: ST. MARY PEAK
 EO rank: C
 EO rank comments: RECREATIONAL USE OF HIKING TRAIL IS
 AFFECTING AREA (1990).

County: RAVALLI

USGS quadrangle: SAINT MARY PEAK

Township-range: 009N021W Section: 28 Precision: S
 Township-range comments: SE4NW4,NE4; 21,SW4SE4

Survey date: 1990-07-17 Elevation: 9200
 First observation: 1967 Slope/aspect:
 Last observation: 1990-07-17 Size (acres): 35

Location:

BITTERROOT RANGE, SUMMIT OF SAINT MARY PEAK.

Element occurrence data:

EST. 300-400+ PLANTS, SPARSELY SCATTERED IN AND ABOVE KRUMMHOLZ. 1990:
 800+ PLANTS, MOST MATURE AND WITH IMMATURE FRUIT; VIGOR NORMAL TO
 FEEBLE.

General site description:

1987: ON STEEP HILLSIDES OF METAMORPHOSED ROCKS; ALPINE SLOPES (EAST
 AND SOUTH-FACING), SANDY TO GRAVELLY GRANITIC FELLFIELD SOIL, WITH
 PINUS ALBICAULIS, DRABA SPP., IVESIA GORDONII, ERIGERON SIMPLEX,
 HULSEA ALGIDA, SMELOWSKIA CALYCINA, ERITRICHUM NANUM, DRYAS. 1990:
 ALSO WITH PHLOX HOODII, ARENARIA OBTUSILOBA, PHLOX PULVINATA, LEDUM
 GLANDULOSUM, GEUM ROSII, SEDUM LANCEOLATUM, PEDICULARIS CONTORTA.

Land owner/manager:

SELWAY-BITTERROOT WILDERNESS AREA
 BITTERROOT NATIONAL FOREST, STEVENSVILLE RANGER DISTRICT

Comments:

TYPE LOCALITY, NEWLY DESCRIBED SPECIES (1984); VOUCHERS- ROLLINS,
 R.C., ET AL. (83300), 1983, GH; PAVEK, D. (178), 1990, MONTU; SHELLY,
 J.S. (1381), 1987, MONTU. D. NEWMAN, UNIVERSITY OF MONTANA, IS DOING
 THESIS STUDIES ON THIS AREA.

Information source:

NEWMAN, D. DIVISION OF BIOLOGICAL SCIENCES, UNIVERSITY OF MONTANA,
 MISSOULA, MT 59812.

ELEMENT OCCURRENCE RECORD
Lesquerella humilis

33

Occurrence number: 002

Global rank: G1 Forest Service status: SENSITIVE LIST
State rank: S1 Federal Status: C2

Survey site name: EAST ST. JOSEPH PEAK
EO rank: B
EO rank comments: FRAGILE ALPINE AREA.

County: RAVALLI

USGS quadrangle: SAINT MARY PEAK

Township-range: 010N021W Section: 22 Precision: S
Township-range comments: SE4SE4, SE4SW4; 26NW4

Survey date: 1990-08-28 Elevation: 9000
First observation: 1970 Slope/aspect: 15-35% / SOUTH
Last observation: 1990-08-28 Size (acres): 15

Location:

BITTERROOT MOUNTAINS, EAST ST. JOSEPH PEAK, WITHIN AND BORDERING
SELWAY-BITTERROOT WILDERNESS AREA.

Element occurrence data:

1970: EST. 200-400 PLANTS. 1990: EST. 300 PLANTS CA. 0.25 MILE
NORTHWEST OF SUMMIT; HEALTHY, DENSE POPULATION, IN FLOWER (MANY PLANTS
WITH SEVERAL INFLORESCENCES) AND FRUIT. TWO SUBPOPULATIONS IN FLOWER
AND FRUIT: TO THE WEST, CA. 400 PLANTS, VIGOR FEEBLE TO NORMAL; TO THE
SOUTHEAST, CA. 200 PLANTS, VIGOR FEEBLE.

General site description:

ROCKY FELLFIELD, WITH PHLOX PULVINATA, ARENARIA OBTUSILOBA,
ERITRICHUM NANUM, SMELOWSKIA CALYCINA, ERIGERON SIMPLEX, DRABA
OLIGOSPERMA, DRYAS OCTOPETALA, PHLOX HOODII, PHYLLODOCE EMPETRIFORMIS,
P. GLANDULIFLORA, ANTENNARIA ROSEA.

Land owner/manager:

SELWAY-BITTERROOT WILDERNESS AREA
BITTERROOT NATIONAL FOREST, STEVENSVILLE RANGER DISTRICT

Comments:

NEWLY DESCRIBED SPECIES (1984); VOUCHER-LACKSCHEWITZ, K.H. (2126),
1970, SPECIMEN #65828 UM.

Information source:

NEWMAN, D. DIVISION OF BIOLOGICAL SCIENCES, UNIVERSITY OF MONTANA,
MISSOULA, MT 59812.

Lesquerella humilis

Occurrence number: 003

Global rank: G1 Forest Service status: SENSITIVE LIST
 State rank: S1 Federal Status: C2

Survey site name: SAINT JOSEPH PEAK
 EO rank: B
 EO rank comments: VERY SPARSE, SMALL PLANTS; SPOTTY
 DISTRIBUTION.

County: RAVALLI

USGS quadrangle: SAINT JOSEPH PEAK
 SAINT MARY PEAK

Township-range: 010N021W Section: 28 Precision: S
 Township-range comments: SW4NE4

Survey date: 1990-08-29	Elevation: 9500
First observation: 1966	Slope/aspect: 8-35% / S, SE
Last observation: 1990-08-29	Size (acres): 20

Location:

BITTERROOT MOUNTAINS, SELWAY-BITTERROOT WILDERNESS AREA, ST. JOSEPH
 PEAK.

Element occurrence data:

1971: MORE THAN 1000 PLANTS; SITE IS NOT CURRENTLY ACCESSIBLE BY
 MAINTAINED TRAIL. 1990: CA. 700 PLANTS SPARSELY DISTRIBUTED OVER CA.
 20 ACRES.

General site description:

DRY LEDGE, SOUTH SLOPE; ALPINE ROCKY FELLFIELD, WITH DRABA SPP.,
 DOUGLASIA MONTANA, ERIGERON SIMPLEX.

Land owner/manager:

SELWAY-BITTERROOT WILDERNESS AREA
 BITTERROOT NATIONAL FOREST, STEVENSVILLE RANGER DISTRICT

Comments:

NEWLY DESCRIBED SPECIES (1984); LACKSCHEWITZ, K.H., 1966, SPECIMEN
 #60039, UM; LACKSCHEWITZ & GOUAUX, 1971, SPECIMEN #69003, UM. ROLLINS,
 R.C. 1984. STUDIES IN THE CRUCIFERAE OF WESTERN NORTH AMERICA II.
 CONTRIB. GRAY HERB. 214: 1-18.

Information source:

NEWMAN, D. DIVISION OF BIOLOGICAL SCIENCES, UNIVERSITY OF MONTANA,
 MISSOULA, MT 59812.

