STATUS REPORT ON

Lesquerella macrocarpa

IN SOUTHWESTERN WYOMING

Prepared for the Bureau of Land Management
Wyoming State Office and Rock Springs District

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I. INTRODUCTION

Lesquerella macrocarpa (Large-fruited bladderpod) was originally discovered by Aven Nelson near the Bush Ranch (along Bush Rim) in 1900. A second collection was made in the vicinity by E. Merrill and L. Wilcox in 1901. No additional observations were made for over seventy years, prompting the US Fish and Wildlife Service (USFWS) to list the species as presumed extinct (Ayensu and DeFilipps 1978). In May 1977, Robert Dorn discovered L. macrocarpa near Nelson's type location, confirming that the species was still extant. Subsequent surveys in the Steamboat Mountain and Continental Peak areas of southwestern Wyoming have resulted in the discovery of additional populations (Whiskey Basin Consultants 1981; Marriott 1988).

Due to its limited distribution, Lesquerella macrocarpa is designated by USFWS as a Category 2 (C2) candidate for listing under the Endangered Species Act (US Fish and Wildlife Service 1993). Under Bureau of Land Management (BLM) Manual 6840, the BLM is directed to manage USFWS candidate species in such a manner that these species and their habitats are conserved and to ensure that agency actions do not contribute to the need to list these species as Threatened or Endangered (Willoughby et al. 1992). L. macrocarpa is currently managed as a Special Status plant species by the BLM Rock Springs District (Amidon 1994).

In 1994, the Rock Springs District and Wyoming State Office of the BLM contracted on a cost-share basis with The Nature Conservancy's Wyoming Natural Diversity Database (WYNDD) to conduct field surveys for Lesquerella macrocarpa on public lands in southwest Wyoming. The objectives of this project were to collect information on the biology, distribution, habitat use, population size, and potential threats to this species to be used in guiding management decisions. In addition, existing monitoring plots were resurveyed and demographic and population trend data were collected.

II. METHODS

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

Field surveys were conducted by the author in late May and mid June 1994 (survey routes and collection sites are indicated in

Appendix B). Data on biology, habitat, population size, and management needs were collected using WYNDD plant survey forms (Appendix C). Locations of occurrences were mapped on 7.5' USGS topographic maps. If populations were sufficiently large, voucher specimens were collected for deposit at the RM. Information gathered in the field was entered into the computerized Element Occurrence database of WYNDD.

Three permanent monitoring transects were established in the Bush Rim area by Marriott (1988), following the protocol of Lesica (1987). The transects consisted of a single belt 1 m x 30 m long, subdivided into 30 1 m x 1 m cells. Within each cell, individual plants were mapped and assigned to one of four age classes: seedling (vegetative plants with less than 6 leaves), non-reproducing (vegetative plants with 6 or more leaves), reproducing (plants in flower and fruit), and dead. The number of flowering and fruiting stems per plant was also tallied. This technique generated quantitative data on population size, density, age distribution, and reproductive potential. Baseline data from this transect are included in Appendix D.

III. SPECIES INFORMATION

A. CLASSIFICATION

1. SCIENTIFIC NAME: Lesquerella macrocarpa A. Nels. (Nelson 1902).

2. SYNONYMS: None.

3. COMMON NAME: Large-fruited bladderpod.

4. FAMILY: Brassicaceae (Mustard family).

5. SIZE OF GENUS: Rollins (1993) recognizes 95 species in the genus Lesquerella, all native to North and South America. Ten species and three varieties occur in Wyoming (Dorn 1992).

6. PHYLOGENETIC RELATIONSHIPS: Payson (1922) considered Lesquerella macrocarpa to be a recent derivative of L. ludoviciana (synonym L. argentea), which it resembles in certain technical features of the fruit and ovules. Rollins and Shaw (1973) disagreed with this conclusion, placing L. macrocarpa in the L. prostrata-L. occidentalis group based on its inflated fruits.

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. NATIONAL

a. LEGAL STATUS: Listed as a Category 2 (C2) species by the USFWS (US Fish and Wildlife Service 1993). Category 2 includes taxa for which there is current evidence of vulnerability, but for which USFWS lacks sufficient biological data or field survey information to support a listing proposal. Lesquerella macrocarpa is also designated as a Special Status plant by the Rock Springs District, BLM (Weynand and Amidon 1990; Amidon 1994).

b. HERITAGE RANK: Ranked G2 in The Nature Conservancy's Natural Heritage Network system. As a species, Lesquerella macrocarpa is considered imperiled because of rarity throughout its range (less than 20 extant occurrences are known).

2. STATE

a. LEGAL STATUS: None.

b. HERITAGE RANK: WYNDD ranks this species as S2, indicating that it is imperiled because of rarity in the state of Wyoming (Fertig 1994).

C. DESCRIPTION

1. GENERAL NON-TECHNICAL DESCRIPTION: Lesquerella macrocarpa is a densely silvery-gray pubescent perennial herb with decumbent stems 2-12 inches (5-30 cm) long (Figures 1-2). The basal leaf blades are oval to oblanceolate, 1/4-1 1/4 inches (0.5-3 cm) long, 1/8-3/4 inches (3-20 mm) wide, and petioled. Stem leaves are narrower and stalkless. Flowers have four yellow petals 3/16-1/4 inches (4-7 mm) long. The inflated, globose fruits are 3/16-5/16 inches (4-8 mm) long and borne on recurved stalks. The fruits are slightly hairy on the outer wall and glabrous on the inner surface (Rollins and Shaw 1973; Dorn 1980; Fertig et al. 1994).

2. TECHNICAL DESCRIPTION: Small perennial, densely pubescent; trichomes sessile or on a short stalk, finely granular, rays 4-6, distinct at base, forked or rarely bifurcate. Stems prostrate

to decumbent, simple or branched, 0.5–1.5 dm long. Basal leaves entire or rarely remotely dentate, petiolate, 1.5–3 cm long, blades orbicular to broadly obovate. Cauline leaves elliptical to oblanceolate, entire and obtuse, sessile or the lower with a short petiole, 1–2.5 cm long. Sepals

Figure 1. Line drawing of Lesquerella macrocarpa from Dorn 1980. Illustration by Jane L. Dorn.

5-5.5 mm long, broadly ovate or oblong-elliptic. Petals yellow, ca 7 mm long, blade cuneate or broadly obovate and slightly narrowed to a broad claw. Paired stamens about 5.5 mm long, single stamens 4.5 mm long. Fruiting pedicels stout and sharply recurved, 5-10 mm long. Siliques 5-7 mm long, sessile, subglobose to broadly obovoid, often slightly compressed contrary to the plane of the septum, valves thin and inflated, sparsely pubescent on exterior, glabrous on interior, styles 2-3 mm long, ovules 2-4 per locule, seeds somewhat flattened, neither margined nor winged (adapted from Rollins and Shaw 1973; Rollins 1993).

3. LOCAL FIELD CHARACTERS: Lesquerella macrocarpa can be recognized by its rosette of oval to oblanceolate leaves, and its inflated globe-shaped fruits on recurved stalks. The fruit walls are slightly hairy on the outside and glabrous on the inside.

4. SIMILAR SPECIES: Lesquerella fremontii has smaller fruits that are slightly flattened and densely pubescent on the outer walls and lightly hairy on the inner walls. Other Wyoming species of Lesquerella differ in having linear leaves or fruits borne on ascending or S-shaped fruitstalks. The large fruits of L. macrocarpa resemble those of twinpods (Physaria spp.), but are rounded at the top rather than notched and divided into two balloon-like bladders (Marriott 1988; Dorn 1992; Fertig et al. 1994).

D. SIGNIFICANCE: Over 20 species in the genus Lesquerella have been studied for possible cultivation as an oil-seed crop in the United States. Oils in the seeds and fruits of L. fendleri (a native of arid regions of the southwestern United States) have been found to be rich in hydroxy fatty acids. These acids are similar in quality to those currently available only from imported castor oil. These oils can be used in the production of resins, waxes, plastics, lubricants, soaps, and cosmetics. Residual meal from the seeds also makes a protein-rich livestock feed supplement (Senft 1992). L. macrocarpa may also contain commercial-grade oils and the plant's adaptations to arid climates and barren soils could make it valuable in the development of dryland agriculture in Wyoming (Lichvar and Dorn 1981).

Figure 2. Lesquerella macrocarpa from the southwest slope of Bush Rim, Sweetwater County, Wyoming. Plants are prostrate with numerous flowering and fruiting branches. WYNDD Photograph by W. Fertig.

E. GEOGRAPHICAL DISTRIBUTION

1. RANGE: Lesquerella macrocarpa is endemic to the western rim of the Great Divide Basin in Sweetwater and Fremont counties, Wyoming and the Green River Basin near Opal, Wyoming in Lincoln County (Figure 3). The entire known range of the species occupies an area of less than 25 square miles.

2. EXTANT SITES: Surveys in the early 1980s resulted in the discovery of two primary populations of Lesquerella macrocarpa in the Bush Rim and Continental Peak areas. These two populations have been interpreted as representing either four (Whiskey Basin Consultants 1981) or seven (Marriott 1988) discrete occurrences in the past. Several of these occurrences, however, are based on ambiguous location data or have not been relocated since 1981. A third occurrence was discovered approximately 81 miles southwest of the Bush Rim population by Robert Dorn in 1992. No additional populations were discovered during survey work in 1994.

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

3. HISTORICAL SITES: Nelson (1902) discovered the type population of Lesquerella macrocarpa "near Bush Ranch" in 1900. It is presumed that Nelson's location is the same as the extant Bush Rim population (Occurrence # 002). Merrill and Wilcox also collected L. macrocarpa "45 miles north of Point of Rocks" in 1901 (Payson 1922). Based on mileage, this collection may be from the Continental Peak area.

4. POPULATIONS KNOWN OR ASSUMED EXTIRPATED: Whiskey Basin Consultants (1981) documented a small population of Lesquerella macrocarpa from the bench between Oregon Butte and Continental Peak. This site was surveyed in 1994, but no plants and little potential habitat were observed. Two other reported sites along ridges south of Bush Rim also could not be relocated during 1994 surveys. These populations may be extirpated or did not flower (and thus were unrecognizable) under the drought conditions of 1994.

Figure 3. Wyoming distribution of Lesquerella macrocarpa.

Table 1. Location information for known populations of Lesquerella macrocarpa in southwestern Wyoming.

1. Bush Rim/Steamboat Mountain Area (includes one extensive population (Occ. # 002) and three imprecise satellite populations).

Occurrence # 001
County: Sweetwater.
Legal Description: T24N R102W S35 (SE4) and 36 (SW4).
Latitude: 42° 00' 28" N (centrum).
Longitude: 108° 55' 05" W (centrum).
Elevation: 7760 ft (2365 m).
USGS 7.5' Quad: Monument Ridge.
Location: Rim due east of Blind Canyon along the Continental Divide, about 1.5 miles east of Jack Morrow Creek.

Occurrence # 002 (includes Occ. # 005 listed in Marriott [1988])
County: Sweetwater.
Legal Description: T24N R101W S3 (NW4), 4 (N2 of SW4, SE4 of NW4, & W2 of NE4), 5 (SE4), 7 (NE4 & SW4), 8 (NW4), and 18 (NW4). T24N R102W S1 (SW4), 2 (SE4 of NE4), and 12 (NE4 & SE4 of SE4). T25N R100W S19 (E2), 20 (W2), 29 (NW4), and 30 (N2). T25N R101W S24 (S2 of S2), 25 (E2 & E2 of W2), 35 (SE4 of NE4, SE4 of SW4, & SE4), and 36 (NW4).
Latitude: 42° 05' 40" N (centrum).
Longitude: 108° 50' 10" W (centrum).
Elevation: 7100-7650 ft (2160-2330 m).
USGS 7.5' Quad: Freighter Gap and Monument Ridge.
Location: Southern, western, and northeastern slopes of Bush Rim,

Occurrence # 006
County: Sweetwater.
Legal Description: T25N R101W S20 (S2).
Latitude: 42° 07' 15" N.
Longitude: 108° 53' 55" W.
Elevation: 7400 ft (2255 m).
USGS 7.5' Quad: Monument Ridge.
Location: Middle Hay Bar X Ranch Road, at base of ridge approximat

Occurrence # 007
County: Sweetwater.
Legal Description: T24N R101W S28 (NW4).
Latitude: 42° 01' 45" N.
Longitude: 108° 51' 20" W.
Elevation: 7400 ft (2255 m).

USGS 7.5' Quad: Freighter Gap.
Location: Ridge on east side of Alkali Draw, approximately 0.3 miles east of Freighter Spring.

2. Continental Peak area (includes one extant population (Occ. # 00

Occurrence # 003
County: Fremont.
Legal Description: T27N R100W S27 (NW4), 28 (SE4), and 33 (NE4).
Latitude: 42° 16' 45" N (centrum).
Longitude: 108° 45' 00" W (centrum).
Elevation: 7500-7700 ft (2290-2350 m).
USGS 7.5' Quad: Dickie Springs and Continental Peak.
Location: Bench between Oregon Butte and Continental Peak, approximately 2 air miles northwest of the summit of Continental Peak and 2 air miles south-southeast of Oregon Gulch.

Occurrence # 004
County: Fremont.
Legal Description: T27N R100W S25 (NW4 of SE4).
Latitude: 42° 16' 50" N (centrum).
Longitude: 108° 42' 08" W (centrum).
Elevation: 7560-7600 ft (2300-2320 m).
USGS 7.5' Quad: Continental Peak.
Location: Approximately 1 air mile north-northeast of Continenta

3. Green River Basin, Roberson Creek.

Occurrence # 008
County: Lincoln.
Legal Description: T20N R114W S8 (N2 of SW4).
Latitude: 41° 43' 47" N.
Longitude: 110° 19' 20" W.
Elevation: 6750 ft (2060 m).
USGS 7.5' Quad: Roberson Creek.
Location: 3.5 miles south-southeast of Opal near the headwaters of Roberson Creek.

5. UNVERIFIED/UNDOCUMENTED REPORTS: Hardy (1987) mapped an occurrence of Lesquerella macrocarpa from the vicinity of Rock Cabin Dugway, about 5 air miles northwest of Bush Rim (T25N R102W S23). This site is not reported in any other literature sources nor is it based on known herbarium specimens. This area was not surveyed in 1994 and its authenticity still needs to be confirmed.

6. AREAS SURVEYED BUT SPECIES NOT LOCATED: Surveys in 1994 focus
southern edge of the Great Divide Basin along Delaney Rim and in the vicinity of Table Rock and Bitter Creek, Wyoming. Survey routes are shown in Appendix B.

F. HABITAT

1. ASSOCIATED VEGETATION: Lesquerella macrocarpa typically occurs in sparsely vegetated Gardner saltbush-squirreltail (Atriplex gardneri-Elymus elymoides) communities on barren, fine-textured soils (Figure 4). It is absent from areas dominated by sagebrush or high cover of grasses.

2. FREQUENTLY ASSOCIATED SPECIES:

Allium textile (Textile onion)
Artemisia pedatifida (Birdfoot sagebrush)
Atriplex gardneri (Gardner saltbush)
Atriplex suckleyi (Rillscale)
Camissonia subacaulis (Long-leaf evening- primrose)
Cymopterus acaulis (Plains cymopterus)
Elymus elymoides [Sitanion hystrix] (Squirreltail)
Ipomopsis congesta var. congesta (Ballhead ipomopsis)
Lomatium foeniculaceum (Fennel-leaved desert- parsley)
Musineon divaricatum (Leafy musineon)
Oryzopsis hymenoides (Indian ricegrass)
Phacelia demissa (Intermountain phacelia)
Phlox hoodii (Hood's phlox)
Thelypodiopsis elegans (Elegant thelypody)

3. TOPOGRAPHY: Lesquerella macrocarpa typically occurs on slopes of 0-15° on low hills, knolls and colluvial fans. It is usually absent from ridgetops, summits and mesic draws (Figure 5). Populations may occur on all exposures. Known occurrences range in elevation from 6750-7760 feet (2057-2365 m).

4. SOIL RELATIONSHIPS: Known occurrences of Lesquerella macrocarpa are restricted to extremely fine-textured clays and shales, often with gypsum or bentonite present (Dorn 1980). Soil texture and moisture-retaining capacity may be especially critical in determining the suitability of microsites for seedling establishment (Whiskey Basin Consultants 1981). L. macrocarpa is usually absent from rocky soils, but may occur on fine-textured soils covered by a thin layer of oily-shale rocks.

5. REGIONAL CLIMATE: Average annual precipitation in the range of Lesquerella macrocarpa is 10-12 in (279 mm), with peak levels in April and May. Mean annual temperature is 38-40° F (3.8° C), with mean maximum and minimum temperatures in January of 26° and 5° F (- 3.3° and - 15° C) and mean maximum and minimum temperatures in July of 84° and 47° F (28.8° and 8.3° C) (Martner 1986).

6. LOCAL MICROCLIMATE: Lesquerella macrocarpa populations occur on light-colored, barren substrates on gentle slopes. These sites are exposed to high levels of solar radiation and wind, and are likely to be drier and have higher surface temperatures than adjacent, more highly vegetated, sites.

G. POPULATION BIOLOGY AND DEMOGRAPHY

1. PHENOLOGY: Flowering occurs from mid May to late June, probably depending on spring moisture conditions. Based on field surveys and herbarium specimens, flowering has been documented from 11 May to 29 June. In the drought year of 1994, flowering was at a peak in late May and completely finished in most dry areas by mid June. Mature fruits have been observed from 21 May to 29 June. Fruits probably persist into July, but are not likely to remain as late as September as has been reported (Weynand and Amidon 1990; Fertig et al. 1994).

Figure 4. Habitat of Lesquerella macrocarpa, southwest slope of Bush Rim, Sweetwater County, Wyoming. Plants are located on semi-barren gray shale slopes on low hills at the center of the photograph. WYNDD photograph by W. Fertig.

Figure 5. Position of Lesquerella macrocarpa on the landscape. A. View looking south from Bush Rim near the site of transect # 1. L. macrocarpa plants are restricted to gentle fans and slopes of low hills with sparse vegetative cover and extremely fine-textured clay soils. B. Close-up of a low hill showing the localized distribution of L. macrocarpa. Illustration by W. Fertig.

2. POPULATION SIZE AND CONDITION: There are three main populations of Lesquerella macrocarpa divided into seven subpopulations. Individual occurrences range in area from 2 to approximately 1930 acres. The total area occupied by the species is estimated to be 2079 acres. The four subpopulations in the Bush Rim area account for nearly 97% of the total area occupied by the species.

Anecdotal evidence suggests that population numbers of L. macrocarpa may fluctuate greatly from year to year depending on moisture conditions. Populations initially discovered by Robert Dorn in the drought years of 1977-78 were very small, in one case containing as few as 10 flowering plants (Whiskey Basin Consultants 1981). In contrast, four populations surveyed in 1981 (following the moist summer of 1980) were found to be extremely abundant, ranging in size from 200 to over 46,000 plants (Whiskey Basin Consultants 1981). These populations were also found to contain nearly 30,000 seedlings and first-year (non-reproductive) plants.

Demographic plot data collected in the drought years of 1988 and 1994 support the hypothesis that population numbers fluctuate in response to moisture conditions (Table 2 and Appendix D). Plots sampled in 1988 (following the drought year of 1987) contained 0.23-0.8 flowering and fruiting plants per square meter, and almost no seedlings. These same plots were resurveyed in 1994 (following the wet summer of 1993), and densities of flowering and fruiting plants were found to range from 0.4 to 6.5 plants per square meter. Seedling density was equally low in 1994, however, suggesting that drought conditions were reducing seed germination or seedling survival.

Based on ground surveys and observations of available habitat in 1994, the total population of Lesquerella macrocarpa is estimated at 52,000-52,300 plants. This represents a decline of 38% from the estimate of 83,910 first- and second-year plants derived from 1981 surveys (Whiskey Basin Consultants 1981). When first-year plants are excluded from the 1981 data, however, the population estimates for both years are

approximately equal.

Table 2. Demographic information for known populations of *Lesquerella macrocarpa* in southwestern Wyoming.

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1. Bush Rim/Steamboat Mountain area (Sweetwater County). Divided into four subpopulations:

Occurrence # 001
Area: 80 acres.
Number and age of plants: 7165 first- and second-year plants were estimated to occur at this site in 1981 (Whiskey Basin Consultants 1981). No plants were located during 1994 surveys.
Density: 62 second-year and 27 first-year plants per acre were estimated for this site by Whiskey Basin Consultants (1981).
Presence of dispersed seed: Unknown.
Evidence of reproduction: Plants observed in flower and fruit at this site in 1977, 1978, and 1981.
Evidence of expansion/contraction: No plants have been observed at this site since 1981. Drought conditions in 1994 may have prevented flowering and fruiting. This site should be resurveyed during wetter years to determine if it is still extant.

Occurrence # 002
Area: 1930 acres.
Number and age of plants: Whiskey Basin Consultants (1981) estimated the total size of this population to be 46,119 second-year and 29,544 first-year plants in 1981 (following a wet year in 1980). 1994 surveys placed the population at approximately 50,000 flowering and fruiting plants. Population size estimates are not available for 1988, but demographic plot data from Marriott (1988) suggest a population six to eight times smaller than in 1994 (approximately 6520-11,000 plants).
Density: Based on three demographic monitoring plots, densities ranged from 0.4 to 6.5 plants per square meter in 1994. Sampling of the same plots in 1988 (a drought year) resulted in a density range of 0.23 to 0.8 plants per square meter (Marriott 1988). Plants typically exhibit a non-random, clumped distribution pattern.
Presence of dispersed seed: Broken stem branches bearing 3-6 fruits were often observed on the ground.
Evidence of reproduction: Plants were observed in flower and fruit at this site in 1900, 1978, 1981, 1988, and 1994.
Evidence of expansion/contraction: Density and population monitoring data suggest that populations fluctuate yearly based on moisture conditions. Low densities were observed following a drought year in 1988, while higher

densities and overall numbers were observed in years following wet summers (1981 and 1994). A six to eight-fold increase in density and total numbers was observed between 1988 and 1994.

Occurrence # 006
Area: Unknown.
Number and age of plants: Unknown.
Density: Unknown.
Presence of dispersed seed: Unknown.
Evidence of reproduction: Herbarium records from this site indicate that plants were in flower and fruit in June, 1981.
Evidence of expansion/contraction: This occurrence has not been relocated since 1981.

Occurrence # 007
Area: Unknown.
Number and age of plants: Unknown.
Density: Unknown.
Presence of dispersed seed: Unknown.
Evidence of reproduction: Herbarium records from this site indicate that plants were in flower and fruit in June, 1981.
Evidence of expansion/contraction: This occurrence has not been relocated since 1981.

Total population estimate for Bush Rim/Steamboat Mountain area:
1981: 82,828 (Whiskey Basin Consultants 1981)
1988: 6250-11,0000 (based on comparison of demographic data from Marriott [1988] and 1994 surveys)
1994: 50,000

2. Continental Peak area (Fremont County). Divided into two subpopulations:

Occurrence # 003
Area: 7 acres.
Number and age of plants: 242 first- and second-year plants were estimated to occur at this site in 1981 (Whiskey Basin Consultants 1981). No plants could be located here in 1994.
Density: 29 second-year plants per acre were observed in 1981.
Presence of dispersed seed: Unknown.
Evidence of reproduction: Plants were observed in flower and fruit at this site in 1978 and 1981.
Evidence of expansion/contraction: This occurrence could not be relocated during surveys in May 1994. A small area of suitable habitat is present and should be resurveyed in non-drought years.

Occurrence # 004
Area: 60 acres.
Number and age of plants: 840 first- and second-year plants were estimated to occur at this site in 1981 (Whiskey Basin Consultants 1981). Population size was estimated at 1500-1800 in 1994.

Density: Density was estimated at 11 second-year plants per acre in 1981. Plants occur in a non-random, clumped pattern.
Presence of dispersed seed: Individual fruits and stems bearing 3-6 fruits were observed on the ground during 1994 surveys.
Evidence of reproduction: Plants were observed in flower and fruit in 1981 and 1994.
Evidence of expansion/contraction: Population estimates suggest that L. macrocarpa is stable or increasing slightly at this site. Monitoring data are needed at this site to determine long-term trends.

Total population estimate for the Continental Peak area:
1981: 1082 (Whiskey Basin Consultants 1981)
1994: 1500-1800

3. Roberson Creek area (Lincoln County)

Occurrence # 008
Area: ca 2 acres.
Number and age of plants: Approximately 500 plants were observed in June, 1994. About 15% were observed in flower and 75% in fruit (Juli Crane, personal communication).
Density: Approximately 250 plants per acre, based on observations in 1994.
Presence of dispersed seed: Unknown.
Evidence of reproduction: Plants were observed in flower and fruit in 1992 and 1994.
Evidence of expansion/contraction: No population size estimates are available for this site prior to 1994. Follow-up surveys are needed to determine population trends.

Total population estimate for the Roberson Creek area:
1992: Unknown
1994: 500

Total population estimates for Lesquerella macrocarpa (all sites):

1981: 83,910 (Whiskey Basin Consultants 1981)

1994: 52,000–52,300

Demographic plot data suggest that population size and density are 6 to 8 times greater in 1994 than in 1988 (Marriott 1988).

Based on 1994 surveys, the vast majority of all living Lesquerella macrocarpa plants (approximately 50,000 individuals) are found in the single extensive occurrence along Bush Rim. A smaller population containing 1500-1800 plants was observed north of Continental Peak. The disjunct Roberson Creek occurrence consists of about 500 plants (Juli Crane, Ecotone Environmental Consulting, personal communication).

Populations of Lesquerella macrocarpa are often locally abundant but restricted to specialized microsites of suitable habitat. The plants exhibit a clumped, non-random distribution pattern.

3. REPRODUCTIVE BIOLOGY

a. TYPE OF REPRODUCTION: Lesquerella macrocarpa is a short-lived perennial or biennial that reproduces by seed. Field observations suggest that many plants die after producing fruit. Additional demographic studies (including long-term monitoring of tagged individuals) are needed to determine if the species is strictly monocarpic or can survive to flower and fruit in successive years.

b. POLLINATION BIOLOGY: The pollinator of Lesquerella macrocarpa is unknown. The plant's yellow flowers are likely to attract flies or other small insect pollinators (Whiskey Basin Consultants 1981).

c. SEED DISPERSAL AND BIOLOGY: The seeds of Lesquerella macrocarpa are somewhat flattened but lack wings or other structures to facilitate dispersal (Rollins 1993). In 1994 numerous plants were observed with dehiscent fruiting branches bearing 3-6 mature fruits. It is possible that the entire branch serves as the dispersal agent (being carried to new locations by the wind). This type of dispersal could account for the clumped distribution pattern exhibited by seedlings and young plants.

Germination requirements of the seeds are unknown. Due to the rigors of its desert habitat, it is likely that the seeds of L. macrocarpa remain dormant for one to several years, only germinating during wetter springs (Whiskey Basin Consultants 1981).

H. POPULATION ECOLOGY

1. GENERAL SUMMARY: Lesquerella macrocarpa is restricted to extremely fine-textured clay and shale slopes and low hills with low vegetative cover. Populations may be locally abundant during favorable years with adequate spring moisture, but may decline significantly during drought years (especially after successive dry years).

2. COMPETITION: Lesquerella macrocarpa is often locally dominant on microsites of suitable habitat with low total vegetative cover. Preliminary demographic data from 1988 and 1994 suggest that populations with higher densities may contain smaller individual plants. L. macrocarpa is rarely found on adjacent areas with higher cover of bunchgrasses or sagebrush, suggesting that it is intolerant of shading or competition with other species on less extreme sites.

3. HERBIVORY: Leaves, stems, and inflorescences of Lesquerella macrocarpa showed little to no evidence of herbivory by livestock, native grazers, or insects in 1994. Fruits and seeds may be preyed upon by insects and rodents.

4. HYBRIDIZATION: There is no field nor experimental evidence to suggest that Lesquerella macrocarpa hybridizes with other members of its genus.

I. LAND OWNERSHIP

1. BLM: With the exception of two sections of state land (listed below), the entire range of Lesquerella macrocarpa occurs on lands managed by the BLM Rock Springs District. The Bush Rim and Continental Peak populations are located within the Green River Resource Area, while the Roberson Creek population is found in the Kemmerer Resource Area.

2. STATE OF WYOMING: Lesquerella macrocarpa has been documented from two state sections in the Bush Rim area (T24N R102W S36 and T25N R101W S36).

3. PRIVATE: No occurrences of Lesquerella macrocarpa have been the BLM checkerboard near the Roberson Creek population.

IV. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. POTENTIAL THREATS TO CURRENTLY KNOWN POPULATIONS: A small geog years. The following potential threats were observed during field surveys in 1994 or have been reported in the literature:

1. RECREATIONAL ACTIVITIES: Trampling by off-road vehicles may result in direct mortality of individual plants and lead to soil compaction and erosion. The amount of damage, however, is probably dependent on the degree of use. Plants are able to become established on the open edges of two-tracks that receive relatively little vehicle traffic. Plants do not, however, appear to become established on roads that are regularly bladed or receive high use. There is no evidence to suggest that disturbances (such as those associated with road-building) are required for maintenance of Lesquerella macrocarpa habitat (Marriott 1988).

2. WILD HORSES: Trampling by wild horses has been suggested as a threat by Dorn (1980) and Whiskey Basin Consultants (1981). Plants were reported as "severely trampled" at the Continental Peak site in 1981 (Whiskey Basin Consultants), but follow-up surveys at this same location in 1994 indicated that the population had either recovered or was not seriously impacted. Studies of wild horse activity in the Bush Rim area suggest that horse use of Lesquerella macrocarpa habitat is lowest in late spring and early summer during the plant's short flowering and fruiting period (Richard Miller, letter to R. Lichvar of The Nature Conservancy, postmarked 18 October 1979).

3. GRAZING: Cattle grazing occurs in the vicinity of the Bush R is relatively minor due to the low amount of forage and lack of water. Trampling by livestock is a possible threat.

4. MINERAL DEVELOPMENT: Construction associated with the discov testing seismic lines may also be a threat.

B. MANAGEMENT PRACTICES AND RESPONSE: No experimental data exist on the response of this species to management actions, such as prescribed burning or herbicide treatment. Observations in 1994 suggest that Lesquerella macrocarpa is not seriously impacted by grazing, although it could be negatively affected by trampling. The absence of plants in heavily-used roadbeds in suitable habitat suggests that road construction and trampling by vehicles is a negative impact. Long-term response to off-road vehicle trampling is unknown.

C. CONSERVATION RECOMMENDATIONS

1. RECOMMENDATIONS REGARDING PRESENT OR ANTICIPATED ACTIVITIES: Establishment of additional roads and two-tracks should be discouraged in Lesquerella macrocarpa habitat. Well pads, roads, and other structures associated with oil and gas development should be located off-site of occupied L. macrocarpa habitat. Salt blocks and water tanks should not be placed in occupied habitat in order to minimize trampling by livestock.

2. NOTIFICATION OF BLM PERSONNEL OF LOCATIONS ON BLM LANDS: To prevent inadvertent impacts to known populations, all appropriate BLM personnel involved in planning and on-the-ground land management activities should be provided with location data for Lesquerella macrocarpa. It is especially important that agency minerals, engineering, and range staff know precise locations so that disturbances can be avoided.

3. AREAS RECOMMENDED FOR PROTECTION: Populations of Lesquerella macrocarpa in the Bush Rim and Continental Peak areas are recommended for protection from surface disturbance activities in the preferred alternative of the draft Green River Resource Area Management Plan (USDI Bureau of Land Management 1992). Known populations would be closed to the location of new mining claims, off-road vehicle travel, use of explosives and blasting, and surface disturbance activities associated with mineral development and road,

pipeline, and powerline construction. Some habitat may be protected within the proposed Steamboat Mountain ACEC and the proposed Red Desert Special Management Area (USDI Bureau of Land Management 1992).

D. STATUS RECOMMENDATIONS: Lesquerella macrocarpa should continue to be listed as a C2 candidate by USFWS and as a Special Status plant species by the Rock Springs BLM. Although not immediately threatened with extinction solely due to development pressures, the fluctuating population size of the species makes it unusually vulnerable to local, human-induced threats during drought years. Sufficient areas of habitat need to be maintained in relatively undisturbed condition to ensure that the species can survive periodic population declines associated with adverse climatic conditions. Follow-up surveys should be conducted periodically in potential habitat in the Great Divide Basin and the western Green River Basin to determine population trends and possibly locate unknown occurrences. Such surveys should be done in both drought and wet years. Listing as Threatened or Endangered may be necessary if sufficient conservation measures are not taken to ensure the protection of adequate habitat.

The BLM Wyoming State Office should list Lesquerella macrocarpa as a state Sensitive species and develop appropriate management strategies to ensure that actions by agency personnel do not contribute to the further endangerment of the species and the subsequent need for listing under the Endangered Species Act.

E. SUMMARY: Lesquerella macrocarpa is endemic to southwestern Wyoming. It is currently listed as a C2 candidate by USFWS and is managed as a Special Status plant species by the BLM Rock Springs District. Based on surveys from 1977-1994, L. macrocarpa is only known from three main locations, covering a total area of less than 2100 acres. These locations are primarily on BLM lands on the western rim of the Great Divide Basin (Bush Rim and Continental Peak areas) and in the western Green River Basin (Roberson Creek, 3.5 miles south of Opal). L. macrocarpa is restricted to barren, low hillsides of fine-textured clay in sparsely vegetated Gardner saltbush-squirreltail communities. Preliminary demographic monitoring data support past observations that populations are often locally abundant in favorable years, but may be greatly reduced

during drought years. Surveys in 1994 suggest that the population currently numbers about 52,000 individuals. This represents a sizeable increase from the drought year of 1988, but down from projections made in the wet year of 1981. Trampling by off-road vehicles and other surface-disturbing activities (such as road construction) are probably the main threats to the species. These threats are most significant during drought years when populations are naturally at a low level. Two of the three main populations are recommended for protection from many human-induced threats in the preferred alternative of the draft Green River Resource Area Management Plan. Follow-up surveys and continued study of established demographic plots are recommended to determine population trends of the species. L. macrocarpa should remain a C2 candidate and be officially designated as a Sensitive species by the BLM Wyoming State Office.

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Appendix A.

Element Occurrence Records

and

Population Maps

for *Lesquerella macrocarpa*

Appendix B.

1994 Survey Routes

Appendix C.

Special Plant Survey Form

WYNDD

Appendix D.

Monitoring Data, 1994

Lesquerella macrocarpa (Large-fruited bladderpod)

Demographic Monitoring Data

Date: 29 May 1994 Surveyor: Walter Fertig

Transect Locations: (Consult photographs of plot locations in Marriott 1988).

Transect # 1
County: Sweetwater.
Occurrence: EO # 002.
Legal Description: T25N R101W S36 NE4 of NW4.
Orientation: 343° magnetic North.
USGS Quad: Freighter Gap.
Directions: From State highway 28 follow the Oregon Buttes Road south approximately 27 miles to the junction with the Hay Bar X Ranch Road. Continue west on the Hay Bar X Ranch Road about 9 miles to the base of Bush Rim. Turn right onto the two-track on the north side of the road that parallels the base of the rim. Continue northeastward on the two-track for about 0.1 miles. Walk from the road westward toward the base of the rim.

Transect # 2
County: Sweetwater.
Occurrence: EO # 002.
Legal Description: T25N R101W S25 SW4 SE4.
Orientation: 346° magnetic North.
USGS Quad: Freighter Gap.
Directions: From Transect # 1, continue on the same two- track appr slope of Bush Rim. Cross a small draw before reaching the transect site.

Transect # 3
County: Sweetwater.
Occurrence: EO # 002.
Legal Description: T24N R101W S7 NE4 NE4 SW4.
Orientation: 52° magnetic North.
USGS Quad: Monument Ridge.
Directions: From Transect # 1, proceed on the Hay Bar X Ranch Road miles. This road will make two sharp turns where it drops off the southwest end of Bush Rim. Park at the lower turn and proceed due south downslope about 0.1 miles to the transect site on the first small knoll below the rim.

Sampling Method: Three permanent 30 x 1 meter belt transects were established by Marriott (1988). Starting points were marked by orange re-bar and low rock piles. The meter tape formed the baseline and meter sticks framed each 1 x 1 meter

subdivision. 30 contiguous plots were read following the left side of the tape, beginning from the origin. Locations of individual plants were mapped and the number of flowering and fruiting stems per plant was recorded on the map. One of four age classes was assigned to each plant: S (seedling, with less than 6 leaves), N (non-reproducing, with 6 or more leaves), R (reproducing, with flowering or fruiting stems), and D (dead). The number of flowering and fruiting stems per plot was also recorded.

Habitat: All three transects are located on gently sloping hillsides of barren, extremely fine-textured clay with low vegetative cover. The sites are dominated by the Atriplex gardneri-Elymus elymoides vegetation type.

Summary of Results: Populations in transects number 1 and 2 showed a six to eight-fold increase in total number of plants and density between 1988 and 1994. Transect 3 showed little change between the two periods. Total number of flowering and fruiting stems per plant showed a marked increase in transect 1 and 2, but was off sharply in transect 3. The average number of flowering and fruiting stems per plant may be density dependent, but additional monitoring is needed for confirmation.

The accompanying data sheets summarize information collected from transects in 1988 and 1994. Maps of the location of individuals within the transects are included for 1994, but are not available for 1988.

Discussion and Recommendations: Follow-up monitoring should be conducted at this site for the next 3-4 years and thereafter every 2-3 years. Data are needed to determine how quickly populations can rebound from drought years. In addition, yearly monitoring would provide valuable data on reproductive success, seedling establishment, and longevity of individual plants. Periodic monitoring (every 2-3 years) is probably less useful because it would not adequately reflect the "boom-and-bust" population dynamics of the species, possibly resulting in incorrect conclusions being reached on management needs. Additional monitoring sites should be located in the Bush Rim area and at other known occurrences in the future to create a larger data set that will more accurately indicate population size and trends.

Figure 6. Location of monitoring plots (from Marriott 1988)

Figure 6. Location of monitoring plots (from Marriott 1988)

Lesquerella macrocarpa
Transect # 1
Census Data

Date: 29 May 1994
Surveyor: Walter Fertig and Jane Struttmann

Subdiv #	Total #	# S	# N	# R	# D	# Fl/Fr branches	Notes
1	1	0	0	1	0	7	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	1	0	0	1	0	12	
5	5	0	0	5	0	88	Plants appear stressed, wilting.
6	0	0	0	0	0	0	
7	1	0	0	1	0	4	
8	4	0	0	4	0	34	Plants stressed.
9	1	0	0	1	0	25	
10	2	0	0	2	0	31	
11	1	0	0	1	0	8	
12	7	0	0	7	0	52	
13	2	0	0	2	0	13	
14	4	0	0	4	0	46	
15	0	0	0	0	0	0	
16	0	0	0	0	0	0	
17	0	0	0	0	0	0	
18	0	0	0	0	0	0	
19	3	0	0	3	0	16	
20	5	1	0	4	0	13	
21	3	0	0	3	0	25	
22	1	0	0	1	0	11	
23	0	0	0	0	0	0	
24	0	0	0	0	0	0	
25	0	0	0	0	0	0	
26	0	0	0	0	0	0	
27	0	0	0	0	0	0	
28	0	0	0	0	0	0	
29	0	0	0	0	0	0	
30	2	0	0	2	0	22	
Total	43	1	0	42	0	407	

Number of plants per square meter: 1.43

Number of flowering/fruiting stems per square meter: 13.6

Average number of flowering/fruiting stems per reproductive plant: 9.69

% of plots occupied: 53.3%

Codes: S = Seedling (vegetative plant with less than 6 leaves), N = Non-reproducing (vegetative plant with 6 or more leaves), R = Reproductive (with flowers and fruits), D = Dead, Fl = Flowering, Fr = Fruiting.

Lesquerella macrocarpa
Transect # 1
Census Data

Date: 20 June 1988
Surveyor: Hollis Marriott and Dennis Horning (Marriott 1988).

Subdiv #	Total #	# S	# N	# R	# D	# Fl/Fr branches	Notes
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	1	0	0	1	0	12	
5	2	0	1	1	0	8	
6	0	0	0	0	0	0	
7	0	0	0	0	0	0	
8	0	0	0	0	0	0	
9	0	0	0	0	0	0	
10	0	0	0	0	0	0	
11	0	0	0	0	0	0	
12	0	0	0	0	0	0	
13	0	0	0	0	0	0	
14	0	0	0	0	0	0	
15	0	0	0	0	0	0	
16	0	0	0	0	0	0	
17	0	0	0	0	0	0	
18	0	0	0	0	0	0	
19	0	0	0	0	0	0	
20	2	0	0	2	0	12	
21	2	0	0	2	0	11	
22	0	0	0	0	0	0	
23	0	0	0	0	0	0	
24	0	0	0	0	0	0	
25	0	0	0	0	0	0	
26	0	0	0	0	0	0	
27	0	0	0	0	0	0	
28	0	0	0	0	0	0	
29	0	0	0	0	0	0	
30	0	0	0	0	0	0	
Total	7	0	1	6	0	43	

Number of plants per square meter: 0.23

Number of flowering/fruiting stems per square meter: 1.43

Average number of flowering/fruiting stems per reproductive plant: 7.16

% of plots occupied: 13.3%

Codes: S = Seedling (vegetative plant with less than 6 leaves), N = Non-reproducing (vegetative plant with 6 or more leaves), R = Reproductive (with flowers and fruits), D = Dead, Fl = Flowering, Fr = Fruiting.

Lesquerella macrocarpa
Transect # 2
Census Data

Date: 29 May 1994
Surveyor: Walter Fertig and Jane Struttmann

Subdiv #	Total #	# S	# N	# R	# D	# Fl/Fr branches	Notes
1	2	0	0	2	0	4	
2	4	0	0	4	0	14	
3	23	1	14	8	1	28	
4	12	1	1	10	0	33	
5	4	0	0	4	0	34	
6	4	0	1	3	0	21	
7	7	0	2	5	0	23	
8	6	0	2	4	0	30	
9	7	0	1	6	0	32	
10	4	0	2	2	0	16	
11	7	0	2	5	0	13	
12	4	1	0	3	0	21	
13	9	0	2	7	0	36	
14	4	0	1	3	0	34	
15	5	0	0	5	0	41	
16	9	0	4	5	0	18	
17	7	0	2	5	0	14	
18	1	0	0	1	0	4	
19	3	0	1	2	0	4	
20	9	0	1	8	0	44	
21	20	4	3	13	0	67	
22	14	1	0	13	1	114	
23	10	1	2	7	0	65	
24	9	0	2	7	1	60	
25	0	0	0	0	0	0	
26	2	0	0	2	0	7	
27	1	0	0	1	0	11	
28	2	0	0	2	0	18	
29	5	0	1	4	0	21	
30	1	0	0	1	0	13	
Total	195	9	44	142	3	840	

Number of plants per square meter: 6.5

Number of flowering/fruiting stems per square meter: 28.0

Average number of flowering/fruiting stems per reproductive plant: 5.92

% of plots occupied: 96.6%

Codes: S = Seedling (vegetative plant with less than 6 leaves), N = Non-reproducing (vegetative plant with 6 or more leaves), R = Reproductive (with flowers and fruits), D = Dead, Fl = Flowering, Fr = Fruiting.

Lesquerella macrocarpa
Transect # 2
Census Data

Date: 20 June 1988
Surveyor: Hollis Marriott and Dennis Horning (Marriott 1988)

Subdiv #	Total #	# S	# N	# R	# D	# Fl/Fr branches	Notes
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	2	0	0	2	0	25	
4	2	0	0	2	0	17	
5	0	0	0	0	0	0	
6	0	0	0	0	0	0	
7	0	0	0	0	0	0	
8	3	0	0	0	0	72	
9	2	0	0	2	0	14	
10	1	0	0	1	0	22	
11	0	0	0	0	0	0	
12	0	0	0	0	0	0	
13	0	0	0	0	0	0	
14	0	0	0	0	0	0	
15	2	0	0	2	0	3	
16	2	0	0	2	0	64	
17	4	0	0	4	0	58	
18	2	0	1	1	0	47	
19	1	0	0	1	0	14	
20	0	0	0	0	0	0	
21	1	0	0	1	0	3	
22	2	1	0	1	0	5	
23	0	0	0	0	0	0	
24	0	0	0	0	0	0	
25	0	0	0	0	0	0	
26	0	0	0	0	0	0	
27	0	0	0	0	0	0	
28	0	0	0	0	0	0	
29	0	0	0	0	0	0	
30	0	0	0	0	0	0	
Total	24	1	1	22	0	344	

Number of plants per square meter: 0.80

Number of flowering/fruiting stems per square meter: 11.47

Average number of flowering/fruiting stems per reproductive plant: 15.6

% of plots occupied: 40%

Codes: S = Seedling (vegetative plant with less than 6 leaves), N = Non-reproducing (vegetative plant with 6 or more leaves), R = Reproductive (with flowers and fruits), D = Dead, Fl = Flowering, Fr = Fruiting.

Lesquerella macrocarpa
Transect # 3
Census Data

Date: 29 May 1994
Surveyor: Walter Fertig and Jane Struttmann

Subdiv #	Total #	# S	# N	# R	# D	# Fl/Fr branches	Notes
1	1	0	1	0	0	0	
2	0	0	0	0	0	0	
3	3	0	1	2	0	4	
4	0	0	0	0	0	0	
5	0	0	0	0	0	0	
6	0	0	0	0	0	0	
7	2	0	2	0	0	0	
8	0	0	0	0	0	0	
9	0	0	0	0	0	0	
10	1	1	0	0	0	0	
11	0	0	0	0	0	0	
12	0	0	0	0	0	0	
13	0	0	0	0	0	0	
14	0	0	0	0	0	0	
15	0	0	0	0	0	0	
16	0	0	0	0	0	0	
17	0	0	0	0	0	0	
18	3	0	2	1	0	2	
19	0	0	0	0	0	0	
20	0	0	0	0	0	0	
21	0	0	0	0	0	0	
22	0	0	0	0	0	0	
23	0	0	0	0	0	0	
24	0	0	0	0	0	0	
25	0	0	0	0	0	0	
26	0	0	0	0	0	0	
27	0	0	0	0	0	0	
28	0	0	0	0	0	0	
29	1	0	1	0	0	0	
30	1	1	0	0	0	0	
Total	12	2	7	3	0	6	

Number of plants per square meter: 0.40

Number of flowering/fruiting stems per square meter: 0.20

Average number of flowering/fruiting stems per reproductive plant: 2.0

% of plots occupied: 23.3%

Codes: S = Seedling (vegetative plant with less than 6 leaves), N = Non-reproducing (vegetative plant with 6 or more leaves), R = Reproductive (with flowers and fruits), D = Dead, Fl = Flowering, Fr = Fruiting.

Lesquerella macrocarpa
Transect # 3
Census Data

Date: 20 June 1988
Surveyor: Hollis Marriott and Dennis Horning (Marriott 1988)

Subdiv #	Total #	# S	# N	# R	# D	# Fl/Fr branches	Notes
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	3	0	0	3	0	33	
4	0	0	0	0	0	0	
5	0	0	0	0	0	0	
6	0	0	0	0	0	0	
7	0	0	0	0	0	0	
8	4	0	0	4	0	21	
9	2	0	0	2	0	6	
10	0	0	0	0	0	0	
11	2	0	0	2	0	37	
12	0	0	0	0	0	0	
13	2	0	0	2	0	18	
14	0	0	0	0	0	0	
15	0	0	0	0	0	0	
16	0	0	0	0	0	0	
17	0	0	0	0	0	0	
18	0	0	0	0	0	0	
19	0	0	0	0	0	0	
20	0	0	0	0	0	0	
21	0	0	0	0	0	0	
22	0	0	0	0	0	0	
23	3	0	0	3	0	16	
24	0	0	0	0	0	0	
25	0	0	0	0	0	0	
26	0	0	0	0	0	0	
27	0	0	0	0	0	0	
28	0	0	0	0	0	0	
29	0	0	0	0	0	0	
30	0	0	0	0	0	0	
Total	16	0	0	16	0	131	

Number of plants per square meter: 0.53

Number of flowering/fruiting stems per square meter: 4.37

Average number of flowering/fruiting stems per reproductive plant: 8.19

% of plots occupied: 20%

Codes: S = Seedling (vegetative plant with less than 6 leaves), N = Non-reproducing (vegetative plant with 6 or more leaves), R = Reproductive (with flowers and fruits), D = Dead, Fl = Flowering, Fr = Fruiting.

Appendix E.

Slides