DISTRIBUTION OF VASCULAR PLANT SPECIES OF SPECIAL CONCERN AND LIMITED DISTRIBUTION IN THE PRYOR MOUNTAIN DESERT, CARBON COUNTY, MONTANA

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SUMMARY

The Pryor Mountain Desert of southern Carbon County has one of the most unusual floras in Montana. The arid climate and unusual and varied soils provide numerous desert-like habitats that are otherwise unknown in the state. Furthermore, this region lies at the north end of the Bighorn Basin, a broad trough that may have served as a migration route from the Red Desert of southern Wyoming. As a result, numerous species of desert plants reach the northern limit of their range in the Pryor Mountain Desert. Many of these species occur nowhere else in the state. For these reasons, the Pryor Mountain Desert is important for the conservation of biological diversity in the Northern Rocky Mountains region. The purpose of our study was (1) to determine which of the rare plants may be threatened or endangered in the area, (2) locate and map these elements of diversity, and (3) use this information to delineate special management areas that efficiently protect the biological diversity of the region.

We surveyed the 65,000-ha study area for 35 species of vascular plants listed as species of special concern or of limited distribution by the Montana Natural Heritage Program. Efforts were concentrated in areas of high habitat diversity. We mapped locations, estimated population density, and recorded soil and vegetation information for each population observed.

We located nearly 900 populations of target species, including six rare species previously unknown from the area and four species previously unknown from Montana. From these data, we determined that 26 of the 41 target species were common in the study area. We mapped the occurrences of the remaining 15 high-priority species and determined that a special management area located in ca. one township in the Gypsum Creek-Crooked Creek area would protect populations of half of these species. Sensitive plant species may be threatened by exotic weed encroachment, livestock and feral horse grazing, off-road vehicle use, and oil and gas development.

INTRODUCTION

The Pryor Mountain Desert region of southern Carbon County, Montana has one of the most unusual floras in the state (Dorn 1978, Lesica et al. 1984). The arid climate and unusual and varied soils provide desert-like habitats that are otherwise unknown in Montana. Furthermore, this region lies at the north end of the Bighorn Basin, a broad trough that extends south to the Red Desert of southern Wyoming. The Bighorn Basin has undoubtedly been a migrational pathway for desert plants (Dorn 1977). For these reasons, numerous species of desert plants reach the northern limit of their range in the Pryor Mountain Desert (Lichvar et al. 1985). Many of these species occur nowhere else in the state. In addition, at least four species are endemic to limestone-derived substrates in this region.

The Montana Natural Heritage Program lists 24 species of special concern occurring in the Pryor Mountain Desert. In addition, there are 11 species of limited distribution found in the area (Lesica et al. 1984, Lesica and Shelly 1991). Much of the desert below 1980 m (6500 ft) is public land administered by the Bureau of Land Management. Many populations of rare plants occur on these public lands. Although the presence of these plant species in the area has been documented, the size and number of populations has never been assessed. It is necessary to determine which species are truly rare and which are locally common in order to afford protection to those species that are most sensitive. The purpose of this study is to survey BLM lands in the Pryor Mountain Desert and document the presence and size of rare plant populations.

THE STUDY AREA

The Pryor Mountain Desert lies at the north end of the Bighorn Basin in south-central Montana and adjacent Wyoming (Figure 1). It is bordered on the north by the Pryor Mountains, a northwest extension of the Bighorn Mountain Range. The Pryors are a large dome-shaped range rising to nearly 2740 m (9000 ft), composed of Paleozoic sedimentary formations, principally Madison limestone. Numerous canyons incised in the limestone occur on the south slope of the range. The east boundary of the Pryor Mountain Desert is formed by the Bighorn River which has formed a spectacular canyon in the sedimentary formations of the Bighorn-Pryor uplift. The slopes of the Bighorn Mountains rise abruptly on the east side of the River. This portion of the river has been impounded, and it and a strip of land 2-6 miles wide on the west side comprise Bighorn Canyon National Recreation Area administered by the U. S. Park Service. The valley of the Clarks Fork of the Yellowstone River forms the west boundary of the Pryor Mountain Desert. Just to the west of the Clarks Fork is the east slope of the Beartooth Mountains which rise to over 3800 m (12,500 ft). The Pryor Mountain Desert lies in the rain shadow produced by this massive uplift. The southern border of the region is formed by the valley of the Shoshone River in Wyoming.

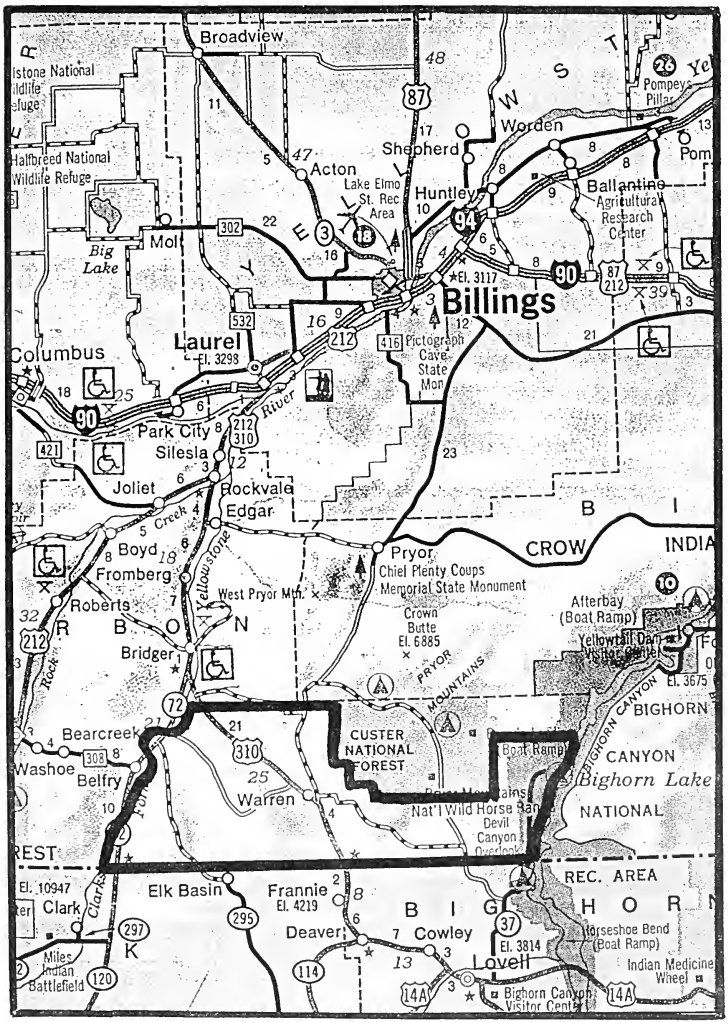

Figure 1. Map of Pryor Mountain Desert study area.

The study area consists of that portion of the Pryor Mountain Desert north of the Wyoming border and below the Douglas fir zone on the south slope of the Pryor Mountains (ca. 1980 m). Lowest elevations are ca. 1220 m (4000 ft) at the southwest end of the study area. We did not conduct surveys on Bighorn Canyon N.R.A. or on private lands within the study area.

The oldest formation outcropping in the study area is the Madison limestone which forms the south slopes of the Pryor Mountains. On more level terrain south of the mountain slopes, younger formations overlie the Madison limestone. These are Paleozoic and late Mesozoic sediments, predominantly sandstones and shales. The red sandstones and siltstones interbedded with thin lenses of gypsum of the Chugwater formation are particularly conspicuous (Richards 1955). A geologic history of the area is provided by Knight et al. (1987).

Soils in the study area are entisols, mollisols and aridisols (Kratz 1988). In general, soils in the northeast portion of the study area are sandy and often calcareous, while those in the south and west portions have a higher clay content and are often saline. Very sandy soils occur locally where they weather from sandstone outcrops. Productivity of the vegetation is low due to the arid climate. As a result, soil development is minimal and organic matter is low. Shallow soils formed over Chugwater sandstone are particularly barren.

Climate of the study area is semi-arid. Bridger, Montana, 16 km (10 miles) north of the west end of the study area at 1100 m (3680 ft), receives an average of 323 mm (12.7 in) annual precipitation, and mean daily temperatures for January and July are -5.8° C (21.5° F) and 21.4° C (70.5° F), respectively (NOAA 1982). Lovell, Wyoming, 16 km (10 miles) south of the east end of the study area at 1160 m (3800 ft), receives an average of 180 mm (7.1 in) precipitation annually. Daily temperatures averaged -4° C (16.8° F) in January and 22.0° C (71.8° F) in July (Knight et al. 1987). Spring and early summer rainfall accounts for two-thirds of the annual precipitation, the balance coming as snow (Knight et al. 1987).

METHODS

We conducted our surveys on 20-24 May, 9-13 June, and 23-29 June 1991. In 1990, spring and early summer moisture was average or above average, resulting in a generally good flowering year for most species (Dean Culwell, personal communication). In 1991, there were heavy rains in April, May and June. This above-average precipitation directly following a good year produced an exceptional flowering year for most species. We believe that these conditions allowed us to make a good evaluation of the abundance of species of interest.

We conducted our surveys by walking through an area, moving between canyon bottoms and ridges as much as possible. The study area is large and could not be surveyed entirely and evenly during the time allotted. Thus, we chose to stratify our surveys, giving preference to areas with high topographic and edaphic diversity (Gillison and Brewer 1985). We concentrated our efforts south of the Pryor Mountains in the drainage of the Bighorn River (townships 25, 26, 27, 28). This area is highly dissected with many different soil types. The area west of the mountains in the drainage of the Clarks Fork of the Yellowstone River is a series of parallel valleys with sandy clay and silty soils. We surveyed portions of many of these valleys and found them relatively homogeneous. Most areas were visited only once during the study; however, we did return to areas with exceptional diversity. A map showing the locations of our surveys is in Figure 2.

We located populations of target species on USGS 7.5' topographic maps and recorded the dominant plant species in the immediate area for each population. We used the "feel" method to determine the textural class of the soil (Brady 1974). We also estimated the density of target species plants in 0.5-hectare plots by assigning them into one of three classes: (1) 1-100, (2) 101-1000, and (3) >1000. In this way we obtained estimates of density, soil texture, elevation and vegetation for each population. We recorded only one population of each target species in each quarter-section.

RESULTS

We searched for and recorded information on 35 species of rare plants that were previously known from the Pryor Mountain Desert area. In addition, we discovered six rare species previously unknown from the area, including four species not previously known from Montana. One species, Eriogonum lagopus, is a candidate for listing as a threatened or endangered species by the U.S. Fish and Wildlife Service. A list of these species is provided in Table 1. A list of all vascular plant species encountered in the study area is in Appendix A. We located populations of all but one of the rare species that had previously been found in the area. Although we examined many specimens of Delphinium in the field, we were unable to locate any populations of D. geyeri.

Distribution maps for each species are in Appendix B. Information on location, elevation, vegetation, soil texture and plant density for each population of each species is in Appendix C. The results of our surveys are summarized by species in the following section. The Natural Heritage Program status for each species reflects the most current knowledge, including the results of this survey. The Montana status is taken from Lesica and Shelly (1991) and does not reflect the results of this study.

The Montana State Office of the Bureau of Land Management is currently in the process of establishing a species of special status program (J. Kwiatkowski, personal communication). Species with special status will be given special management considerations. We believe that species that are widespread in the study area with high densities in some parts of the study area should not be given special status by the Bureau of Land Management. These species generally have a revised Heritage Program status of S3. Only species with a very limited distribution or with predominantly low densities in the study area (S1 or S2) should be given special status.

Table 1. Species of special concern and limited distribution in the Pryor Mountain Desert. One asterisk (*) indicates a species previously unknown from the study area; two asterisks (**) indicate a species previously unknown from Montana.

Recommended for BLM Special Status

Astragalus geyeri*	Fabaceae
Astragalus grayi	Fabaceae
Astragalus oreganus	Fabaceae
Camissonia andina	Onagraceae
Camissonia parvula**	Onagraceae
Cleome lutea	Capparaceae
Cryptantha scoparia**	Boraginaceae
Delphinium andersonii*	Ranunculaceae
Delphinium geyeri	Ranunculaceae
Eriogonum salsuginosum**	Polygonaceae
Grayia spinosa	Chenopodiaceae
Leptodactylon caespitosum	Polemoniaceae
Malacothrix torreyi	Asteraceae
Mentzelia pumila	Loasaceae
Nama densum**	Hydrophyllaceae

Not Recommended for BLM Special Status

Artemisia pedatifida	Asteraceae
Artemisia spinescens	Asteraceae
Astragalus chamaeleuce	Fabaceae
Astragalus hyalinus	Fabaceae
Camissonia minor	Onagraceae
Camissonia scapoidea	Onagraceae
Castilleja angustifolia	Scrophulariaceae
Cryptantha cana	Boraginaceae

Table 1. (continued)

Not Recommended for BLM Special Status

Cryptantha flavoculata	Boraginaceae
Erigeron allocotus	Asteraceae
Eriogonum lagopus	Polygonaceae
Gilia inconspicua	Polemoniaceae
Gilia leptomeria	Polemoniaceae
Hymenoxys torreyana	Asteraceae
Ipomopsis pumila	Polemoniaceae
Penstemon laricifolius	Scrophulariaceae
Phacelia ivesiana	Hydrophyllaceae
Physaria acutifolia	Brassicaceae
Platyschkuhria integrifolia	Asteraceae
Sphaeromeria capitata	Asteraceae
Stanleya tomentosa	Brassicaceae
Streptanthella longirostris	Brassicaceae
Townsendia incana	Asteraceae
Townsendia spathulata	Asteraceae
Wyethia scabra	Asteraceae
Xylorhiza glabriuscula	Asteraceae

Artemisia pedatifida Nuttall

Birdfoot Sagebrush

NATURAL HERITAGE PROGRAM STATUS: G4/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: Most of Wyoming and adjacent south-central and southwest Montana

MONTANA DISTRIBUTION: Southern Carbon County and southern Gallatin County

PRYOR MOUNTAINS DESERT DISTRIBUTION: A. pedatifida is abundant below 1525 m (5000 ft) south of the Pryor Mountains near the Wyoming Border and west of the mountains in the Clarks Fork of the Yellowstone Drainage. It is the dominant species in two plant associations. It occurs with Atriplex gardneri in saline clay soils and with Artemisia tridentata, Chrysothamnus nauseosus and Agropyron spicatum in sandy clay soils.

MANAGEMENT RECOMMENDATIONS: Artemisia pedatifida has a limited distribution in Montana, but it is abundant within this small range. It should not be given special status on BLM's Miles City District.

Artemisia spinescens D.C. Eat.

Bud Sagebrush, Spring Sagebrush

NATURAL HERITAGE PROGRAM STATUS: None

MONTANA STATUS: None

GLOBAL DISTRIBUTION: Oregon to Montana, south to California and New Mexico

MONTANA DISTRIBUTION: Southern Carbon and Beaverhead counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Artemisia spinescens is locally common below 1525 m (5000 ft) on the south side of the Pryor Mountains. It generally occurs in sandy soil of alluvial plains, usually with A. tridentata, Atriplex gardneri or A. confertifolia. It is abundant only on soils developed from Chugwater sandstone.

MANAGEMENT RECOMMENDATIONS: This species is widespread and fairly common in the study area. It is probably not sensitive to livestock grazing. Artemisia spinescens should not be given special status on the BLM's Miles City District.

Astragalus chamaeleuce Gray

Cicada Milkvetch, Ground Milkvetch

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Threatened

GLOBAL DISTRIBUTION: South-central Montana, south to Utah, Wyoming and Colorado

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Astragalus chamaeleuce is widespread below 1555 m (5100 ft) south of the Pryor Mountains; however, populations are generally small and sparse (usually fewer than 100 plants). The species occurs in sandy, silty or sandy clay soils principally in plant associations dominated by Artemisia tridentata, although a few populations occur in Utah juniper open woodland.

MANAGEMENT RECOMMENDATIONS: Although A. chamaeleuce is uncommon in the Pryor Mountain Desert due to the low density of plants, there is no evidence that it is sensitive to grazing, and it is widespread enough that other management activities could impact only a small proportion of the total population in the study area. It should not be given special status on BLM's Miles City District.

Astragalus geyeri Gray

Geyer's Milkvetch

NATURAL HERITAGE PROGRAM STATUS: G5/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Southeast Oregon to California, east through southern Idaho to Montana, Wyoming, Utah and Colorado.

MONTANA DISTRIBUTION: Dawson, Garfield and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Astragalus geyeri is local and uncommon to abundant below 1525 m (5000 ft) on the south side of the Pryor Mountains. We located seven populations; most were of small or moderate size and occurred in sandy soils of alluvial plains and terraces, usually with Artemisia tridentata, Stipa comata and Bouteloua gracilis.

MANAGEMENT RECOMMENDATIONS: Astragalus geyeri is uncommon or perhaps even rare in the study area. This species is an annual, so population sizes are expected to fluctuate. It can probably tolerate moderate levels of disturbance but may be threatened by encroachment by exotic annuals such as Halogeton glomeratus or Salsola kali. Astragalus geyeri should be given special status on BLM's Miles City District.

Astragalus grayi Parry

Gray's Milkvetch

NATURAL HERITAGE PROGRAM STATUS: G3-G4/S1

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Western Wyoming and adjacent Carbon County, Montana

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Astragalus grayi is local and uncommon to common below 1370 m (4500 ft) on the west side of the Pryor Mountains in secondary drainages of the Clarks Fork of the Yellowstone River. We located four populations during our study; three of these were small. The species spreads by rhizomes and occurs in silty or clay soils with Artemisia tridentata, A. pedatifida and Agropyron spicatum.

MANAGEMENT RECOMMENDATIONS: Astragalus grayi is rare in the study area and Montana; only two large populations are known. The effects of livestock grazing on this species are unknown. Populations may be threatened by road construction and other developments. This species should be given special status on BLM's Miles City District.

Astragalus hyalinus Jones

Summer Orophaca

NATURAL HERITAGE PROGRAM STATUS: G4/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: South-central Montana and western South Dakota, south to northeast Colorado and western Nebraska

MONTANA DISTRIBUTION: Southern Carbon and Big Horn counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Astragalus hyalinus is abundant below 1675 m (5500 ft) south and west of the Pryor Mountains in the drainages of the Bighorn and Clarks Fork of the Yellowstone rivers. We located 52 populations of A. hyalinus, occurring on barren sandy to clay soils in many plant associations including Utah juniper woodlands, sagebrush steppe and cushion plant-grasslands. Most populations were large.

MANAGEMENT RECOMMENDATIONS: This species is common throughout much of the study area. Its cushion-plant growth form makes it resistant to livestock grazing. Astragalus hyalinus should not be given special status on BLM's Miles City District.

Astragalus oreganus Nuttall

Wind River Milkvetch

NATURAL HERITAGE PROGRAM STATUS: G3-G4/S1

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Western Wyoming and adjacent south-central Montana

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Astragalus oreganus is locally common, known from only four locations on the south side of the Pryor Mountains. This rhizomatous species forms large colonies in sandy soil below 1525 m (5000 ft) and is commonly associated with Artemisia tridentata and Stipa comata.

MANAGEMENT RECOMMENDATIONS: Although known populations are large, A. oreganus is rare in the study area and Montana. Effects of livestock grazing are unknown. This species should receive special status on BLM's Miles City District.

Camissonia andina (Nuttall) Raven

Obscure Evening-primrose

NATURAL HERITAGE PROGRAM STATUS: G4/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Southern British Columbia to Alberta, south to California, Nevada and Wyoming

MONTANA DISTRIBUTION: Carbon and Missoula counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Camissonia andina is local and rare to common from 1220 to 1890 m (4000 to 6200 ft) on the south side of the Pryor Mountains and in the foothills. Six populations of C. andina were located in the study area, and only two of these were large. It occurs in sandy soil and is usually associated with shrubs such as Artemisia tridentata and Cercocarpus ledifolius. One population occurred in Douglas fir-Utah juniper woodland.

MANAGEMENT RECOMMENDATIONS: Camissonia andina is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. This species is uncommon in the study area; the majority of known populations were small. It should receive special status on BLM's Miles City District.

Camissonia minor (A. Nelson) Raven

Small-flowered Evening-primrose

NATURAL HERITAGE PROGRAM STATUS: G4/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Eastern Washington to eastern Montana, south to California, Nevada and Colorado

MONTANA DISTRIBUTION: Carbon and Rosebud counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Camissonia minor is locally common below 1585 m (5200 ft) on the south side of the Pryor Mountains. It generally occurs in moderate-size populations in sandy soil of juniper woodlands or plant associations dominated by Artemisia tridentata.

MANAGEMENT RECOMMENDATIONS: Camissonia andina is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. This species is common in the study area; we located 17 populations. This species should not be given special status on BLM's Miles City District.

Camissonia parvula (Nuttall) Raven

Small Evening-primrose

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: None

GLOBAL DISTRIBUTION: Eastern Washington to south-central Montana, south to California, Nevada and Colorado

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Two small populations of Camissonia parvula were located at the southern foot of the Pryor Mountains between 1585 and 1675 m (5200 and 5500 ft). It occurs in sandy soil weathered from calcareous sandstone and is associated with ecotonal areas between juniper woodland and sagebrush steppe.

MANAGEMENT RECOMMENDATIONS: Camissonia parvula is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. This species was first discovered in Montana during the course of this study. It is rare in the study area and should be given special status on BLM's Miles City District.

Camissonia scapoidea (T. & G.) Raven

Naked-stemmed Evening-primrose

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Eastern Oregon to south-central Montana, south to California, Arizona and New Mexico

MONTANA DISTRIBUTION: Carbon, Choteau and Fergus counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Camissonia scapoidea is abundant below 1525 m (5000 ft) on the south and west sides of the Pryor Mountains in drainages of the Bighorn and Clarks Fork of the Yellowstone rivers. It occurs in sandy to clay soils in many plant associations, including juniper woodlands and shrublands dominated by Artemisia tridentata, Chrysothamnus nauseosus and Atriplex gardneri.

MANAGEMENT RECOMMENDATIONS: Camissonia scapoidea is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. This species is very common throughout the study area; more than 35 populations were located during the course of this study. It should not be given special status on BLM's Miles City District.

Castilleja angustifolia (Nuttall) G. Don

Narrow-leaved Paintbrush

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: Southeast Oregon to southern Montana, south to Nevada, Utah and Wyoming

MONTANA DISTRIBUTION: Beaverhead and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Castilleja angustifolia is common and widespread throughout the foothills and desert areas below 1830 m (6000 ft) both south and west of the Pryor Mountains. Small to large populations occur on sandy or sandy clay soils in juniper woodlands or, more often, in plant associations dominated by Artemisia tridentata or A. arbuscula.

COMMENTS: Castilleja angustifolia is closely related to C. chromosa; the two taxa are separated on the color of the inflorescence (Welsh et al. 1987), and the latter is sometimes treated as a variety of the former (Dorn 1988, Holmgren 1984). Both taxa are reported for Montana. Stanley Welsh identified all of our collections as C. angustifolia.

MANAGEMENT RECOMMENDATIONS: Nearly 30 populations of C. angustifolia were located during this study. The species is common throughout most of the area and should not be given special status on BLM's Miles City District.

Cleome lutea Hook.

Yellow Bee-plant

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Eastern Washington to southern Montana, south to California, New Mexico and Nebraska

MONTANA DISTRIBUTION: Southern Big Horn and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Cleome lutea is rare on the south side of the Pryor Mountains below 1525 m (5000 ft). It has also been collected on the northeast side of the mountains outside of our study area. The one small population located during our study occurred on sandy soil in juniper woodland.

MANAGEMENT RECOMMENDATIONS: Cleome lutea is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. This species is often a roadside weed in the center of its range. However, it appears to be very rare in the study area and should be given special status on BLM's Miles City District.

Cryptantha cana (A. Nelson) Payson

Wooly Cryptantha

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: Southern Montana and adjacent South Dakota, south to Nebraska and Colorado

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Cryptantha cana is widespread and abundant below 1585 m (5200 ft) on the south side of the Pryor Mountains. It occurs in large populations in shallow sandy soils, mainly in plant associations dominated by cushion plants, Agropyron spicatum, Gutierrezia sarothrae and Ceratoides lanata.

MANAGEMENT RECOMMENDATIONS: Cryptantha cana is very common in the study area. It is probably not sensitive to livestock grazing due to its cushion growth form. This species should not be given special status on BLM's Miles City District.

Cryptantha flavoculata (A. Nelson) Payson

Pale Yellow Cryptantha

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana south to California and New Mexico

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Cryptantha flavoculata is common between 1370 and 1830 m (4500 and 6000 ft) in the foothills on the south side of the Pryor Mountains. We located 19 populations, many of which were large. It is usually found in sandy calcareous soils in juniper woodlands.

MANAGEMENT RECOMMENDATIONS: Cryptantha flavoculata is common in the study area. It is probably not sensitive to livestock grazing due to its bristly vesture. This species should not be given special status on BLM's Miles City District.

Cryptantha scoparia A. Nelson

Desert Cryptantha

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: None

GLOBAL DISTRIBUTION: Eastern Washington to south-central Montana, south to Nevada, Utah and Wyoming

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: We discovered only one population of Cryptantha scoparia in the study area. This was the first collection of this species from Montana. It occurs in sandy soil at ca. 1370 m (4500 ft) on the south side the Pryor Mountains. The dominant species at this site were Artemisia tridentata and Agropyron spicatum.

MANAGEMENT RECOMMENDATIONS: Cryptantha scoparia is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. This species is rare in the study area and in Montana, and should be given special status on BLM's Miles City District.

Delphinium andersonii Gray

Anderson's Larkspur

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Eastern Oregon to south-central Montana, south to California, Nevada and Utah

MONTANA DISTRIBUTION: Beaverhead, Carbon and Jefferson counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: We located only two small populations of D. andersonii on the west side of the Pryor Mountains in the Bridger Creek and Jack Creek drainages. It is found in sparsely vegetated, sandy, probably calcareous, soils at 1250-1310 m (4100-4300 ft). It is associated with communities dominated by Pinus flexilis, Juniperus spp. and Agropyron spicatum.

COMMENTS: Delphinium andersonii is very similar in appearance to the more common D. bicolor; however, the former has glabrous herbage with upper petals that are white with blue tips, while the latter is puberulent with blue veins on the upper petals. The habitat of D. andersonii is often more xeric and barren.

MANAGEMENT RECOMMENDATIONS: Delphinium andersonii appears to be rare in Montana and the Pryor Mountain Desert. Populations are small with scattered individuals. Members of this genus are poisonous to livestock and usually do not decline under livestock grazing. Since the plant is so similar to the more common D. bicolor, we may have failed to note all populations encountered. Further survey work is needed to determine the plant's distribution with certainty. Until such surveys have been completed, D. andersonii should be given special status on BLM's Miles City District.

Delphinium geyeri Greene

Geyer's Larkspur

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Southern Montana south to Nebraska, Colorado and Utah

MONTANA DISTRIBUTION: Beaverhead and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: We were unable to locate any populations of Delphinium geyeri in the study area. There is one collection from along the Bighorn River just south of the confluence with Dry Head Creek. Only 12 plants were observed in 1967 when the collection was made.

MANAGEMENT RECOMMENDATIONS: Delphinium geyeri appears to be rare in the study area and Montana. It should be given special status on BLM's Miles City District.

Erigeron allocotus Blake

Bighorn Fleabane

NATURAL HERITAGE PROGRAM STATUS: G3/S3

MONTANA STATUS: Watch List

GLOBAL DISTRIBUTION: North-central Wyoming and adjacent south-central Montana

MONTANA DISTRIBUTION: Southern Big Horn and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Erigeron allocotus is widespread and uncommon to abundant between 1525 and 2315 m (5000 and 7600 ft) on the south slopes of the Pryor Mountains. We located 17 populations in shallow limestone-derived soil in juniper woodland and plant associations dominated by Cercocarpus ledifolius, Artemisia arbuscula and Phlox spp.

MANAGEMENT RECOMMENDATIONS: Erigeron allocotus is common on limestone at mid-elevations in the Pryor Mountains. Many of the sites where it is found are not subject to livestock grazing. This species should not be given special status on BLM's Miles City District.

Eriogonum X lagopus Rydberg

Rabbit Buckwheat

NATURAL HERITAGE PROGRAM STATUS: G3/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: South-central Montana and adjacent Wyoming

MONTANA DISTRIBUTION: Southern Carbon County and reported from Park and Yellowstone counties.

PRYOR MOUNTAINS DESERT DISTRIBUTION: Eriogonum lagopus is abundant between 1220 and 1675 m (4000 and 5500 ft) on the south and west sides of the Pryor Mountains. Large populations occur in barren sandy to clay soils in a number of plant associations, including juniper woodland, sagebrush steppe and, most commonly, cushion plant communities dominated by Agropyron spicatum, Ceratoides lanata and Phlox spp.

COMMENTS: Eriogonum lagopus is thought to be a fertile hybrid between E. brevicaule and E. pauciflorum (James Reveal, personal communication). Other authorities treat such hybrids as varieties of E. brevicaule (Welsh et al. 1987). Robert Dorn calls this plant E. brevicaule var. canum (Stokes) Dorn (Dorn 1988). Eriogonum lagopus is a candidate for listing as a threatened or endangered species under the Federal Endangered Species Act (USDI-FWS 1990).

MANAGEMENT RECOMMENDATIONS: We located 40 populations of E. lagopus in the study area. The species has a wide ecological amplitude and occurs in a variety of open habitats. It should not be given special status on BLM lands in the Miles City District.

Eriogonum salsuginosum (Nuttall) Hook.

Smooth Buckwheat

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: None

GLOBAL DISTRIBUTION: South-central Montana south to Nevada, Arizona and New Mexico

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: We located only one population of Eriogonum salsuginosum during the course of our study. This was the first collection of the species from Montana. It occurs in bentonitic soil at ca. 1430 m (4700 ft) on the south side of the Pryor Mountains. Associated species include Monolepis nuttalliana and Musineon divaricatum.

COMMENTS: Some authorities consider the correct name for this species to be Stenogonum salsuginosum Nuttall.

MANAGEMENT RECOMMENDATIONS: Eriogonum salsuginosum is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. There is a good deal of bentonite mining in the immediate area; thus, strip mining may be a threat to the only known population of this species. Eriogonum salsuginosum is rare in the study area and Montana and should be given special status on BLM's Miles City District.

Gilia inconspicua (Sm.) Sw.

Shy Gilia

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Central Washington to south-central Montana, south to California and New Mexico

MONTANA DISTRIBUTION: Beaverhead and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Gilia inconspicua is locally common below 1675 m (5500 ft) on the south and west sides of the Pryor Mountains in the drainages of the Bighorn and Clarks Fork of the Yellowstone rivers. We located 23, mainly moderate to large populations in sandy soils of juniper woodlands and associations dominated by Artemisia tridentata.

COMMENTS: Montana plants are var. tweedyi (Rydb.) Cronq. Other authors have considered the correct name to be G. tweedyi Rydb. or G. sinuata Dougl.

MANAGEMENT RECOMMENDATIONS: Gilia inconspicua is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. The species is common in the study area and should not be given special status on BLM's Miles City District.

Gilia leptomeria Gray

Great Basin Gilia, Sand Gilia

NATURAL HERITAGE PROGRAM STATUS: G5/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Central Washington to south-central Montana, south to California and New Mexico

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Gilia leptomeria is locally common below 1675 m (5500 ft) on the south and west sides of the Pryor Mountains. Most populations are moderate to large and occur in sandy soil in Utah juniper woodlands and associations dominated by Artemisia tridentata.

MANAGEMENT RECOMMENDATIONS: Gilia leptomeria is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. We located 12 populations of G. leptomeria. The plant is common and widespread enough in the study area that it should not be given special status on BLM's Miles City District.

Grayia spinosa (Hook.) Moq.

Spiny Hopsage

NATURAL HERITAGE PROGRAM STATUS: G5/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Central Washington to south-central Montana, south to California, Arizona and New Mexico

MONTANA DISTRIBUTION: Beaverhead, Big Horn, Carbon and Park counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Grayia spinosa is local and uncommon below 1525 m (5000 ft) on the south side of the Pryor Mountains. Small populations occur in sandy soil in plant associations dominated by Artemisia tridentata, Stipa comata and Agropyron spicatum.

MANAGEMENT RECOMMENDATIONS: We located only nine populations of G. spinosa in the study area, and the majority of these were small. The species is highly palatable to livestock (Welsh et al. 1987) and may decrease with heavy grazing pressure. Grayia spinosa should receive special status on BLM's Miles City District.

Hymenoxys torreyana (Nuttall) Parker

Torrey's Bitterweed

NATURAL HERITAGE PROGRAM STATUS: G4/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: South-central Montana, central Wyoming and northern Utah

MONTANA DISTRIBUTION: Southern Carbon County counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Hymenoxys torreyana is locally common between 1370 and 2440 m (4500 and 8000 ft) on the south and west slopes of the Pryor Mountains. Numerous small to large populations occur on limestone-derived soil in all montane communities including juniper woodlands, mountain mahogany woodland and cushion plant grasslands.

MANAGEMENT RECOMMENDATIONS: We located 23 populations of H. torreyana in the study area. It has a broad ecological amplitude and is common in many communities. This species should not be given special status on BLM's Miles City District.

Ipomopsis pumila (Nuttall) Grant

Dwarf Ipomopsis

NATURAL HERITAGE PROGRAM STATUS: G4/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana, Wyoming and Utah, south to Arizona and New Mexico

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Ipomopsis pumila is locally abundant below 1525 m (5000 ft) on the south and west sides of the Pryor Mountains. Moderate to large populations are found in sandy soil of plant associations dominated by Artemisia tridentata and Atriplex gardneri.

COMMENTS: Some authorities consider the correct name for this species to be Gilia pumila Nuttall.

MANAGEMENT RECOMMENDATIONS: This species is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. We located 30 populations of I. pumila in the study area. The species is common over large areas and should not be given special status on BLM's Miles City District.

Leptodactylon caespitosum Nuttall

Tufted Leptodactylon, Tufted Prickly Phlox

NATURAL HERITAGE PROGRAM STATUS: G3-G4/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana, south to Nebraska, Colorado, Utah and Nevada

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Leptodactylon caespitosum is local below 1525 m (5000 ft) on the south side of the Pryor Mountains. The species appears to be confined to outcroppings of Chugwater sandstone, generally with north or east exposures. Small to sometimes large populations occur in sparsely vegetated communities, often dominated by Chrysothamnus nauseosus and Phlox muscoides.

COMMENTS: Welsh et al. (1987) state that L. caespitosum has a disjunct distribution due to its occurrence in peculiar soils.

MANAGEMENT RECOMMENDATIONS: We located 11 populations of L. caespitosum in the study area, but seven of these had less than 100 plants, and only two populations had more than 1000 plants. Populations are confined to an unusual although locally common substrate over an area smaller in size than a single township. These are the only populations known in Montana. Leptodactylon caespitosum should be given special status on BLM's Miles City District.

Malacothrix torreyi Gray

Desert Dandelion

NATURAL HERITAGE PROGRAM STATUS: G4/S1

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Southern Oregon to south-central Montana, south to California and Arizona

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Malacothrix torreyi is local and rare below 1525 m (5000 ft) on the south side of the Pryor Mountains. We located four small populations in sandy soil with Artemisia tridentata and Bouteloua gracilis.

MANAGEMENT RECOMMENDATIONS: This species is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. Malacothrix torreyi is rare in the study area and in Montana. Populations at the north end of the Bighorn Basin are disjunct from the main portion of the species' range. This species should be given special status on BLM's Miles City District.

Mentzelia pumila Torrey & Gray

Dwarf Mentzelia, Small Blazing-star

NATURAL HERITAGE PROGRAM STATUS: G4/S2

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Western North Dakota to south-central Montana, south to Colorado, Utah and Nevada

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Mentzelia pumila is widespread but uncommon below 1585 m (5200 ft) on the south and west sides of the Pryor Mountains. Sparse populations occur in sandy soils (often Chugwater sandstone) in open juniper woodlands and cushion plant communities dominated by Agropyron spicatum, Ceratoides lanata and Phlox muscoides.

MANAGEMENT RECOMMENDATIONS: Mentzelia pumila plants are sparsely distributed within populations. We located only nine populations, most of which were on Chugwater sandstone in the southeast part of the study area. This species should be given special status on BLM'S Miles City District.

Nama densum Lemmon

Matted Nama

NATURAL HERITAGE PROGRAM STATUS: G5/S1

MONTANA STATUS: None

GLOBAL DISTRIBUTION: Eastern Washington to south-central Montana, south to California, Utah and Colorado

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Nama densum is rare along the southern base of the Pryor Mountains at ca. 1555 m (5100 ft). The one small population was found in sandy soil weathered from outcrops of calcareous sandstone. The vegetation was dominated by Artemisia tridentata and Stipa comata.

MANAGEMENT RECOMMENDATIONS: Nama densum is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. It was first discovered in Montana during the course of our study. It is very rare in the study area and should be given special status on BLM's Miles City District.

Penstemon laricifolius Hook. & Arn.

Larch-leaved Beardtongue

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: None

GLOBAL DISTRIBUTION: South-central Montana, Wyoming and northern Colorado

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Penstemon laricifolius is common between 1370 and 1800 m (4500 and 6000 ft) on the south and west flanks of the Pryor Mountains. It occurs in sandy, often limestone-derived, soils in juniper woodlands, cushion plant grasslands and plant associations dominated by Cercocarpus ledifolius or Artemisia arbuscula.

MANAGEMENT RECOMMENDATIONS: Penstemon laricifolius is common in the study area; we located 23 mostly large populations during this study. This species should not be given special status on BLM's Miles City District.

Phacelia ivesiana Torrey

Ives' Phacelia

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Eastern Washington to south-central Montana, south to California and New Mexico.

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Phacelia ivesiana is abundant below 1675 m (5500 ft) on the south and west sides of the Pryor Mountains. We located 35 mostly large populations in sandy soil in juniper woodlands and associations dominated by Artemisia tridentata, Stipa comata and Bouteloua gracilis.

MANAGEMENT RECOMMENDATIONS: Phacelia ivesiana is an annual; thus, population sizes may very greatly among years and may respond positively to moderate levels of disturbance. It is common in the study area and should not be given special status on BLM's Miles City District.

Physaria acutifolia Rydb.

Southern Twinpod, Rydberg Twinpod

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: South-central Montana south to Utah and Colorado

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Physaria acutifolia is common and widespread below 1675 m (5500 ft) on the south and west sides of the Pryor Mountains. This species is sparsely distributed in sandy or sandy clay soils in juniper woodlands, cushion plant grasslands dominated by Agropyron spicatum and Phlox spp., and shrublands dominated by Artemisia spp.

MANAGEMENT RECOMMENDATIONS: We located 23 populations of P. acutifolia in the study area. Although the plants are sparsely distributed, the species can be found in almost any community in the study area. Physaria acutifolia should not be given special status on BLM's Miles City District.

Platyschkuhria integrifolia (Gray) Rydb.

Platyschkuhria

NATURAL HERITAGE PROGRAM STATUS: G5/S4

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: South-central Montana to eastern Utah, south to Arizona and New Mexico.

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Platyschkuhria integrifolia is abundant below 1525 m (5000 ft) on the south and west sides of the Pryor Mountains in the drainages of the Bighorn and Clarks Fork of the Yellowstone rivers. It occurs in sandy or, more often, sandy clay or clay soils, often in plant communities associated with saline soils and dominated by Artemisia pedatifida, A. tridentata and Atriplex gardneri.

MANAGEMENT RECOMMENDATIONS: We located 58 populations of P. integrifolia in the study area. The species is abundant throughout much of the study area and should not be given special status on BLM's Miles City District.

Sphaeromeria capitata Nuttall

Rock Tansy, Cluster-headed Tansy

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Limited Distribution

GLOBAL DISTRIBUTION: Southern Montana, Wyoming and southeast Utah

MONTANA DISTRIBUTION: Beaverhead and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Sphaeromeria capitata is common between 1370 and 1980 m (4500 and 6500 ft) on the south and west slopes of the Pryor Mountains. It occurs in shallow, limestone-derived soils in exposed locations in juniper and mountain mahogany woodlands and cushion plant grasslands, often with Ceratoides lanatus and Agropyron spicatum.

COMMENTS: Some authorities consider Tanacetum capitatum (Nuttall) T. & G. to be the correct name for this species.

MANAGEMENT RECOMMENDATIONS: Sphaeromeria capitata occurs throughout the foothills and lower montane slopes in the study area. We located 16 populations during our study and most of these were large. Its low cushion-like growth form curtails damage from grazing. This species should not be given special status on BLM's Miles City District.

Stanleya tomentosa Parry

Wooly Prince's-plume

NATURAL HERITAGE PROGRAM STATUS: G4/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana and northwest Wyoming

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Stanleya tomentosa is common between 1370 and 1675 m (4500 and 5500 ft) on the south slopes and foothills of the Pryor Mountains. Sparse but widespread populations occur in sandy soil, principally in juniper woodlands but also in cushion plant grasslands. Common associated species are Artemisia arbuscula, Ceratoides lanatus and Agropyron spicatum.

MANAGEMENT RECOMMENDATIONS: Although plants of S. tomentosa are often sparsely distributed in populations, the species is widespread in the study area. We located 28 populations. This species should not be given special status on BLM's Miles City District.

Streptanthella longirostris (Wats.) Rydb.

Beaked Streptanthella

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Eastern Washington to south-central Montana, south to Baja California and New Mexico

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Streptanthella longirostris is locally common below 1675 m (5500 ft) on the south side of the Pryor Mountains. Small to large populations occur in sandy soil of juniper woodlands and communities dominated by Artemisia tridentata and Bouteloua gracilis.

MANAGEMENT RECOMMENDATIONS: Streptanthella longirostris is an annual; thus, population sizes may very greatly among years and may respond positively to

moderate levels of disturbance. We located 16 populations during our study. Although many of these were small, the species occurs in two very widespread community types. This species should not be given special status on BLM's Miles City District.

Townsendia incana Nuttall

Hoary Townsendia

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana to Nevada, south to Arizona and New Mexico

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Townsendia incana is common below 1375 m (5500 ft) on the south side of the Pryor Mountains. It occurs in sandy soil of juniper woodlands but mainly associations dominated by Artemisia tridentata, Stipa comata and Bouteloua gracilis.

MANAGEMENT RECOMMENDATIONS: We observed 21 populations of T. incana in the study area, and most populations were of small to moderate size. Although plants are often sparsely distributed in populations, the species is widespread in the study area, occurring in two of the most common plant associations. The plant's low cushion-like growth form curtails damage from grazing. It should not be given special status on BLM's Miles City District.

Townsendia spathulata Nuttall

Sword Townsendia, Spoon-leaved Townsendia

NATURAL HERITAGE PROGRAM STATUS: G4/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: Southern Montana and central Wyoming

MONTANA DISTRIBUTION: Beaverhead, Broadwater and Carbon counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Townsendia spathulata is common between 1220 and 2440 m (4000 and 8000 ft) in the Pryor Mountains and adjacent plains on the south side. The species is widespread in shallow, sandy, especially limestone-derived soils in mountain mahogany woodlands and cushion plant grasslands dominated by Agropyron spicatum, Ceratoides lanatus and Phlox spp.

MANAGEMENT RECOMMENDATIONS: Plants are sparsely distributed within populations but the species is very widespread in the study area. We recorded 28 populations. The plant's low cushion-like growth form curtails damage from grazing. Townsendia spathulata should not be given special status on BLM's Miles City District.

Wyethia scabra Hook.

Rough Mule's-ears

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana south to Colorado, Utah and Arizona

MONTANA DISTRIBUTION: Southern Carbon and Big Horn counties

PRYOR MOUNTAINS DESERT DISTRIBUTION: Wyethia scabra is sparsely distributed but widespread below 1585 m (5200 ft) on the south side of the Pryor Mountains. It occurs in barren, sandy, usually shallow soil in sparsely-vegetated juniper woodlands and cushion plant grasslands dominated by Gutierrezia sarothrae, Chrysothamnus nauseosus and Phlox spp.

MANAGEMENT RECOMMENDATIONS: We located 21 populations of W. scabra in the study area. Most populations were small due to the sparse distribution of the plants across the landscape. However, the species is widespread, and the scabrous, resinous foliage is probably not very susceptible to grazing. Wyethia scabra should not be given special status on BLM's Miles City District.

Xylorhiza glabriuscula Nuttall

Smooth Woody-aster

NATURAL HERITAGE PROGRAM STATUS: G5/S3

MONTANA STATUS: Sensitive

GLOBAL DISTRIBUTION: South-central Montana and western South Dakota, south to Colorado and Utah

MONTANA DISTRIBUTION: Southern Carbon County

PRYOR MOUNTAINS DESERT DISTRIBUTION: Xylorhiza glabriuscula is common below 1525 m (5000 ft) on the south and west side of the Pryor Mountains. It occurs in clay or sandy clay soils in plant associations dominated by Artemisia pedatifida, A. tridentata and Chrysothamnus nauseosus.

MANAGEMENT RECOMMENDATIONS: We located 26 populations of X. glabriuscula in the study area, and most of these were large. This species can usually be found where soils are appropriate. It is common in the study area and should not be given special status on BLM's Miles City District.

DISCUSSION

Management Considerations

Populations of rare plants in the Pryor Mountain Desert are threatened by (1) encroachment of exotic species, (2) livestock and feral horse grazing, (3) off-road vehicle use, and (4) oil and gas development.

Halogeton glomeratus is an Asian species that was introduced into arid western North America in 1934. It has since spread throughout much of the arid and semi-arid lands in the western U.S. It is poisonous to livestock and outcompetes many native species by increasing the salinity of the soil (Sauer 1988). This plant has become locally common in the Pryor Mountain Desert region and may be able to displace native plants, especially annuals.

Livestock grazing throughout most of the study area appeared to be light to moderate due to the lack of water developments. However, severe effects of overgrazing were apparent in areas near water, such as Gyp Springs and Bear Canyon. In these areas, populations of rare plants may be threatened with extirpation by trampling and perhaps by increased erosion resulting from destruction of the fragile vegetation.

Damage due to feral horses was observed west of the mouth of Big Coulee. Steep slopes and banks had been severely terraced and destabilized. Both livestock and feral horse grazing increases the likelihood of exotic weed encroachment.

At the present time there is relatively little off-road vehicle use in the Pryor Mountain Desert area. However, the topography and sparseness of the vegetation is suitable for this sort of recreation. If off-road vehicle use increases substantially, it could damage some populations of rare plants by disrupting plants, compacting soil, and increasing erosion.

Bentonite claims have been made on public lands in the Pryor Mountain Desert area and some strip mining has occurred in just south of the border in Wyoming. Oil and gas development has occurred south and west of Warren. Drilling and the associated road-building and development could destroy populations of rare plants. Sensitive plant surveys should be conducted in association with any proposed developments.

Protecting Biological Diversity

Species that are at risk due to their rarity or other aspects of their biology should be given high priority for protection (Jenkins 1981). Based on the results of our study, vascular plants of special concern and limited distribution in Montana occurring in the study area can be divided into two groups: (1) high priority - species that are rare in the study area and in Montana (15 species) and (2) low priority - species of limited distribution in Montana that are common in the study area (26 species). Our knowledge of the distribution of these species, especially high priority species, in the Pryor Mountain Desert can be used to identify areas that are critical for protecting the biological diversity of this northern outlier of intermountain desert vegetation.

Although low-priority species have little chance of becoming extirpated in the Pryor Mountain Desert region and should not be given special protection status, they can provide information on the occurrence of the unusual desert-like habitats in which they occur. Of the 26 low-priority species, Astragalus chamaeleuce, Camissonia minor, Cryptantha cana, Cryptantha flavoculata, Erigeron allocotus, Streptanthella longirostris, Townsendia incana, Wyethia scabra are confined to the area on the south side of the Pryor Mountains in the Drainage of the Bighorn River (T9S R28E, 27E, 26E, 25E), while none are confined to the areas north and west of Warren in the drainage of the Clarks Fork of the Yellowstone. These results suggest that the area directly south of the Pryors contains important habitats not found in the rest of the study area. This effect may be due to greater topographic relief as well as the presence of calcareous sandstone and Chugwater sandstone not present elsewhere.

One criterion for selecting a reserve is density of rare or endangered species (Margules and Usher 1981). We used the geographic information system (GIS) to overlay the distribution maps of the 15 high-priority species (Figure 3). The Gypsum Creek-Crooked Creek area (T9S R27E, W½ R28E) stands out as having the highest concentration of high-priority species populations. Eight of the 15 high-priority species, Astragalus geyeri, Astragalus oreganus, Camissonia andina, Cleome lutea, Grayia spinosa, Leptodactylon caespitosum, Malacothrix torreyi and Mentzelia pumila, have known populations in this area. The Gypsum Creek-Crooked Creek area is 1250-1580 m (4100-5200 ft) in elevation and contains soils derived from calcareous sandstone, Chugwater sandstone and limestone. Terrain varies from highly dissected foothills with deep canyons to broad alluvial valleys. The appreciable habitat diversity and the large number of populations of both high- and low-priority species make the Gypsum Creek-Crooked Creek area the best choice for a single reserve in the Pryor Mountain Desert. The seven high-priority species not represented in this area occur in widely separated sites throughout the study area (Figure 3) and cannot be protected practically in large reserves.

In addition to the many species of rare plants found in the Pryor Mountain Desert, we believe that many of the plant communities are rare in Montana, and some may be globally unique. Data from our floristic study provide a basis for delineating special management areas for protecting the biological diversity of the area. However, we believe that classification and mapping of plant communities should also be completed in order to take into account elements of diversity other than plant species. Using GIS, maps locating rare plant communities could be overlain on the existing rare plant maps to better delineate the boundaries of special management areas. This integrated approach will provide an information base that allows managers to protect biological diversity on multiple-use lands.

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Appendix A. Vascular plant species observed in the Pryor Mountains Desert Study Area in 1991. Nomenclature follows Dorn (1988) except nomenclature for grasses follows Hitchcock and Cronquist (1973). Nomenclature for rare plants follows Lesica and Shelly (1991). * - non-native species.

ANACARDIACEAE
Rhus trilobata

APIACEAE
Cymopterus acaulis
Cymopterus terebinthinus
Lomatium foeniculaceum
Lomatium orientale
Lomatium triternatum
Musineon divaricatum
Musineon vaginatum

ASCLEPIADACEAE
Asclepias speciosa

ASTERACEAE
Achillea millefolium
Agoseris glauca
Antennaria dimorpha
Antennaria microphylla
Antennaria parvifolia
Arnica fulgens
Arnica sororia
Artemisia arbuscula
Artemisia biennis
Artemisia campestris
Artemisia cana
Artemisia frigida
Artemisia longifolia
Artemisia pedatifida
Artemisia spinescens
Artemisia tridentata
Chaenactis douglasii
Chrysopsis villosa
Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Cirsium undulatum
Crepis sp.
Erigeron allocotus
Erigeron caespitosus
Erigeron ochroleucus
Gutierrezia sarothrae
Haplopappus acaulis
Haplopappus armerioides
Helianthus annuus
Helianthus nuttallii
Hymenopappus filifolius
Hymenoxys acaulis
Hymenoxys torreyana
Iva axillaris
Lygodesmia juncea
Machaeranthera grindelioides
Machaeranthera tanacetifolia
Malacothrix torreyi
Nothocalais troximoides
Platyschkuhria integrifolia
Senecio canus
Senecio crassulus
Sphaeromeria capitata
Stephanomeria runcinata
Tetradymia spinescens
Thelesperma subnudum
Townsendia hookeri
Townsendia incana
Townsendia spathulata
Wyethia scabra
Xylorhiza glabriuscula

BORAGINACEAE
Cryptantha ambigua
Cryptantha cana
Cryptantha flavoculata
Cryptantha kelseyana
Cryptantha minima
Cryptantha scoparia
Cryptantha spiculifera

Cryptantha torreyana
Cryptantha watsonii
Eritrichium howardii
Lappula echinata
Lappula redowskii
Lithospermum incisum
Mertensia oblongifolia

BRASSICACEAE
Alyssum alyssoides
Alyssum desertorum
Arabis holboellii
Camelina microcarpa*
Descurainia spp.
Draba oligosperma
Draba reptans
Erysimum asperum
Lepidium perforatum
Lesquerella alpina
Physaria acutifolia
Schoenocrambe linifolia
Sisymbrium altissimum
Stanleya pinnata
Stanleya tomentosa
Streptanthella longirostris

CACTACEAE
Coryphantha missouriensis
Opuntia polyacantha

CAPPARACEAE
Cleome lutea
Polanisia trachysperma

CARYOPHYLLACEAE
Arenaria hookeri
Cerastium arvense
Paronychia sessiliflora

CHENOPODIACEAE
Atriplex argentea
Atriplex canescens
Atriplex confertifolia
Atriplex suckleyi
Atriplex gardneri
Chenopodium album
Chenopodium fremontii
Halogeton glomeratus*
Krascheninnikovia lanata
Monolepis nuttalliana
Sarcobatus vermiculatus
Salsola australis*
Suaeda nigra

CUPRESSACEAE
Juniperus osteosperma
Juniperus scopulorum

CYPERACEAE
Carex filifolia
Carex pensylvanica
Carex rossii

EUPHORBIACEAE
Euphorbia glyptosperma
Euphorbia robusta

FABACEAE
Astragalus adsurgens
Astragalus agrestis
Astragalus bisulcatus
Astragalus chamaeleuce
Astragalus cibarius
Astragalus crassicarpus
Astragalus drummondii
Astragalus geyeri
Astragalus gilviflorus
Astragalus grayi
Astragalus hyalinus
Astragalus lotiflorus
Astragalus miser
Astragalus missouriensis
Astragalus oreganus
Astragalus purshii
Astragalus spatulatus
Astragalus vexilliflexus
Dalea candida

Glycyrrhiza lepidota
Hedysarum boreale
Lupinus argenteus
Lupinus pusillus
Melilotus officinalis*
Oxytropis besseyi
Oxytropis sericea
Psoralea tenuiflora
Vicia americana

GROSSULARIACEAE
Ribes cereum

HYDROPHYLLACEAE
Ellisia nyctelea
Nama densum
Phacelia glandulosa
Phacelia hastata
Phacelia ivesiana
Phacelia linearis

LAMIACEAE
Hedeoma drummondii

LILIACEAE
Allium textile
Calochortus nuttallii
Yucca glauca
Zigadenus elegans
Zigadenus venenosus

LINACEAE
Linum perenne

LOASACEAE
Mentzelia albicaulis
Mentzelia dispersa
Mentzelia pumila

MALVACEAE
Sphaeralcea coccinea

NYCTAGINACEAE
Mirabilis linearis

ONAGRACEAE
Camissonia andina
Camissonia minor
Camissonia parvula
Camissonia scapoidea
Gaura coccinea
Oenothera albicaulis
Oenothera caespitosa
Oenothera latifolia

OROBANCHACEAE
Orobanche fasciculata
Orobanche ludoviciana

PINACEAE
Pinus flexilis
Pinus ponderosa
Pseudotsuga menziesii

PLANTAGINACEAE
Plantago patagonica

POACEAE
Agropyron smithii
Agropyron spicatum
Andropogon scoparius
Aristida longiseta
Avena sativa*
Bouteloua gracilis
Bromus tectorum*
Elymus cinereus
Festuca octoflora
Hordeum jubatum
Koeleria cristata
Munroa squarrosa
Oryzopsis hymenoides
Oryzopsis micrantha
Poa secunda
Sitanion hystrix
Sporobolus airoides
Sporobolus cryptandrus
Stipa viridula

POLEMONIACEAE
Collomia linearis
Gilia inconspicua
Gilia leptomeria
Ipomopsis congesta
Ipomopsis pumila
Ipomopsis spicata
Leptodactylon caespitosum
Leptodactylon pungens
Microsteris gracilis
Phlox hoodii
Phlox muscoides

POLYGONACEAE
Eriogonum cernuum
Eriogonum flavum
Eriogonum X lagopus
Eriogonum mancum
Eriogonum ovalifolium
Eriogonum pauciflorum
Eriogonum salsuginosum
Polygonum douglasii
Rumex venosus

POLYPODIACEAE
Cystopteris fragilis
Pellaea glabella

PORTULACACEAE
Lewisia rediviva

PRIMULACEAE
Dodecatheon conjugens

RANUNCULACEAE
Delphinium andersonii
Delphinium bicolor

ROSACEAE
Cercocarpus ledifolius
Ivesia gordonii
Kelseya uniflora
Potentilla fruticosa
Potentilla hippiana
Potentilla pensylvanica

SANTALACEAE
Comandra umbellata

SCROPHULARIACEAE
Castilleja angustifolia
Castilleja linearifolia
Castilleja sessiliflora
Penstemon aridus
Penstemon eriantherus
Penstemon laricifolius

SOLANACEAE
Solanum triflorum

URTICACEAE
Parietaria pensylvanica

VERBENACEAE
Verbena bracteata

VIOLACEAE
Viola nuttallii

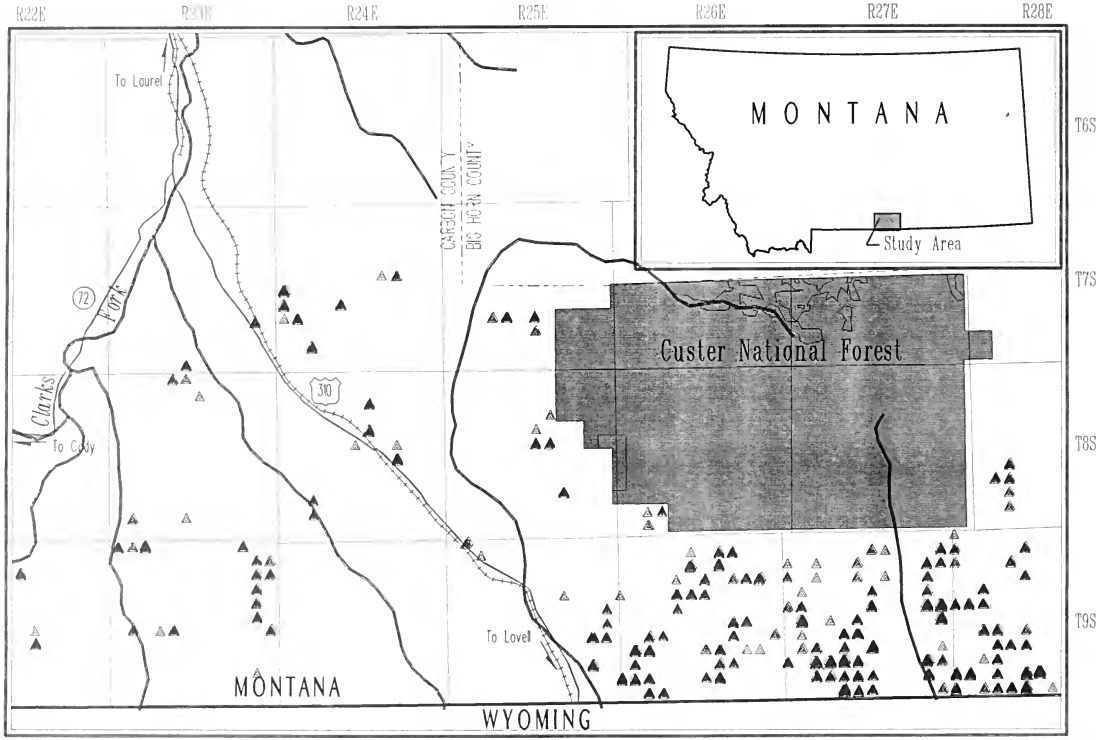

Figure 2.: Location of surveys for species of special concern

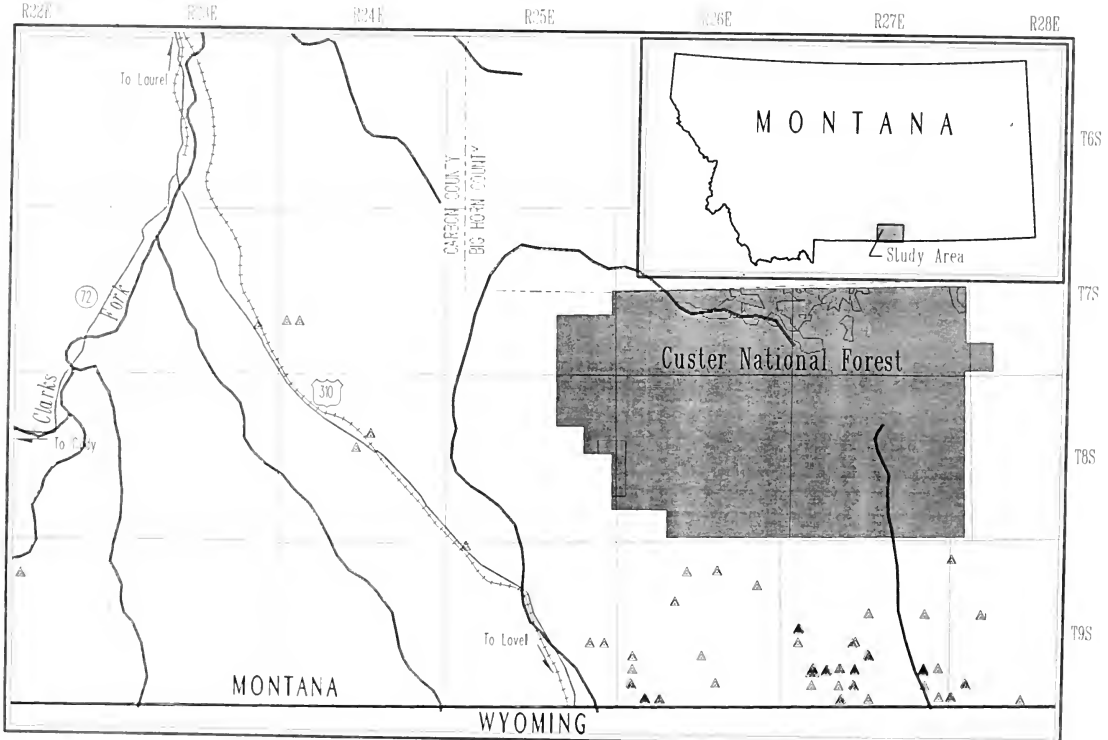

Figure 3: Location of high-priority species

Appendix B. Distributions of species of special concern and of limited distribution.

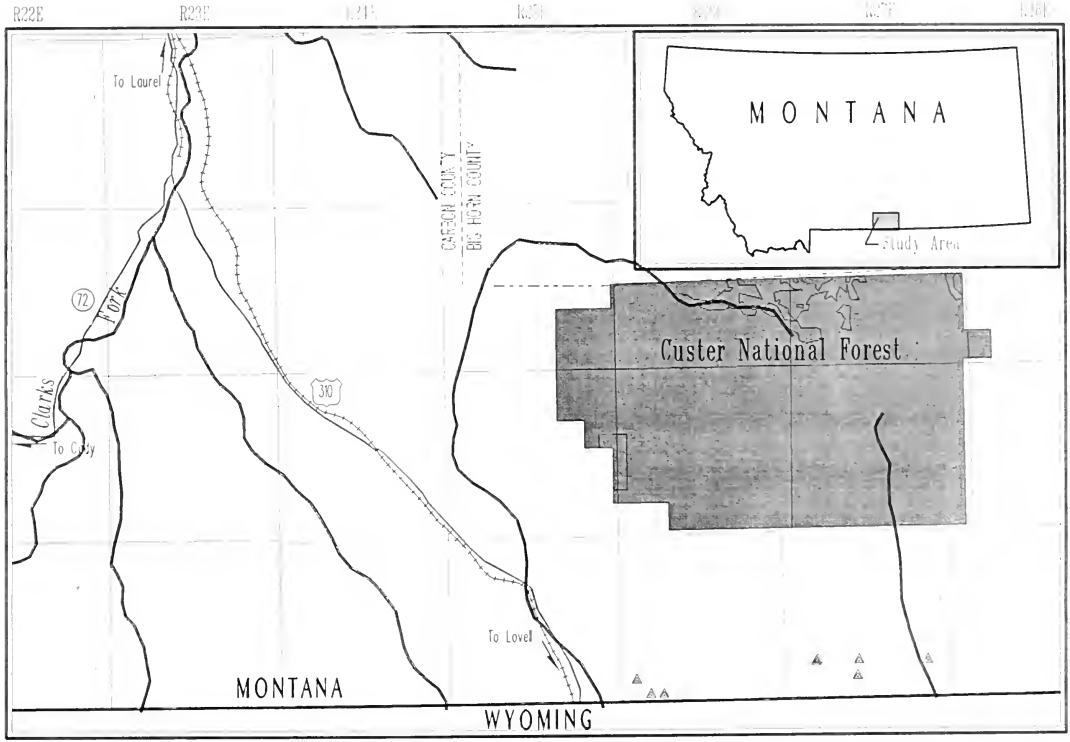

Figure 4.: Location of Astragalus geyeri

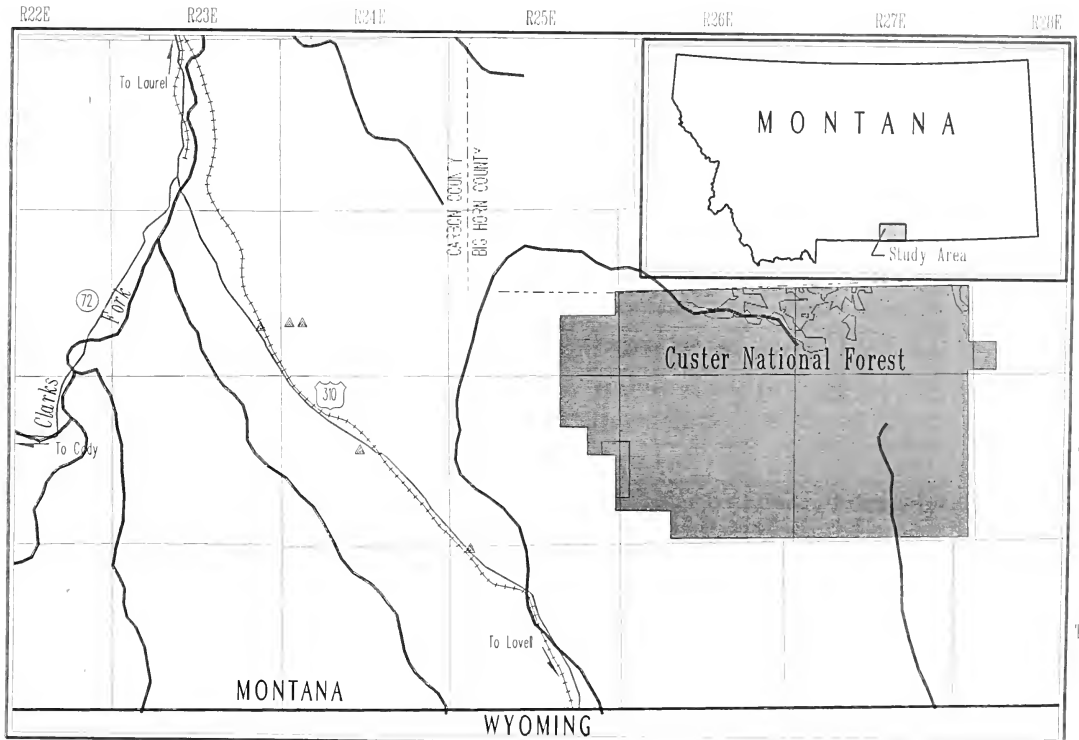

Figure 5.: Location of Astragalus grayi

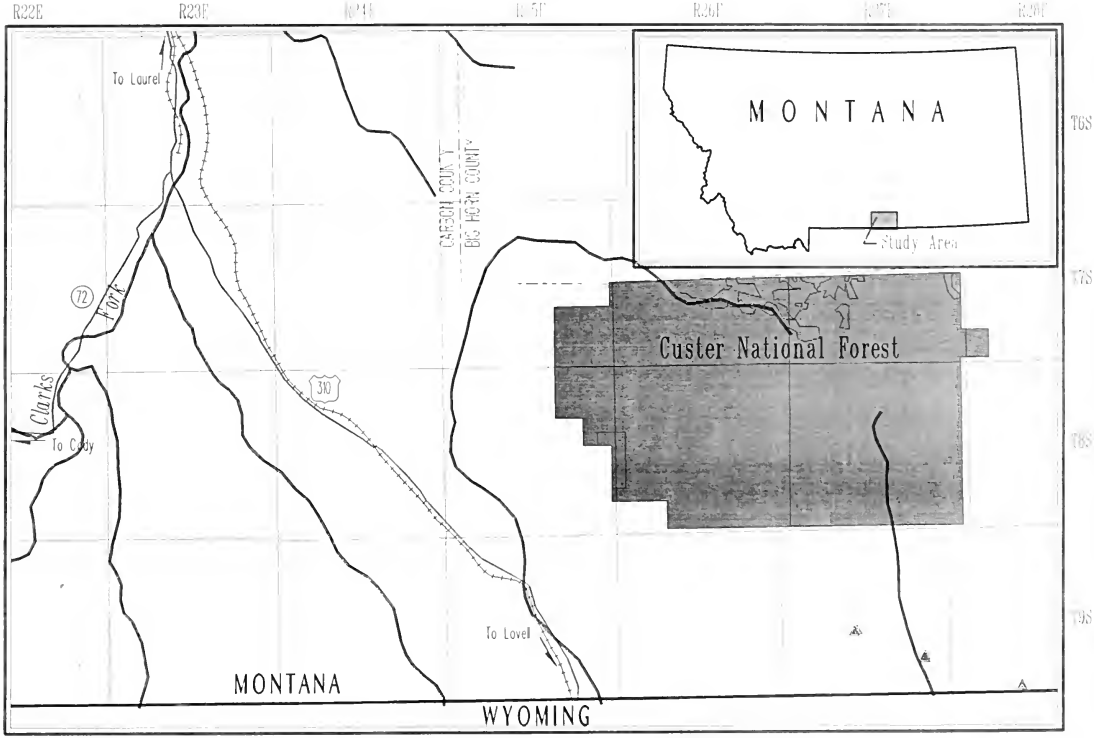

Figure 6.: Location of Astragalus oreganus

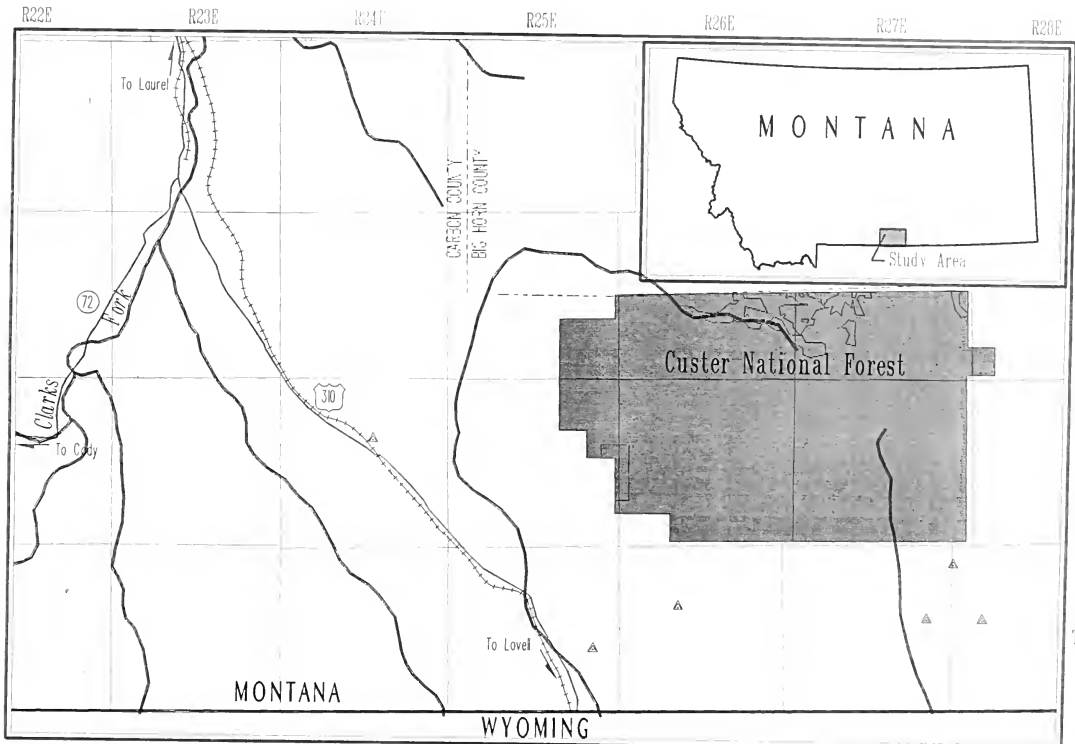

Figure 7.: Location of Camissonia andina

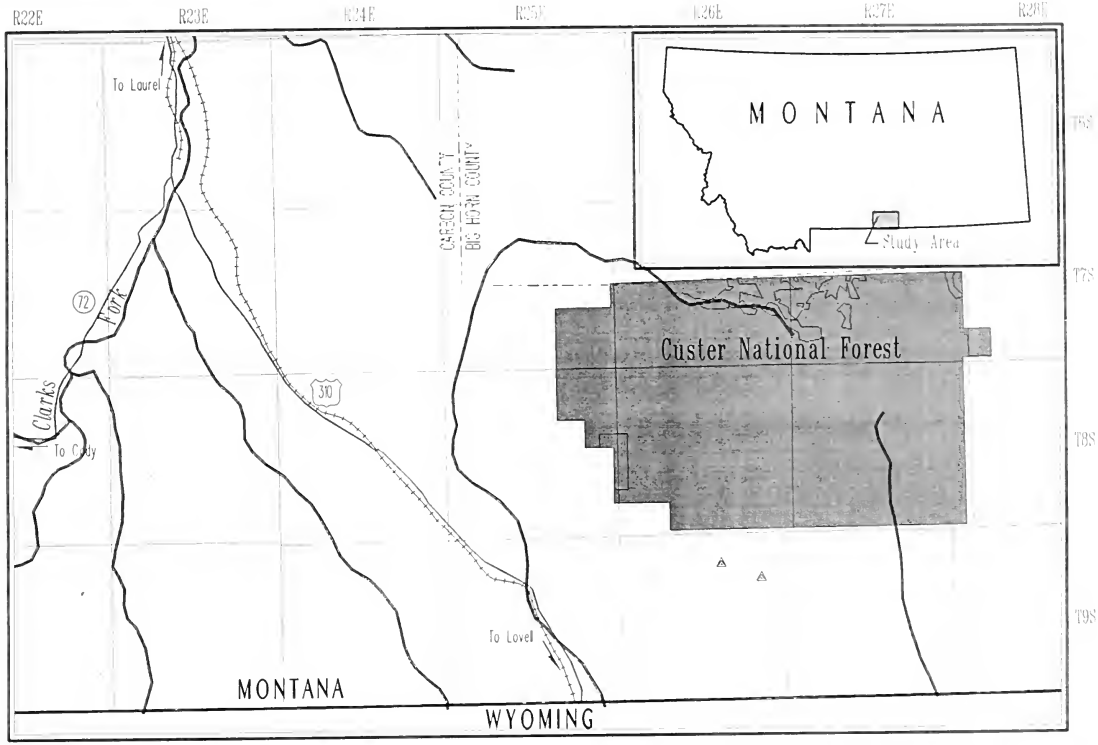

Figure 8.: Location of Camissonia parvula

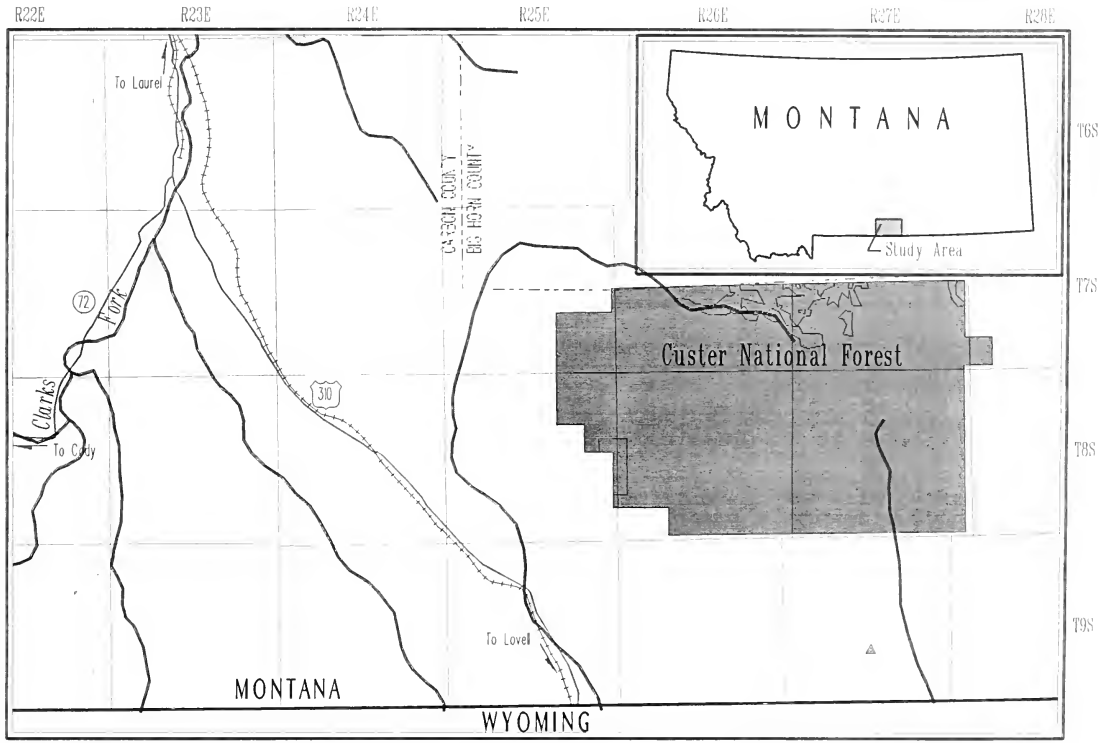

Figure 9.: Location of Cleome lutea

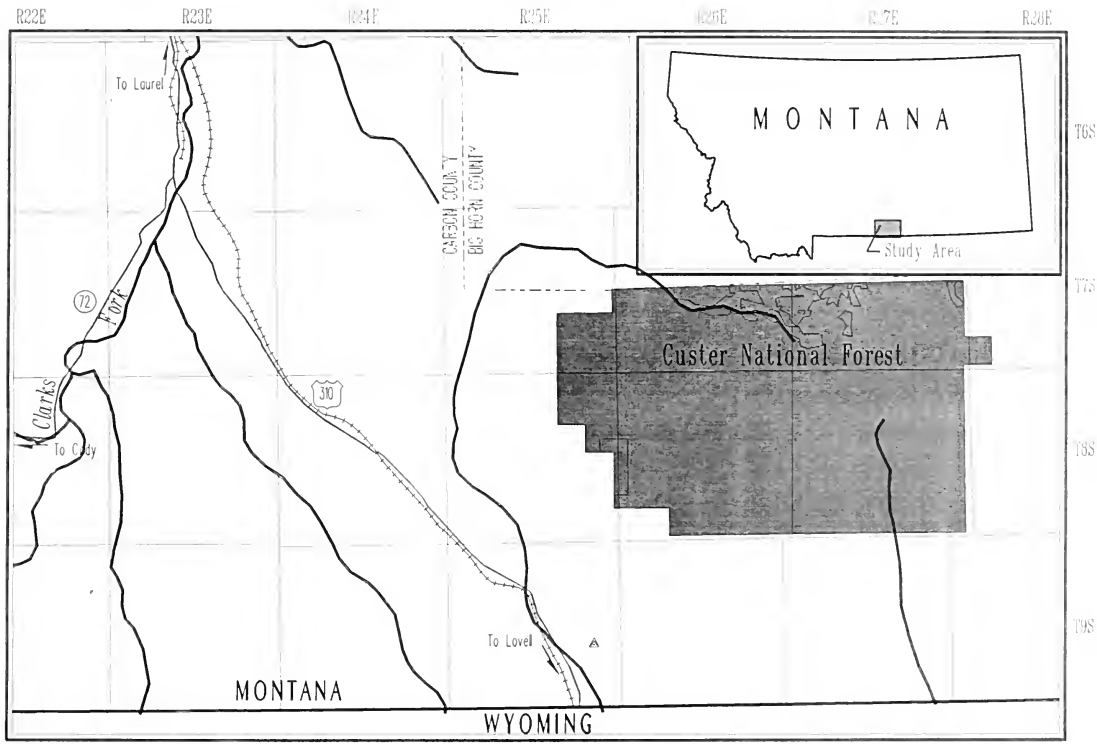

Figure 10.: Location of Cryptantha scoparia

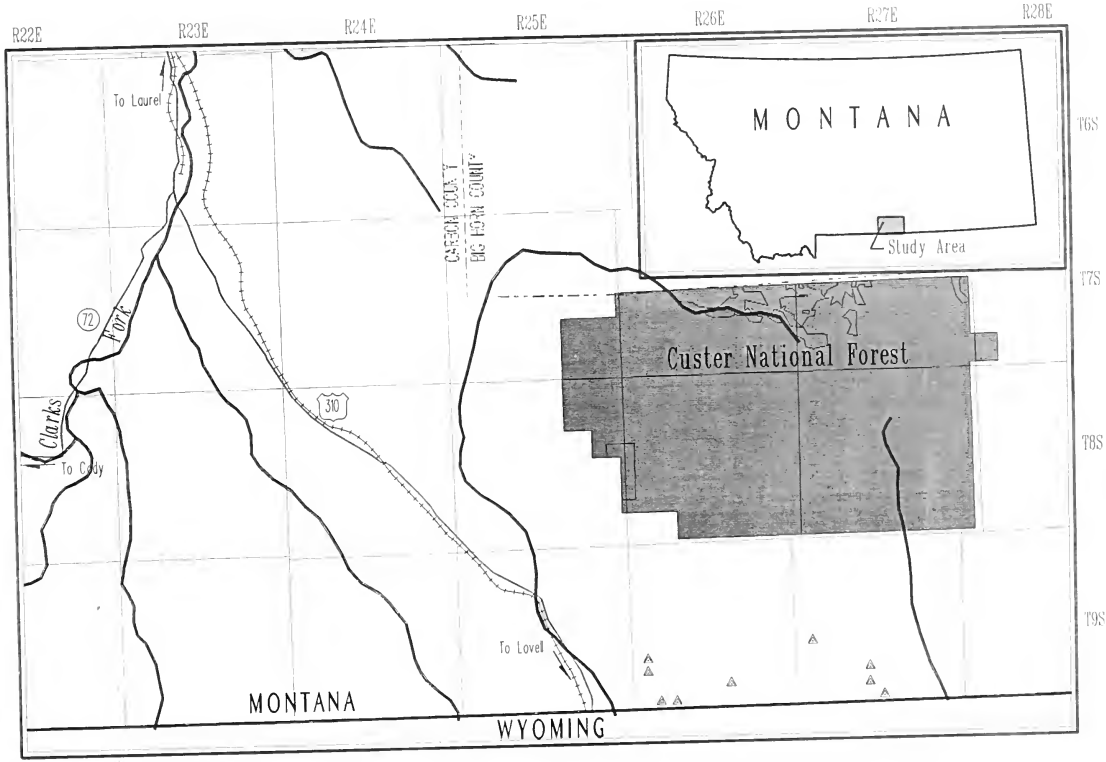

Figure 12.: Location of Grayia spinosa

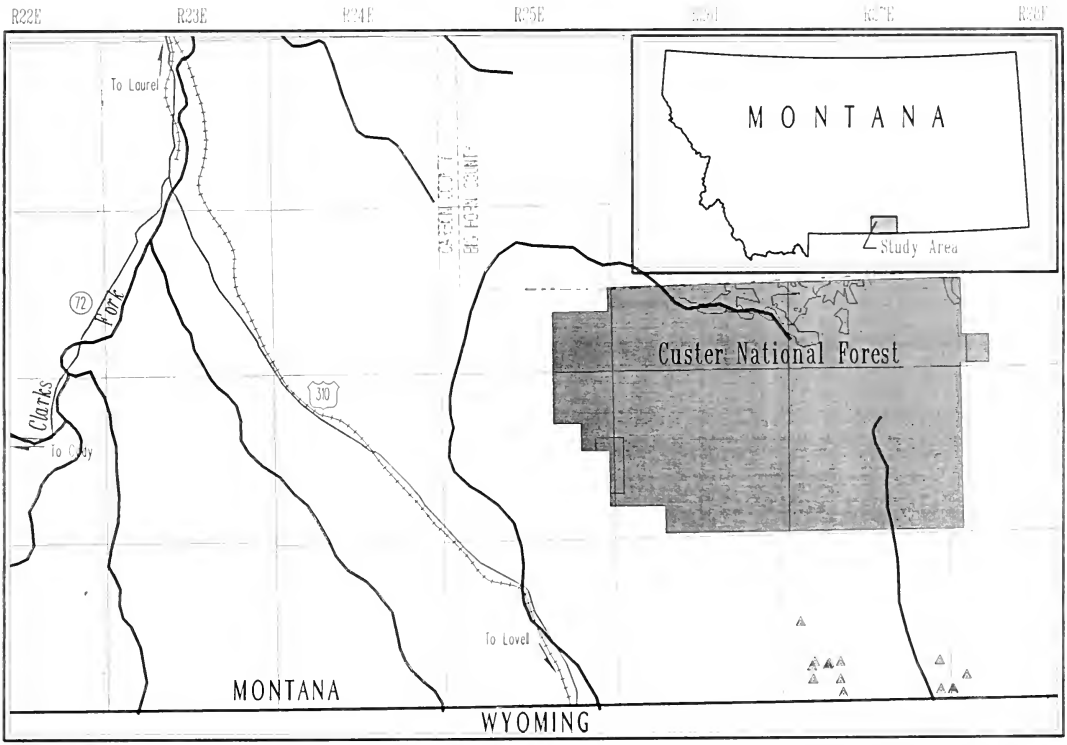

Figure 13.: Location of Leptodactylon caespitosum

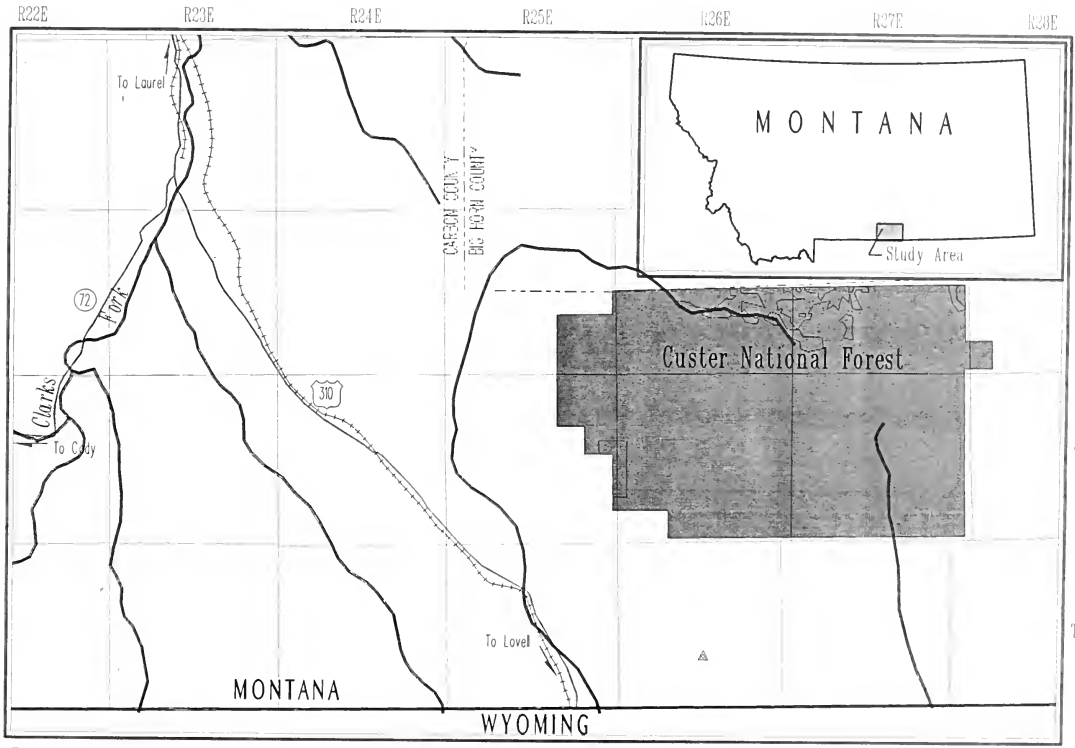

Figure 11.: Location of Eriogonum salsuginosum

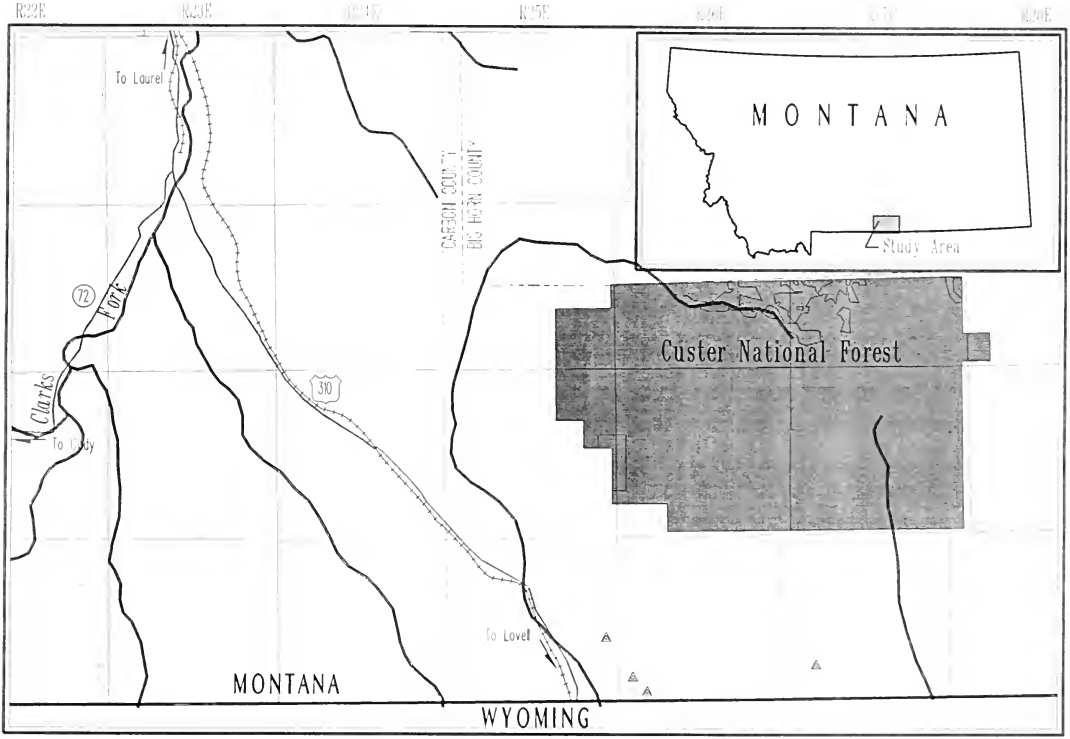

Figure 14.: Location of Malacothrix torreyi

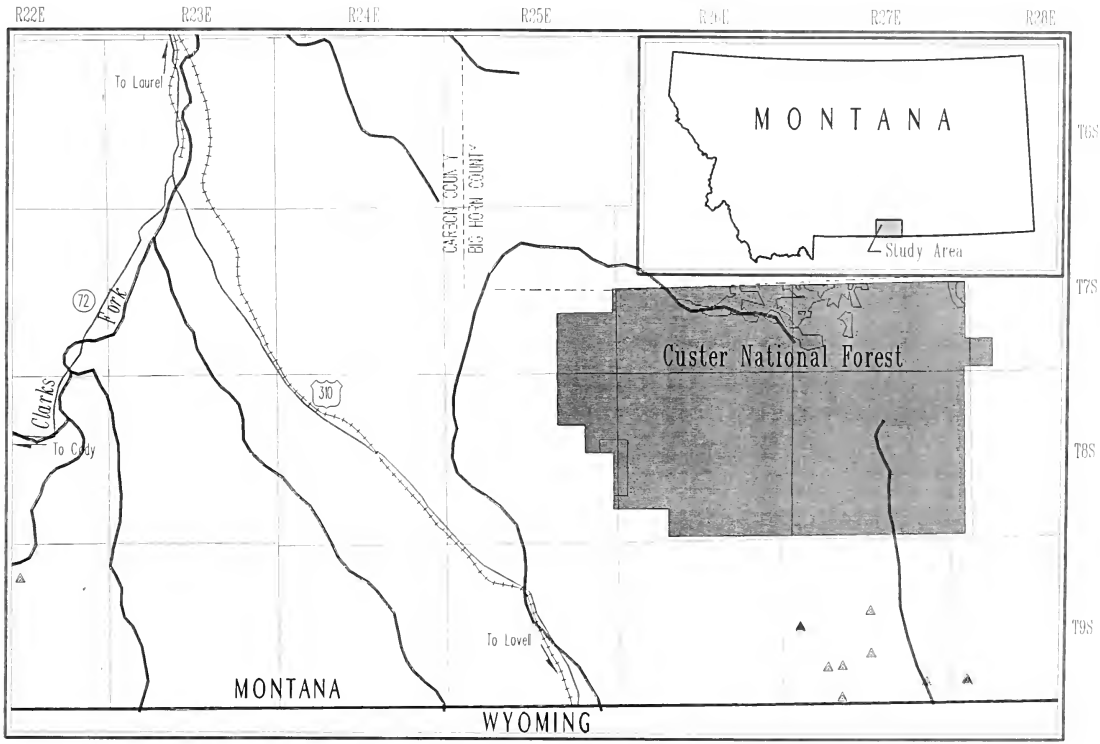

Figure 15.: Location of Mentzelia pumila

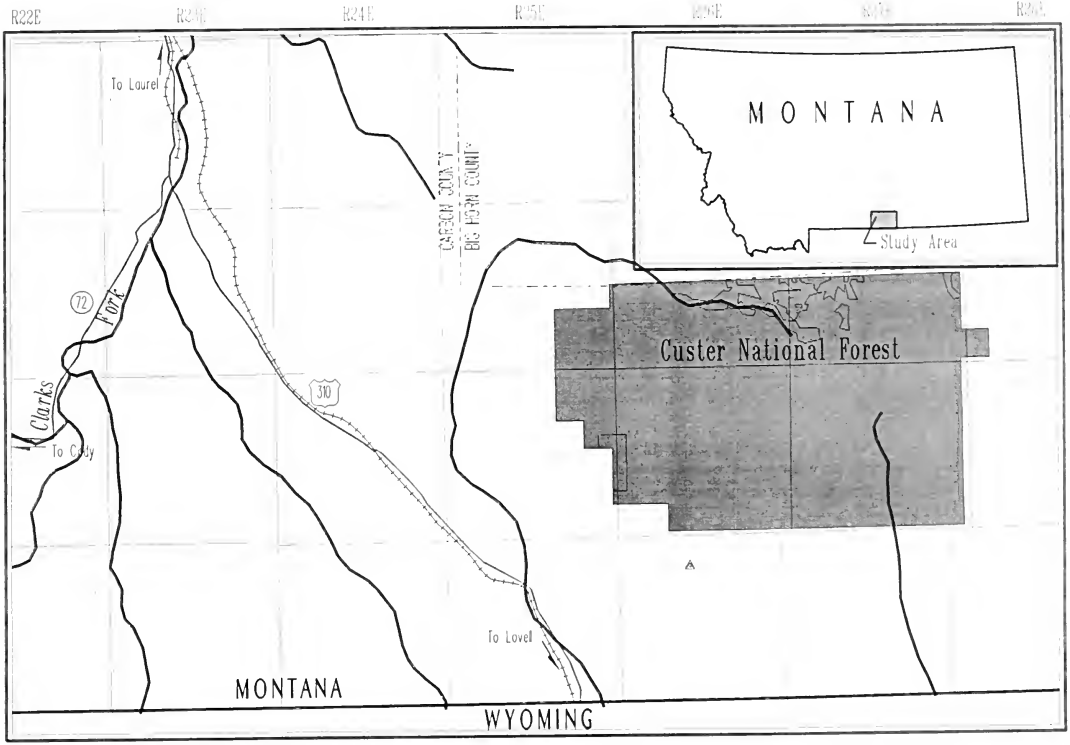

Figure 16.: Location of Nama densum

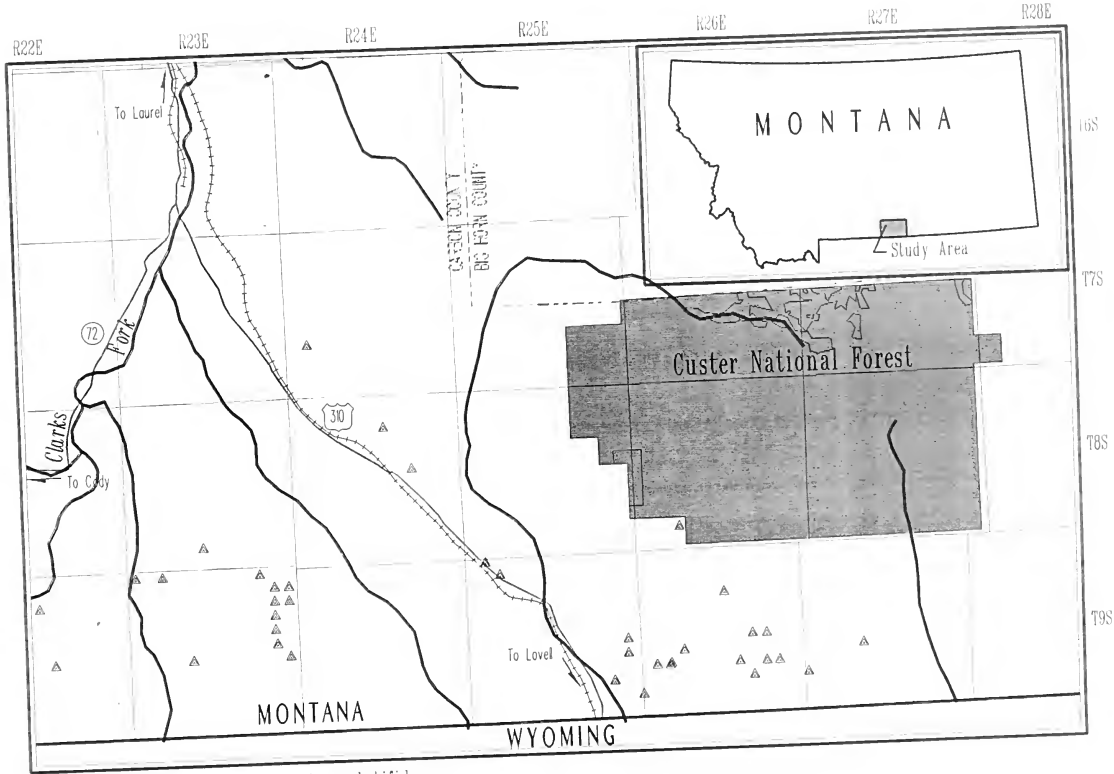

Figure 17.: Location of Artemisia pedatifida

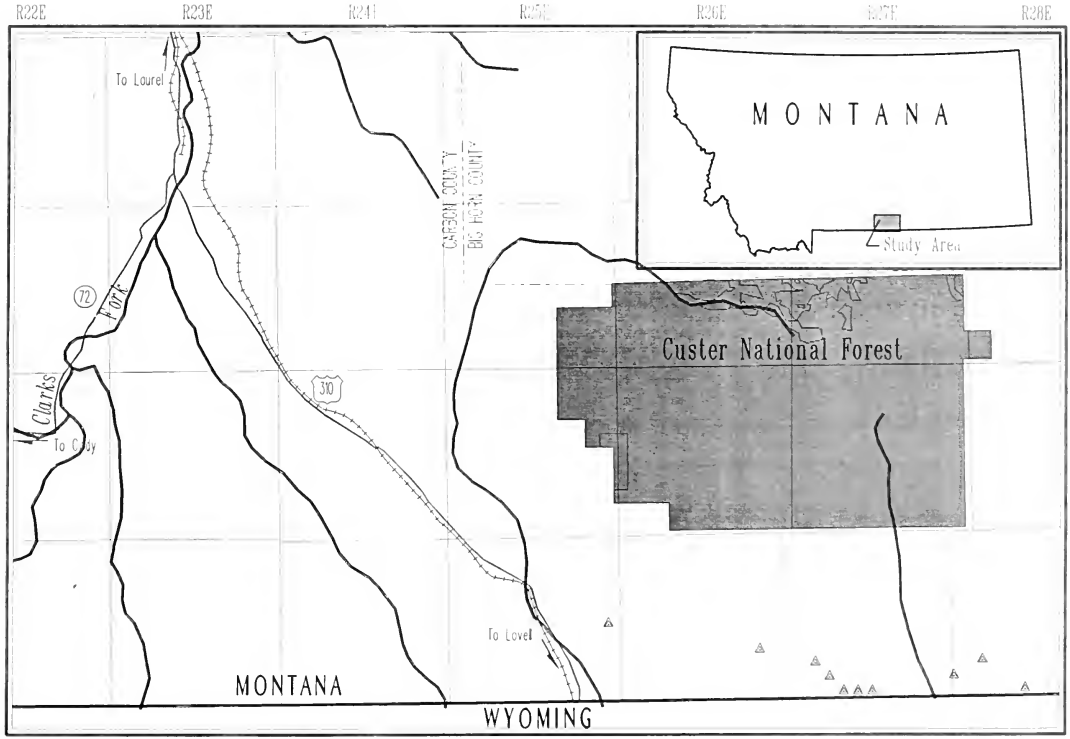

Figure 18.: Location of Artemisia spicata

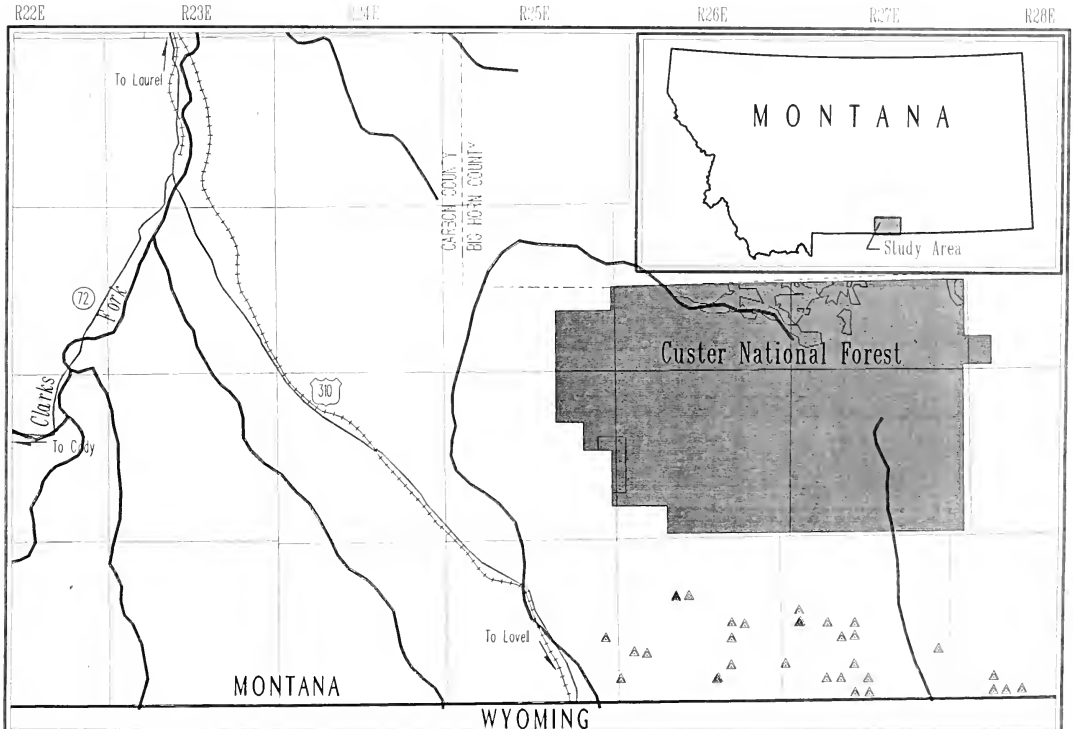

Figure 19.: Location of Astragalus chamaeleuce

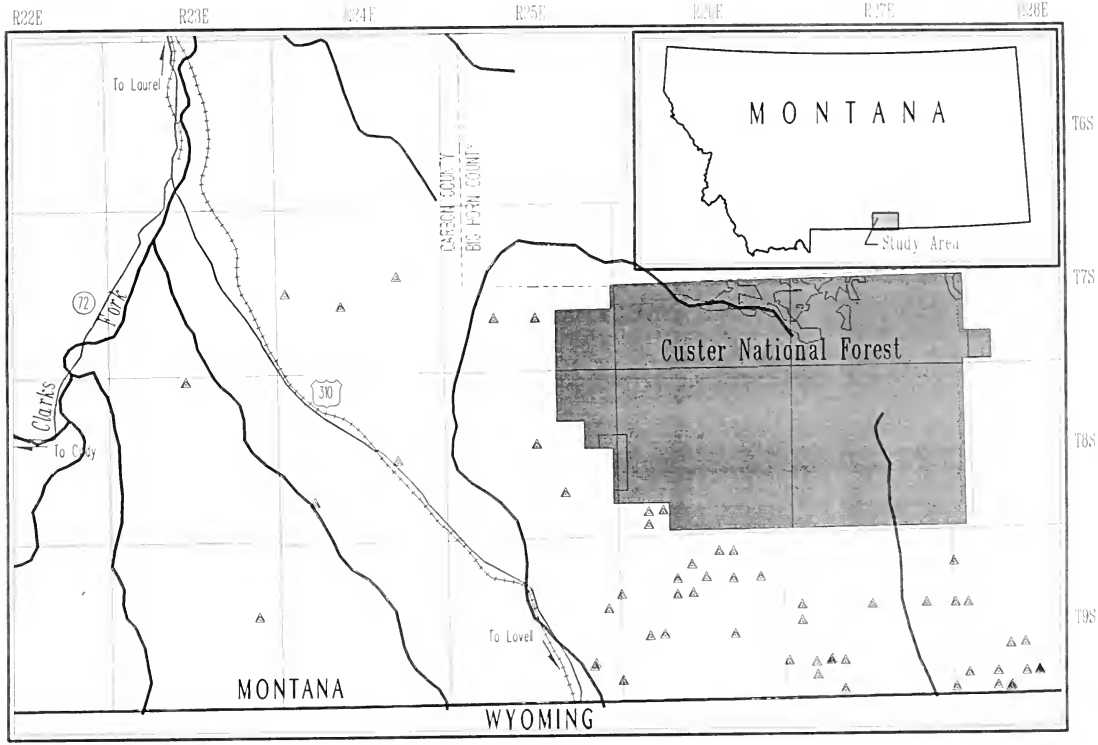

Figure 20.: Location of Astragalus hyalinus

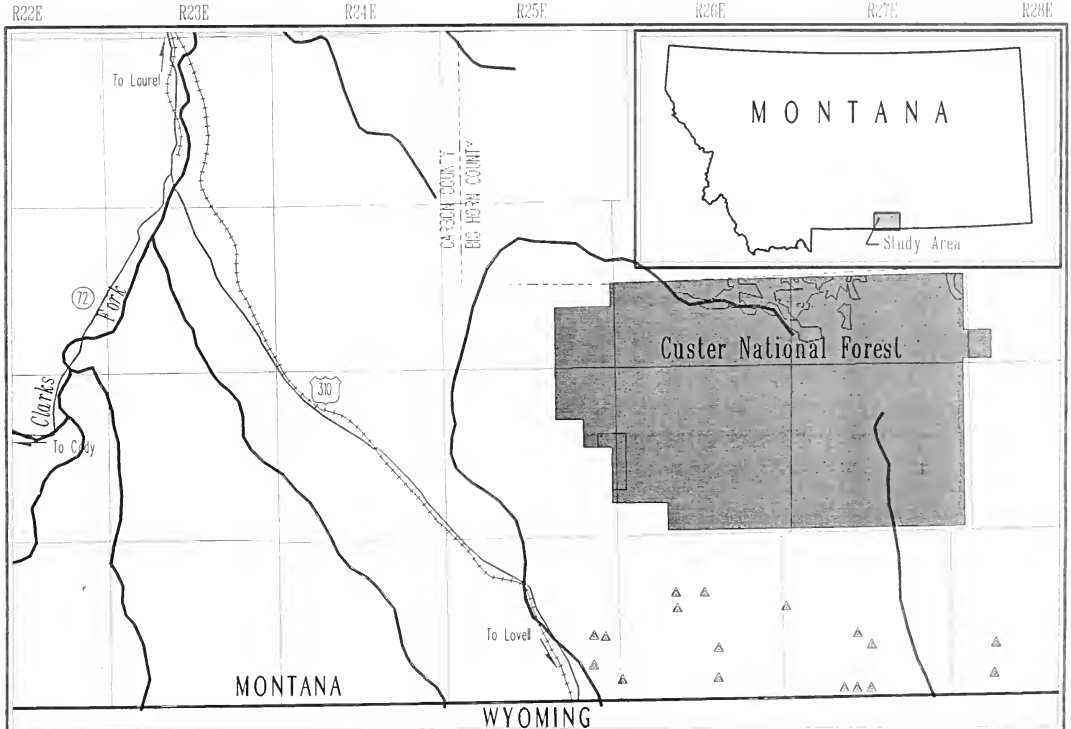

Figure 21.: Location of Camissonia minor

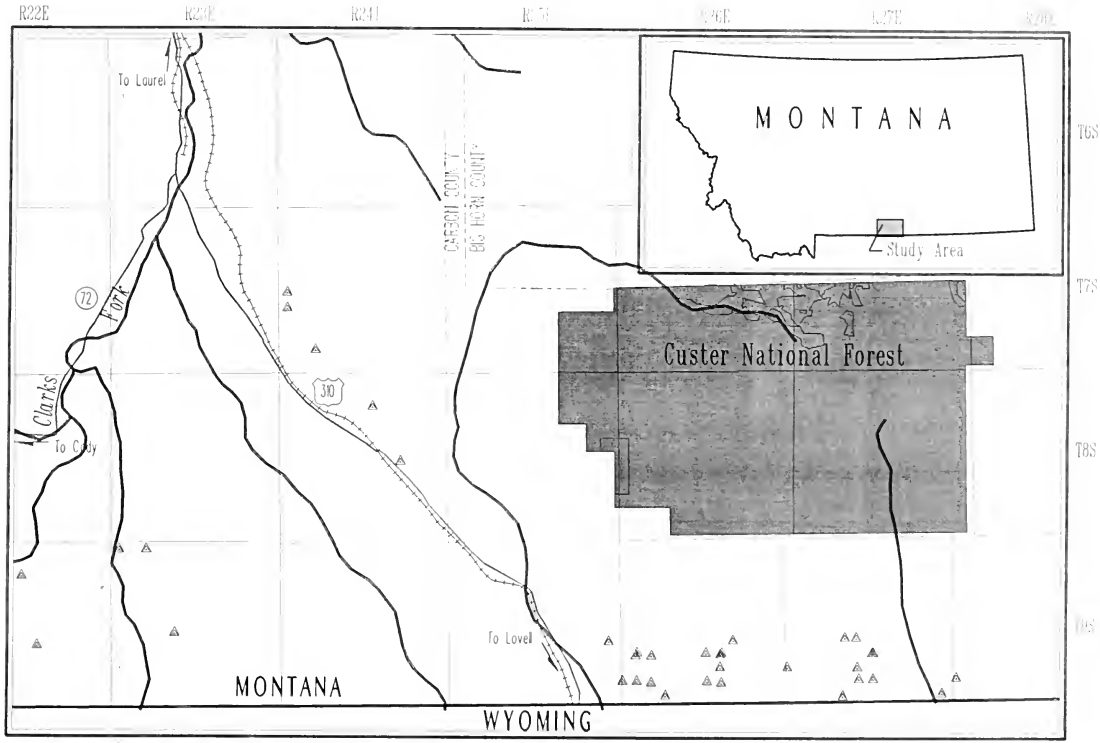

Figure 22.: Location of Camissonia scapoidea

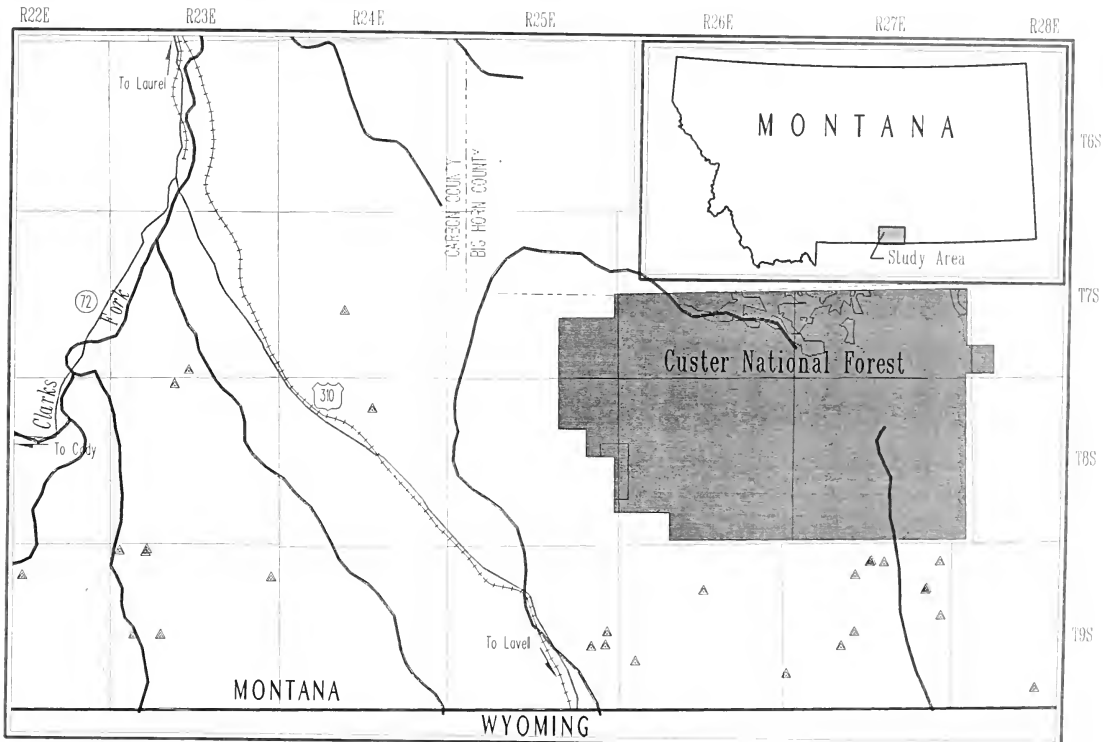

Figure 23. Location of Castilleja angustifolia

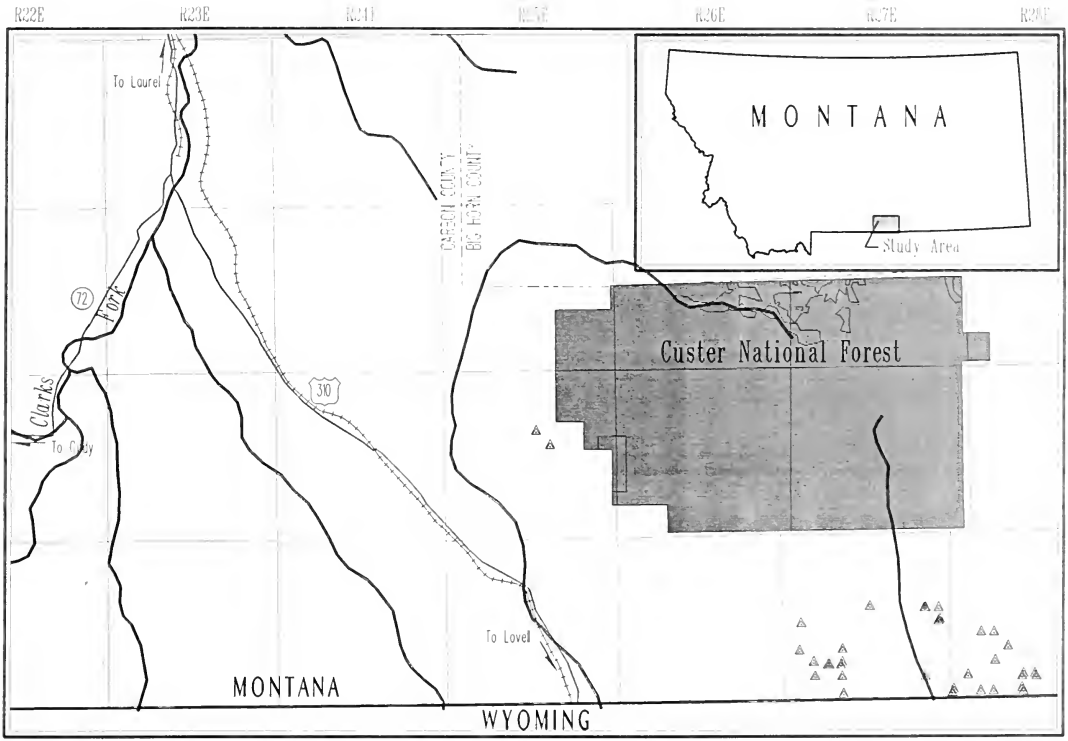

Figure 24.: Location of Cryptantha cana

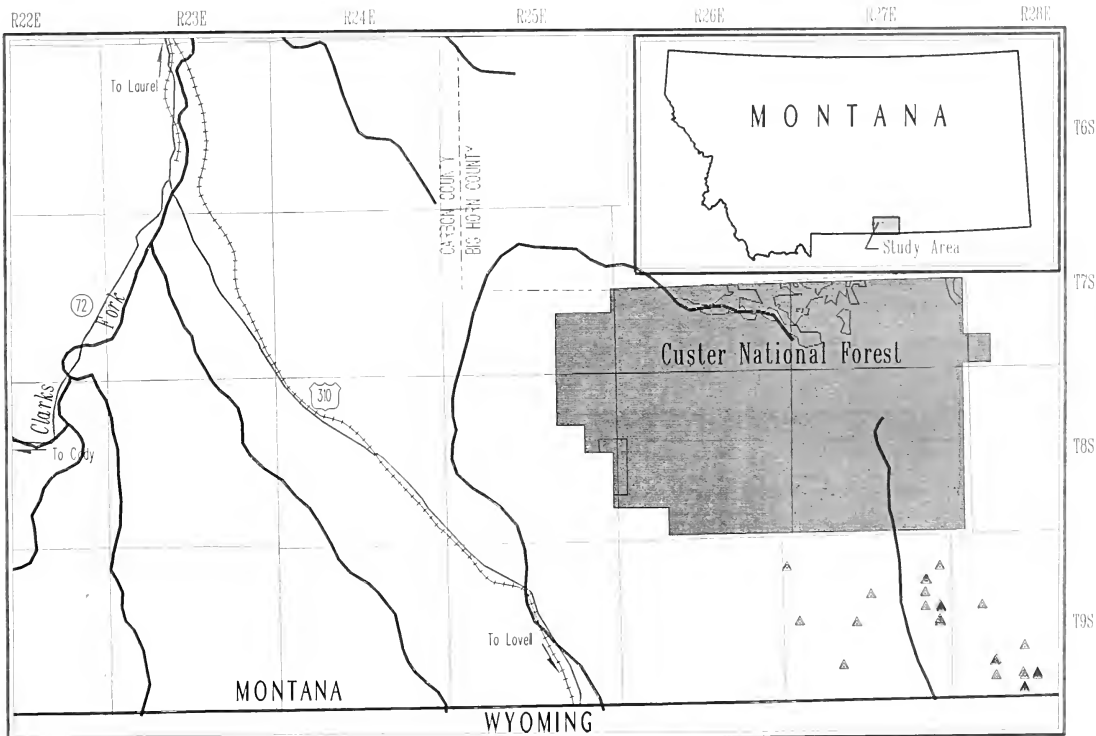

Figure 25.: Location of Cryptantha flavoculata

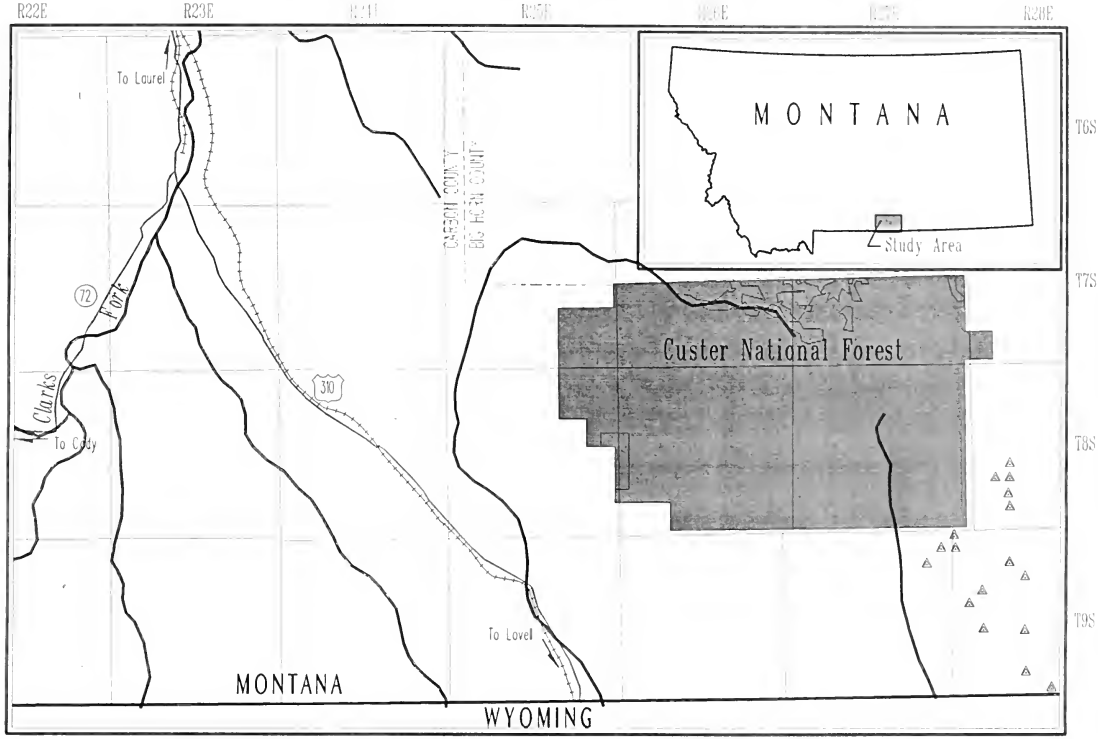

Figure 26.: Location of Erigeron allocotus

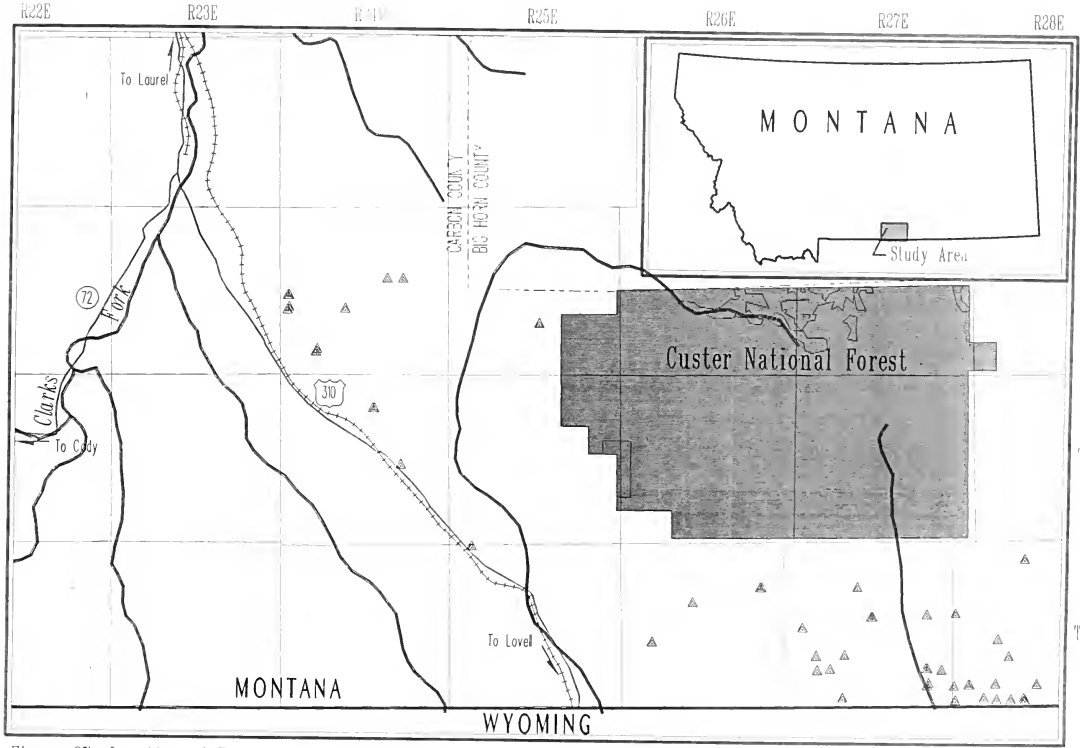

Figure 27.: Location of Eriogonum lagopus

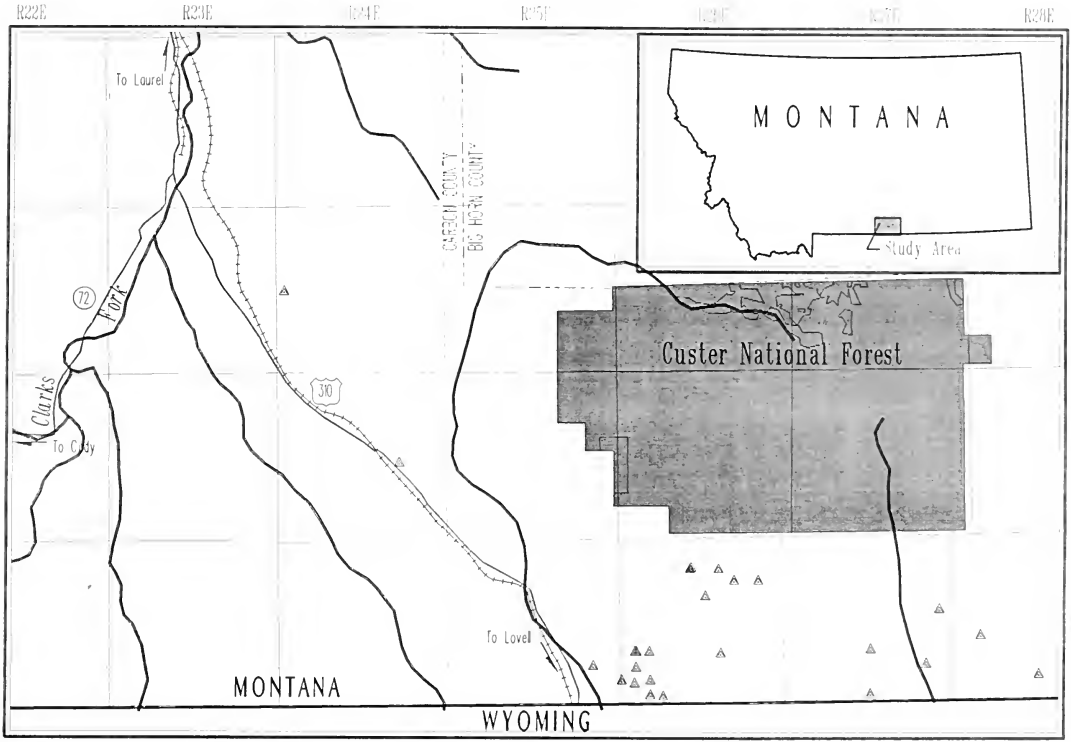

Figure 28.: Location of Gilia inconspicua

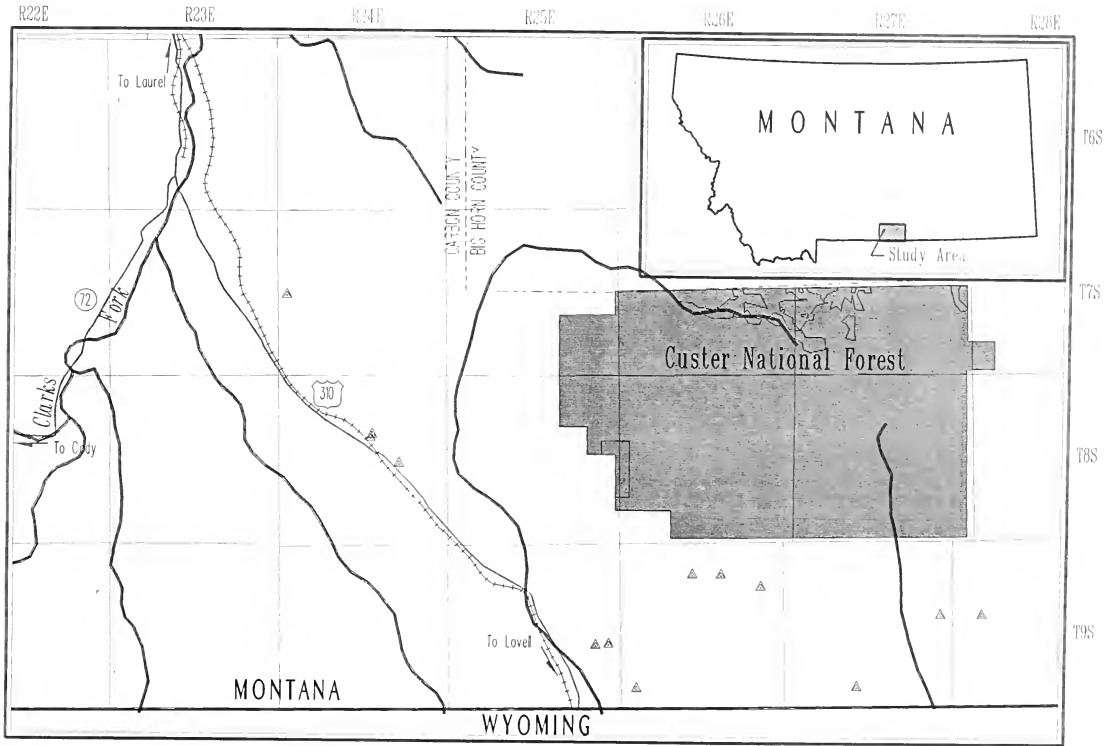

Figure 29.: Location of Gilia leptomeria

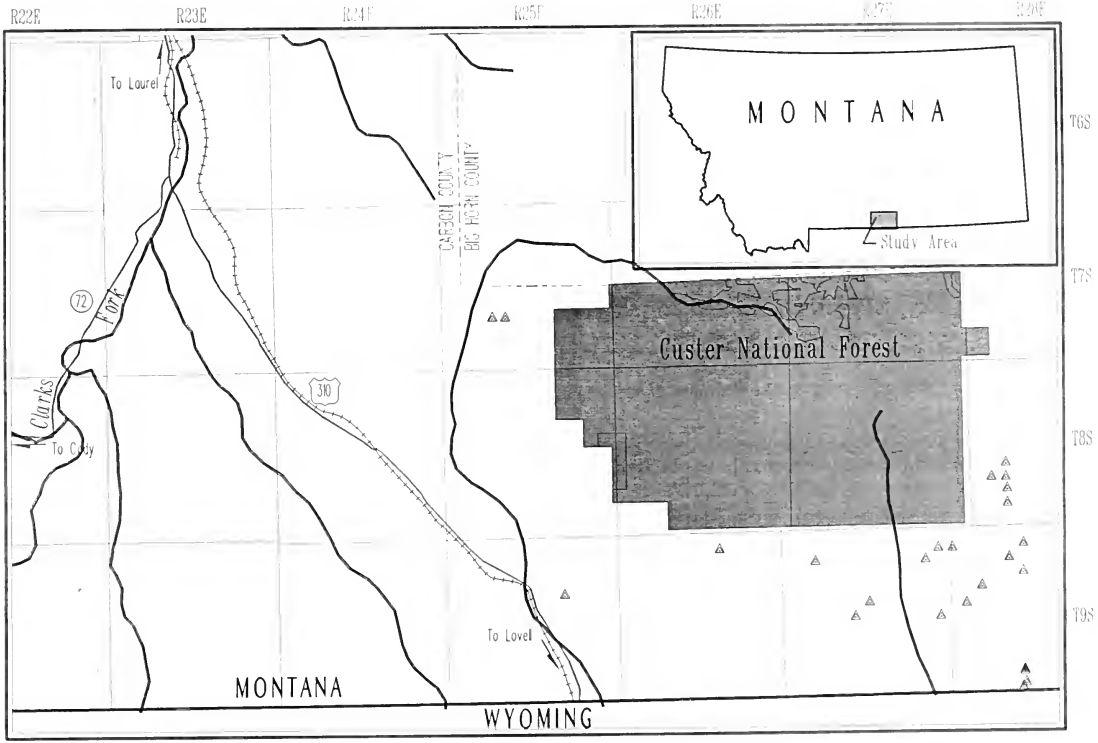

Figure 30.: Location of Hymenoxys torreyana

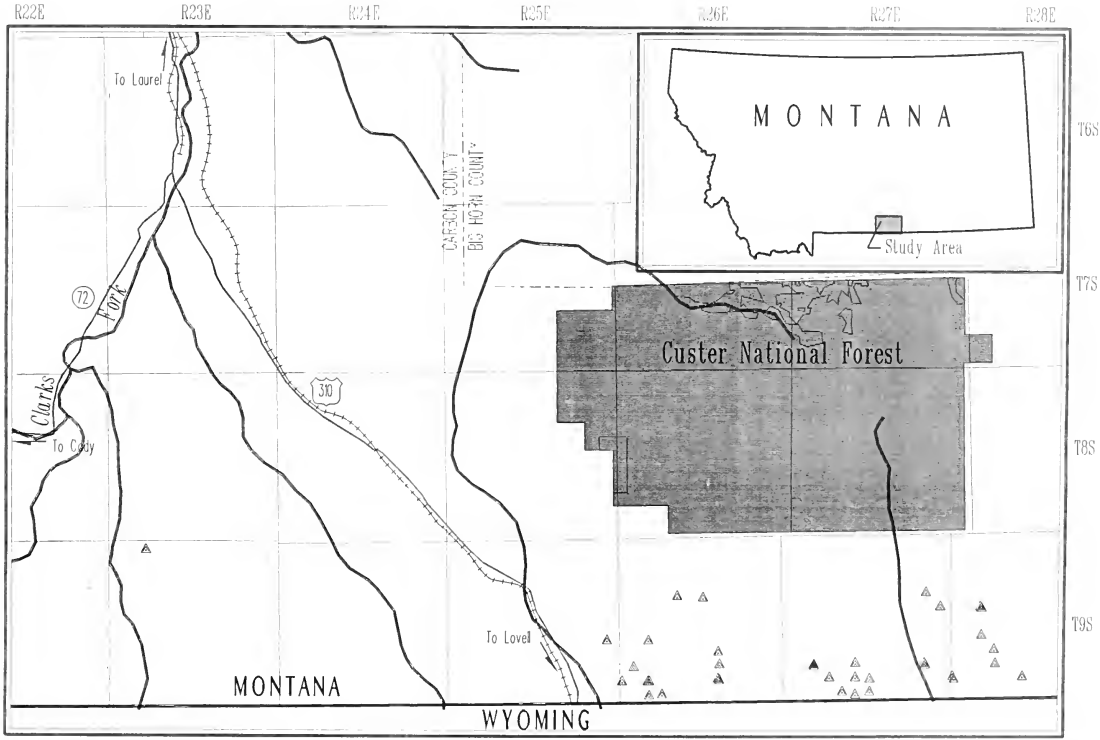

Figure 31.: Location of Ipomopsis pumila

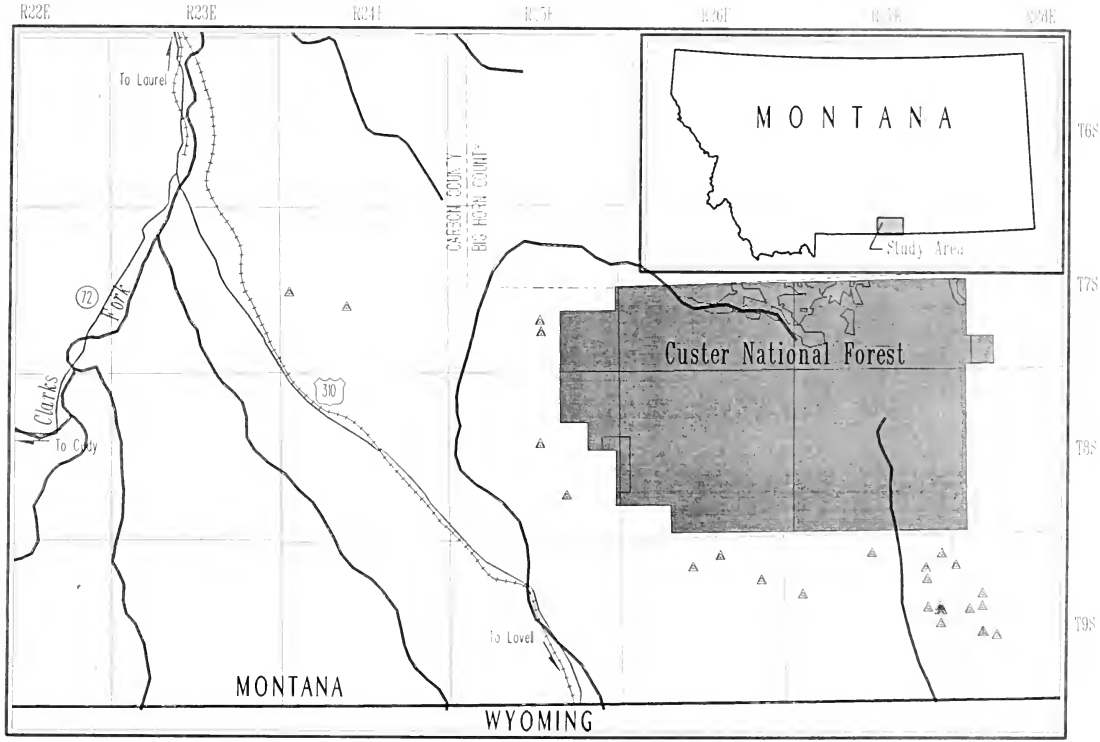

Figure 32.: Location of Penstemon laricifolius

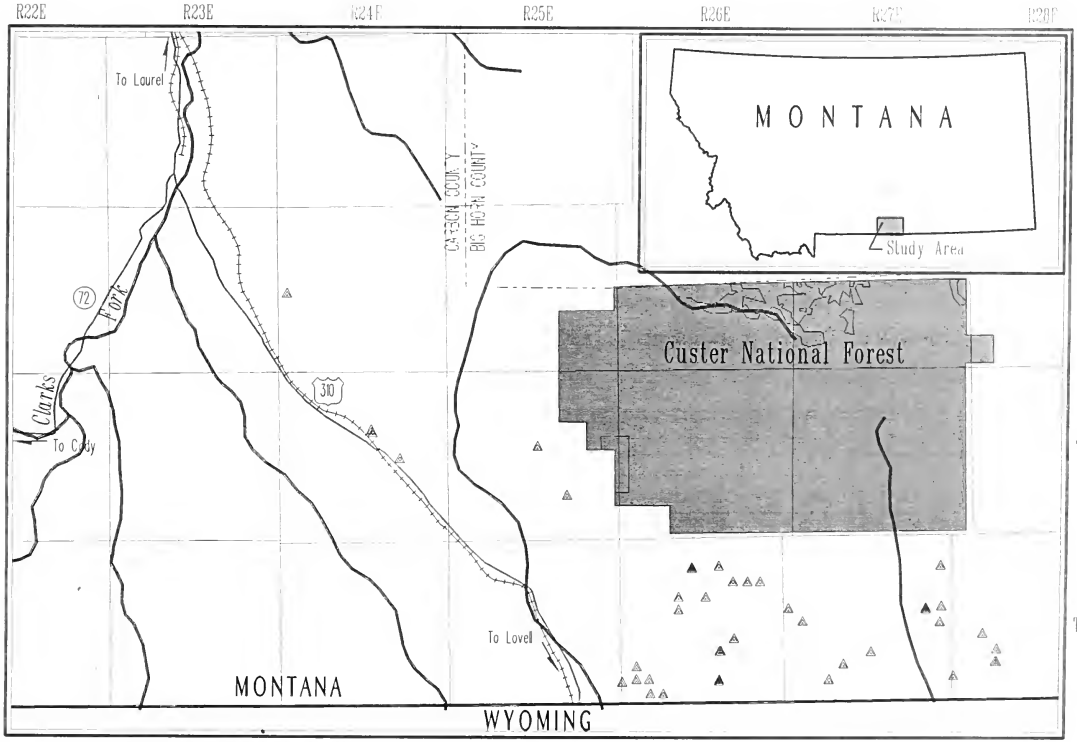

Figure 33.: Location of Phacelia ivesiana

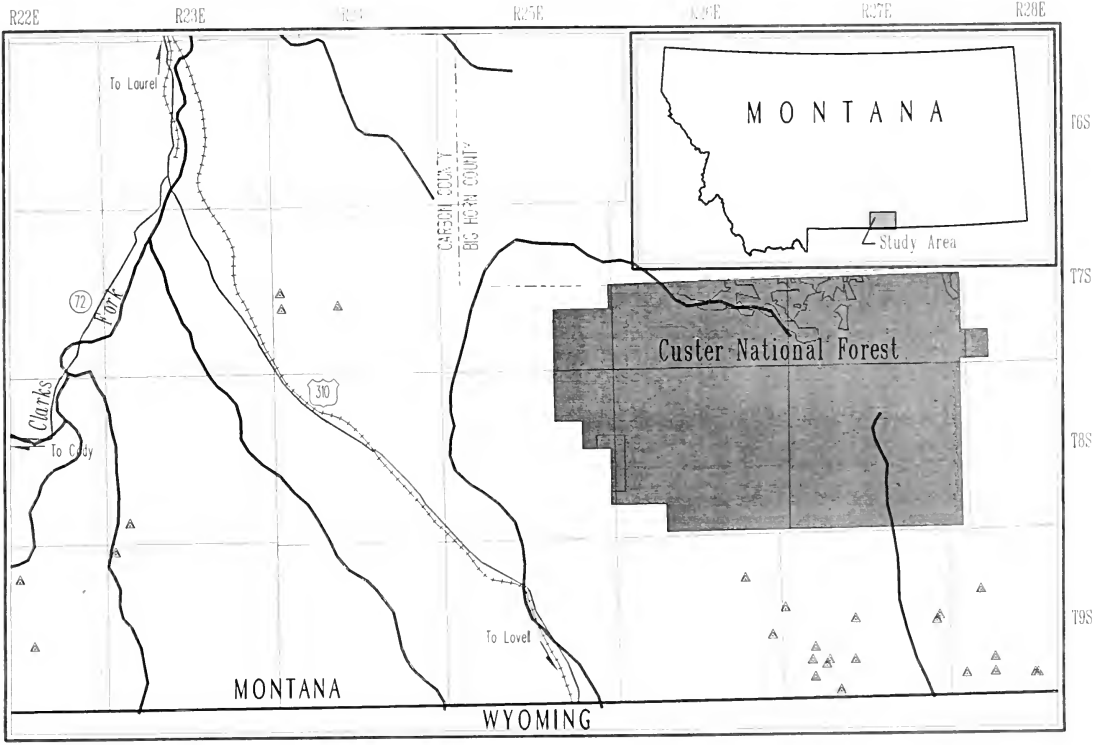

Figure 34.: Location of Physaria acutifolia

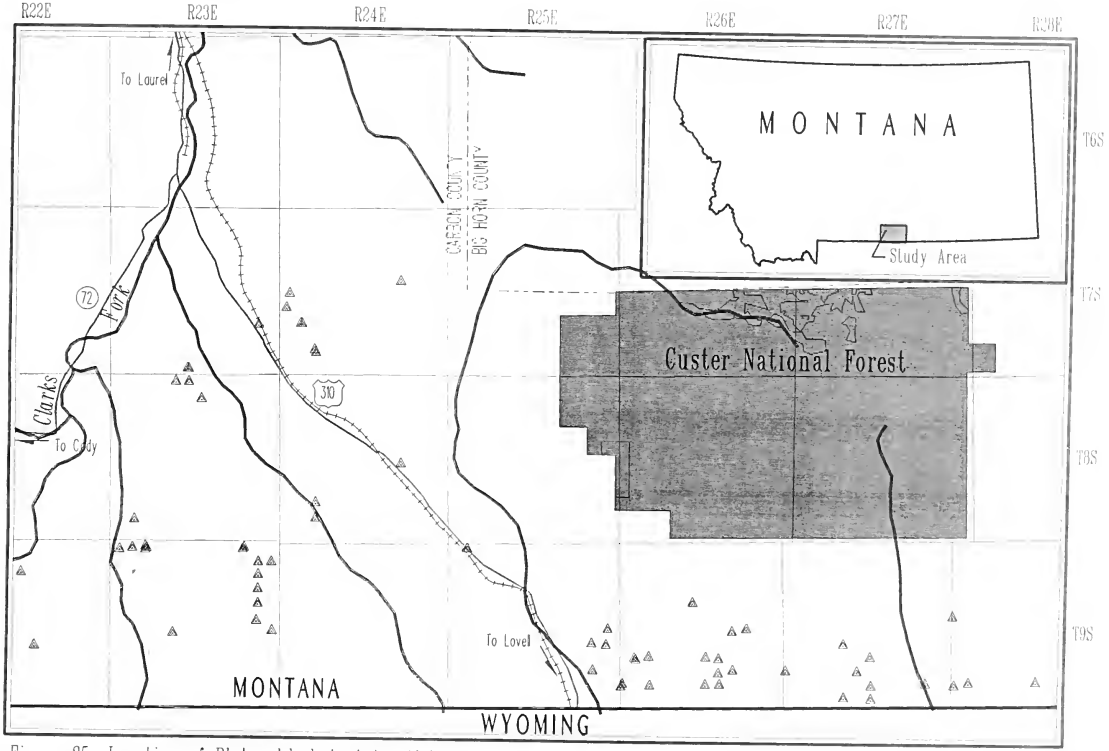

Figure 35.: Location of Platyschkuhria integrifolia

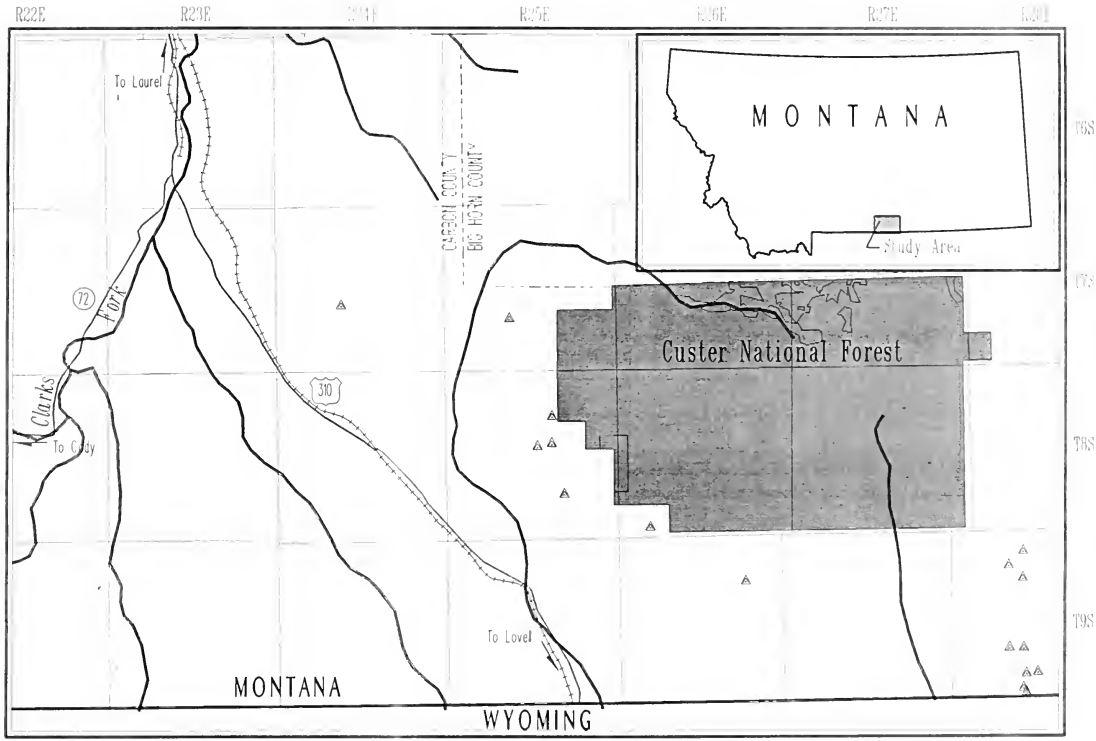

Figure 36.: Location of Sphaeromeria capitata

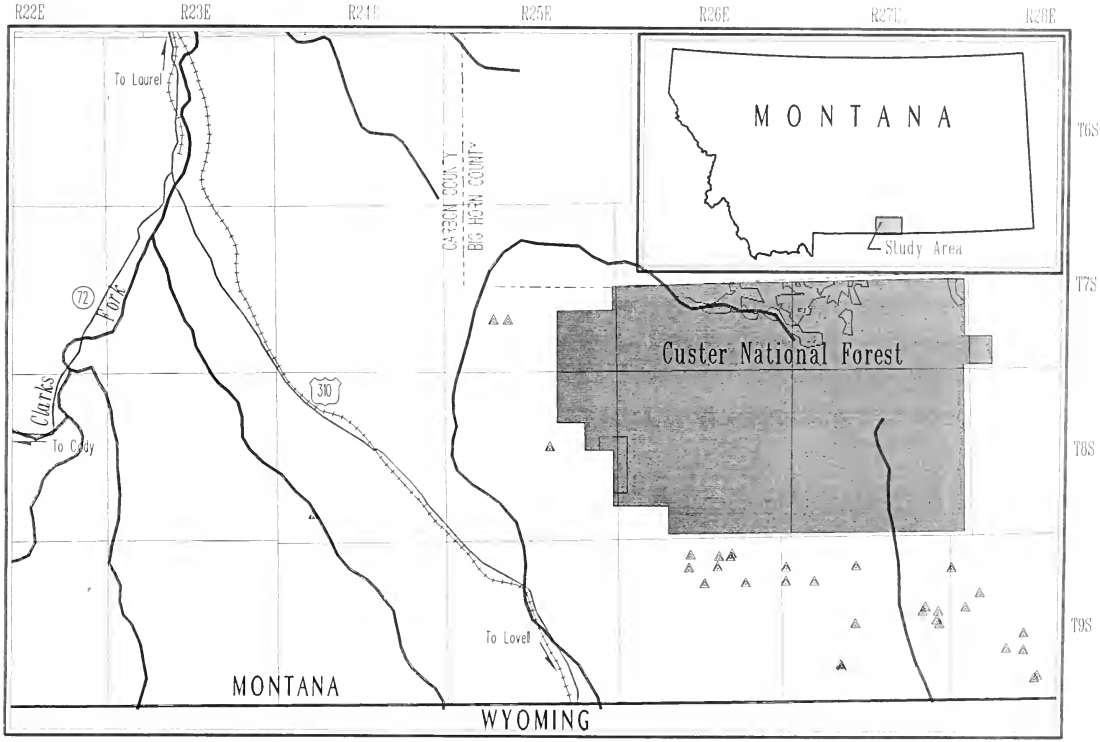

Figure 37.: Location of Stanleya tomentosa

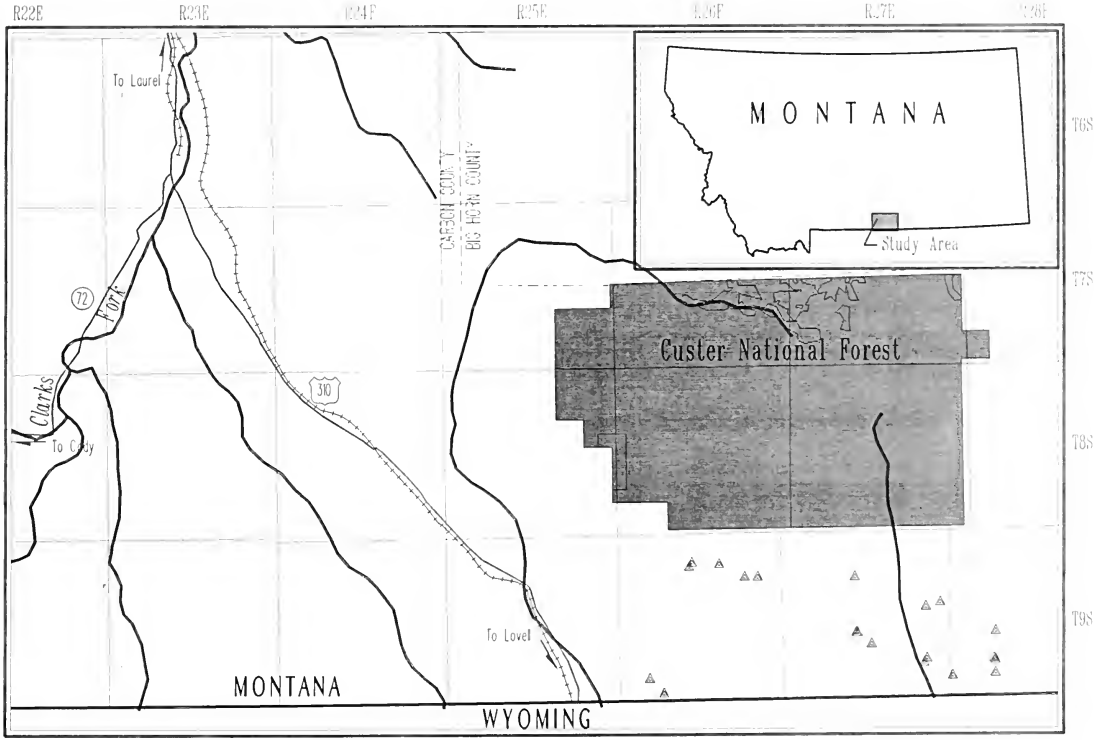

Figure 38.: Location of Streptanthella longirostris

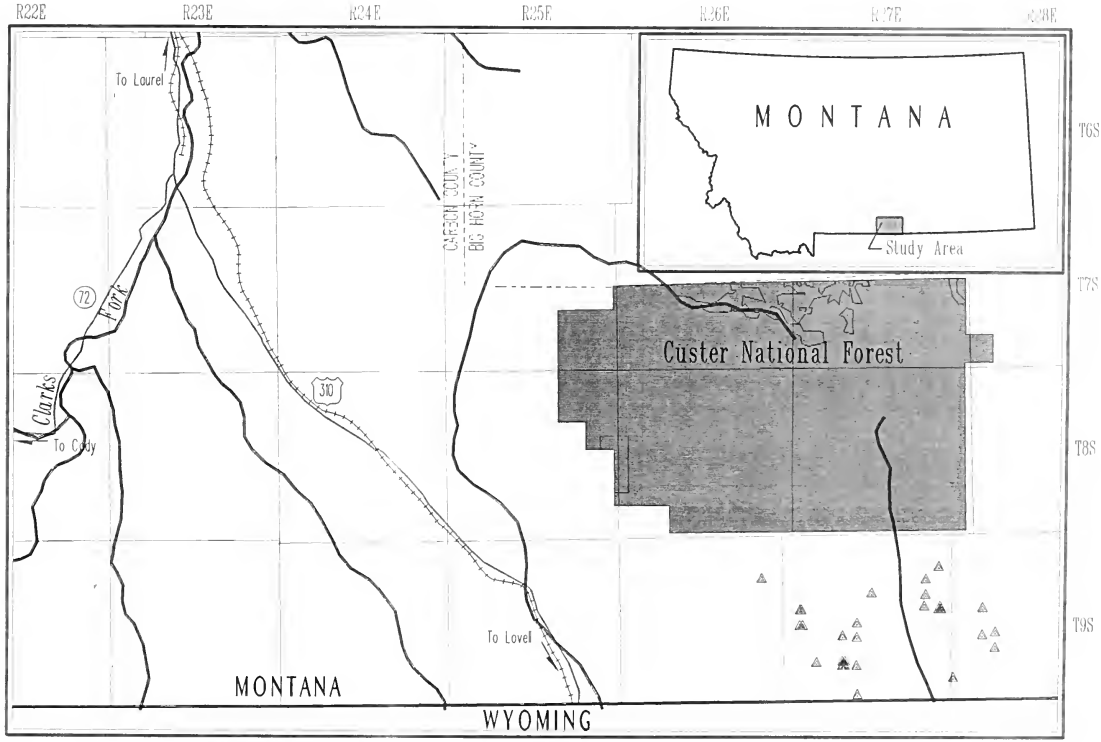

Figure 39.: Location of Townsendia incana

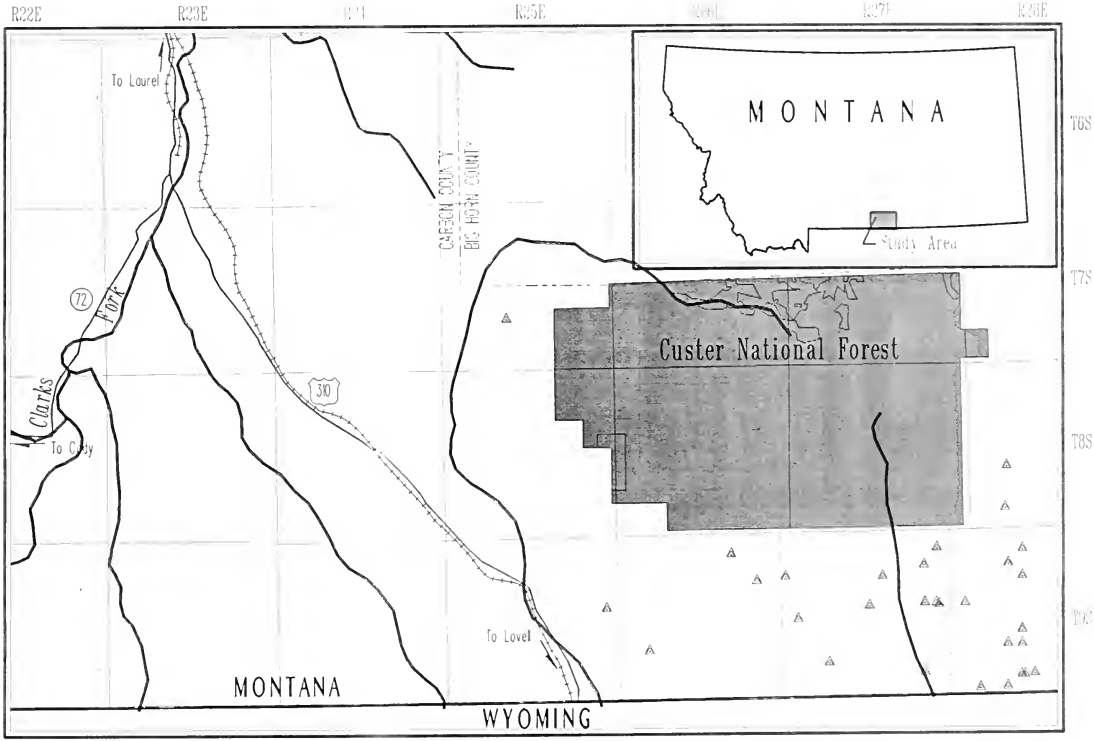

Figure 40.: Location of Townsendia spathulata

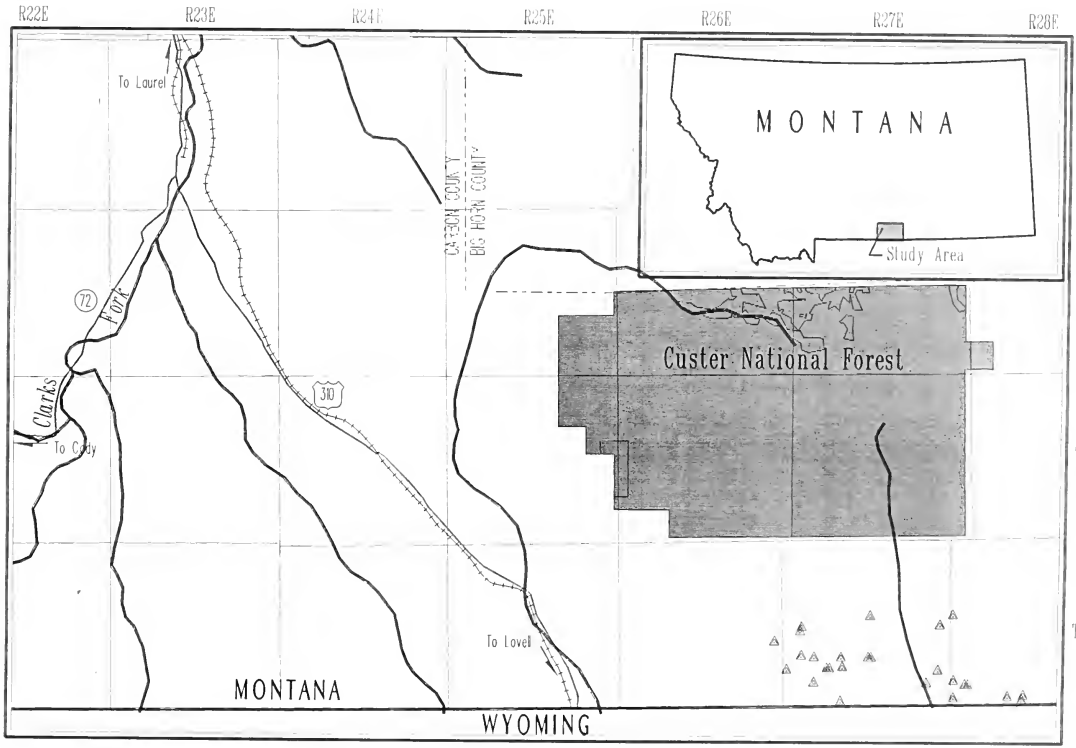

Figure 41.: Location of Wyethia scabra

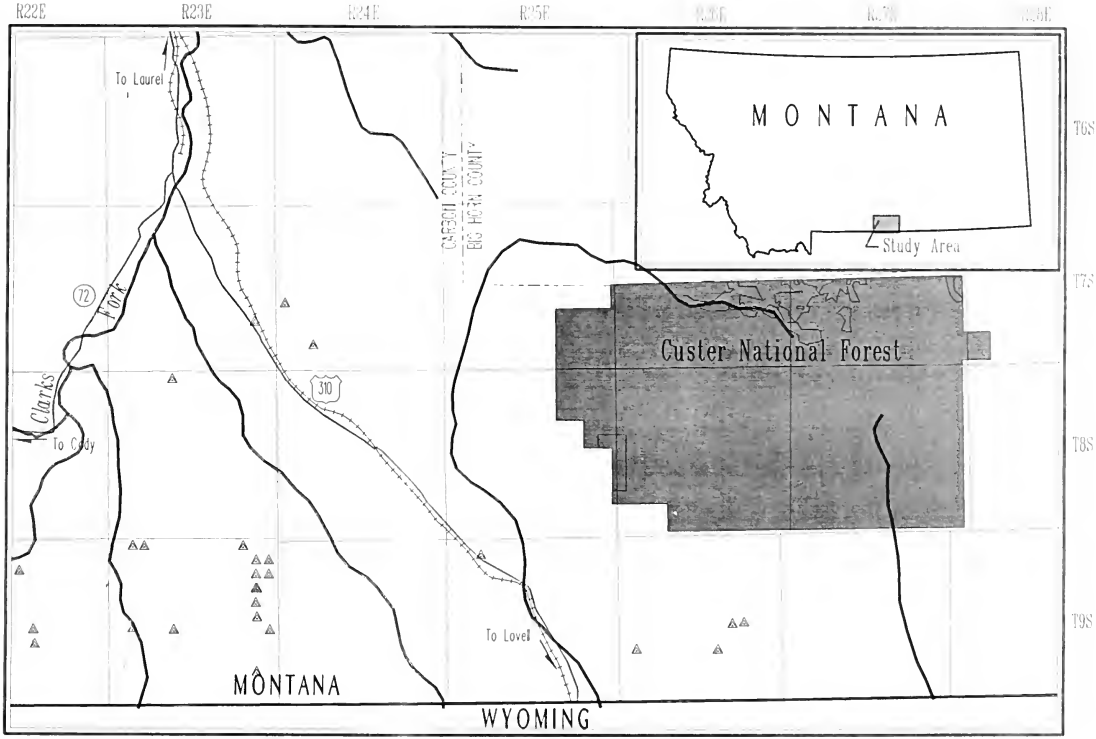

Figure 42.: Location of Xylorhiza glabriuscula

Appendix C. Location, population size, substrate, vegetation type, and elevation of occurrences of species of special concern and of limited distribution.

Location	Size	Substrate	Vegetation	Elevation
Artemisia pedatifida				
T07SR24ES30NE	>1000	clay	Artped/Agrspi	4100
T08SR23ES33SE	>1000	sandy clay	Arttri/Agrspi	3900
T08SR24ES10NW	100-1000	silty	Arttri/Agrspi	4700
T08SR24ES14SW	>1000	sandy clay	Artped/Agrspi	4300
T08SR26ES32NE	100-1000	sandy	Junost/Arttri	5180
T09SR22ES09NE	>1000	sandy clay	Atrtri/Agrspi	4050
T09SR22ES22NW	>1000	sandy clay	Artped/Atrgar	4150
T09SR23ES01SE	>1000	clay	Arttri/Agrspi	4460
T09SR23ES01SW	>1000	clay	Arttri/Agrspi	4400
T09SR23ES02NE	>1000	clay	Arttri/Artped	4360
T09SR23ES05NW	>1000	sandy clay	Artped/Agrspi	4350
T09SR23ES06NW	>1000	sandy clay	Artped/Agrspi	4250
T09SR23ES12NE	>1000	clay	Arttri/Artped	4460
T09SR23ES12NW	>1000	clay	Arttri/Agrspi	4800
T09SR23ES12SW	>1000	clay	Arttri/Agrspi	4820
T09SR23ES13NW	>1000	clay	Arttri/Agrspi	4700
T09SR23ES13SW	>1000	clay	Arttri/Agrspi	5060
T09SR23ES21NW	>1000	clay	Atrtri/Agrspi	4350
T09SR25ES05SW	>1000	sandy clay	Artped/Atrgar	4500
T09SR25ES06NE	100-1000	silty	Arttri/Agrspi	4450
T09SR25ES24NE	>1000	silty	Arttri/Sarver	4550
T09SR25ES24SE	>1000	calc sandstone	Arttri/Artped	4700
T09SR26ES25NW	100-1000	sandy clay	Arttri/Agrspi	4920
T09SR25ES25SW	>1000	clay	Artped/Atrgar	4380
T09SR26ES10SW	>1000	limestone	Junost/Artarb	5100
T09SR26ES20SE	>1000	sandy clay	Arttri/Artped	4800
T09SR26ES23NE	>1000	silty	Artped/Agrspi	5000
T09SR26ES23NW	>1000	sandy clay	Arttri/Agrspi	5000
T09SR26ES26NE	>1000	sandy clay	Artped/Agrspi	5050
T09SR26ES26SW	100-1000	silty	Arttri/Agrspi	4800
T09SR26ES27NE	>1000	stony clay	Artped/Agrspi	4750
T09SR26ES29NW	>1000	clay	Artped/Atrgar	4650
T09SR26ES30NE	>1000	sandy clay	Artped/Atrgar	4650
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR27ES21SW	100-1000	silty	Arttri/Agrspi	4700
T09SR27ES30SW	>1000	silty clay	Artped/Atrgar	4950

Artemisia spinescens

T09SR26ES25NW	100-1000	sandy clay	Arttri/Agrspi	4920
T09SR28ES29SW	100-1000	sandy	Arttri/Sticom	4300
T09SR28ES31NW	100-1000	Chugwater	Arttri/Atrcon	4250
T09SR27ES33SE	100-1000	Chugwater	Arttri/Atrcon	4650
T09SR27ES34SW	>1000	sandy	Arttri/Atrcon	4450
T09SR27ES29SW	>1000	Chugwater	Arttri/Atrcon	4750
T09SR25ES24NE	100-1000	silty	Arttri/Sarver	4550
T09SR27ES29SW	>1000	Chugwater	Atrgar/Artspi	4800
T09SR27ES33SW	>1000	Chugwater	Atrgar/Artspi	4650
T09SR27ES32NE	>1000	Chugwater	Atrgar/Artspi	4700

Astragalus chamaeleuce

T09SR25ES24SE	<10	calc sandstone	Arttri/Artped	4700
T09SR26ES16NE	5	sandy	Arttri/Agrspi	4990
T09SR26ES16NW	<10	sandy	Arttri/Agrspi	4940
T09SR26ES16NW	10	sandstone	Arttri/Agrspi	4940
T09SR26ES23NE	100-1000	silty	Artped/Agrspi	5000
T09SR26ES23NW	<10	sandy clay	Arttri/Agrspi	5000
T09SR26ES23SW	<10	sandy clay	Arttri/Agrspi	4940
T09SR26ES26SW	<100	stony silt	Arttri/Agrspi	4800
T09SR26ES29NW	10	calc sandstone	Arttri/Artped	4700
T09SR26ES30NE	5	sandy	Arttri/Agrspi	4800
T09SR26ES31NW	<10	sandy clay	Artped/Atrgar	4440
T09SR26ES34NE	<100	sandy	Arttri/Sticom	4650
T09SR26ES34NE	<100	sandy	Arttri/Agrspi	4650
T09SR27ES17NE	<10	Chugwater	Junost/Agrspi	5300
T09SR27ES18SE	<100	Chugwater	Junost/Agrspi	5150
T09SR27ES19NE	<100	Chugwater	Junost/Agrspi	5050
T09SR27ES19NE	<100	Chugwater	Arttri/Agrspi	5050
T09SR27ES21NE	<100	sandy	Arttri/Sticom	4800
T09SR27ES21SE	10-100	sandy	Junost/Arttri	4750
T09SR27ES21SW	<100	sandy silt	Junost/Arttri	4700
T09SR27ES25NE	5	Chugwater	Arttri/Poasec	4400
T09SR27ES28SE	<100	sandy	Arttri/Sticom	4750
T09SR27ES30SW	100-1000	silty	Arttri/Agrspi	4900
T09SR27ES32NE	5	silty	Arttri/Artspi	4750
T09SR27ES33NW	5	Chugwater	Arttri/Artspi	4700
T09SR27ES33SE	100-1000	Chugwater	Arttri/Sticom	4650
T09SR27ES34NW	100-1000	sandy clay	Junost/Arttri	4600
T09SR27ES34SW	<100	sandy	Arttri/Atrcon	4450
T09SR28ES32NE	<10	limestone	Junost	4200
T09SR28ES32SE	1	limestone	Gutsar/Agrspi	4150
T09SR28ES33SE	<100	Chugwater	Junost/Arttri	4500

Location	Size	Substrate	Vegetation	Elevation
Astragalus chamaeleuce (cont.)				
T09SR28ES33SW	<10	Chugwater	Junost/Chrnau	4150
Astragalus geyeri				
T09SR26ES31NE	100-1000	sandy	Arttri/Atrgar	4500
T09SR26ES32SE	100-1000	sandstone	Junost/Arttri	4450
T09SR26ES32SW	>1000	sandy	Arttri/Bougra	4450
T09SR27ES25SW	>1000	Chugwater	Arttri/Sticom	4350
T09SR27ES28SE	<100	sandy	Arttri/Sticom	4750
T09SR27ES29SW	100-1000	Chugwater	Arttri/Sticom	4750
T09SR27ES29SW	100-1000	Chugwater	Spocry/Bougra	4800
T09SR27ES33NE	<100	sandy	Arttri/Sticom	4600
Astragalus grayi				
T07SR23ES25NW	>1000	silty	Arttri/Artped	3900
T07SR24ES30NE	<100	sandy clay	Arttri/Artped	4050
T07SR24ES30NW	<100	clay	Arttri/Agrspi	4200
T08SR24ES16SE	<100	silty	Arttri/Artped	4200
T09SR25ES06NE	100-1000	silty	Arttri/Agrspi	4450
Astragalus hyalinus				
T07SR24ES14SW	>1000	sandy clay	Arttri/Agrspi	4800
T07SR24ES19NW	100	sandstone	Pinfle/Artarb	4250
T07SR24ES21SW	>1000	Chugwater	Chrnau/Agrspi	4550
T07SR25ES27NW	100-1000	limestone	Artarb/Agrspi	5000
T07SR25ES29NE	1-100	limestone	Junost/Artarb	4850
T08SR23ES04NE	100-1000	sandy	Pinfle/Arttri	4120
T08SR24ES23NW	>1000	shale	Gutsar/Agrspi	4400
T08SR24ES29SW	100-1000	sandstone	Junost/Arttri	4400
T08SR25ES14NW	>1000	calc sandstone	Pinfle/Junost	5060
T08SR25ES15SW	100-1000	sandy clay	Artped/Atrgar	4900
T08SR26ES32NE	100-1000	limestone	Arttri/Agrspi	5180
T08SR26ES32NW	100-1000	limestone	Junost/Arttri	5180
T08SR26ES32SW	100-1000	limestone	Junost/Arttri	5180
T09SR23ES13SW	100-1000	clay	Arttri/Agrspi	4900
T09SR25ES13SE	>1000	calc stony	Gutsar/Agrspi	4700
T09SR25ES25SW	>1000	sandy clay	Artped/Atrgar	4380
T09SR25ES25SW	>1000	sandy clay	Artped/Atrgar	4380
T09SR26ES02SW	<100	calc sandstone	Cerlan/Agrspi	5550
T09SR26ES03SE	100-1000	calc sandstone	Junost/Artarb	5500
T09SR26ES09NE	100-1000	sandy	Arttri/Sticom	5100
T09SR26ES09SW	10-100	sandy clay	Artped/Atrgar	4980

Location	Size	Substrate	Vegetation	Elevation
Astragalus hyalinus (cont.)				
T09SR26ES10SW	100-1000	limestone	Junost/Artarb	5100
T09SR26ES11SW	100-1000	calc sandy	Gutsar/Agrspi	5250
T09SR26ES12SW	>1000	limestone	Agrspi/Phlmus	5400
T09SR26ES16NE	100-1000	sandy clay	Artped/Atrgar	5020
T09SR26ES16NW	100-1000	sandy clay	Artped/Atrgar	4860
T09SR26ES18NW	100-1000	sandy clay	Arttri/Artped	4760
T09SR26ES20SE	>1000	sandy clay	Arttri/Artped	4800
T09SR26ES20SW	10-100	sandy clay	Arttri/Artped	4800
T09SR26ES23SW	100-1000	sandy clay	Arttri/Agrspi	4940
T09SR26ES31NW	10-100	sandy clay	Artped/Atrgar	4440
T09SR27ES13SW	>1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES15SW	100-1000	limestone	Agrspi/Phlmus	4900
T09SR27ES18SE	100	Chugwater	Junost/Agrspi	5200
T09SR27ES19NE	100-1000	Chugwater	Junost/Phlmus	5150
T09SR27ES28SW	100-1000	Chugwater	Arttri/Agrspi	4800
T09SR27ES29SE	1-100	Chugwater	Chrnau/Phlmus	4850
T09SR27ES29SE	>1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES29SW	>1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES30SW	100-1000	sandy	Artarb/Agrspi	4850
T09SR27ES32NW	100-1000	Chugwater	Chrnau/Phlmus	4800
T09SR27ES33SW	100-1000	Chugwater	Atrcon/Gutsar	4700
T09SR28ES07NW	<10	limestone	Junost	6000
T09SR28ES18SE	100-1000	limestone	Junost	5200
T09SR28ES18SW	100-1000	sandstone	Junost	5200
T09SR28ES28NE	100-1000	limestone	Junost	5000
T09SR28ES28NW	100-1000	limestone	Cerlan/Agrspi	4900
T09SR28ES31NE	100-1000	Chugwater	Gutsar/Oryhym	4350
T09SR28ES31SW	1-100	Chugwater	Chrnau/Phlmus	4400
T09SR28ES32NE	100-1000	limestone	Junost	4200
T09SR28ES32SE	>1000	limestone	Gutsar/Agrspi	4150
T09SR28ES33NE	100-1000	limestone	Junost/Cerled	4680
T09SR28ES33SW	1-100	Chugwater	Junost/Chrnau	4150
T09SR28ES33SW	10-100	Chugwater	Junost/Chrnau	4150
T09SR28ES34NW	100-1000	calc sandy	Junost/Arttri	4500
T09SR28ES34NW	100-1000	Chugwater	Junost/Artarb	4600
Astragalus oreganus				
T09SR27ES21SE	>1000	sandy	Arttri/Sticom	4750
T09SR27ES21SE	>1000	sandy	Junost/Arttri	4750
T09SR27ES25SW	>1000	Chugwater	Arttri/Sticom	4350
T09SR27ES25SW	100-1000	sandy	Arttri/Sticom	4400

Location	Size	Substrate	Vegetation	Elevation
Astragalus oreganus (cont.)				
T09SR28ES33SE	10-100	limestone	Junost/Cerled	4200
Camissonia andina				
T08SR24ES15NW	100	sandstone	Arttri/Agrdas	4350
T09SR25ES24SW	>1000	limestone	Arttri/Agrspi	4550
T09SR26ES16NW	10-100	sandy	Arttri/Agrspi	4940
T09SR27ES13SW	100	calc sandstone	Cerlan/Agrspi	5200
T09SR28ES06SW	>1000	limestone	Psemen/Junost	6200
T09SR28ES17SW	100	sandy	Arttri/Sticom	4900
Camissonia minor				
T09SR25ES24SE	>1000	calc sandstone	Arttri/Artped	4700
T09SR25ES24SW	>1000	limestone	Arttri/Agrspi	4550
T09SR25ES25SW	100-1000	sandy clay	Artped/Atrgar	4380
T09SR26ES15NW	<100	sandy	Arttri/Agrspi	5750
T09SR26ES16NW	100-1000	sandy	Arttri/Agrspi	4940
T09SR26ES16SW	10-100	calc sandy	Junost/Arttri	4900
T09SR26ES27NE	100-1000	sandy	Arttri/Sticom	4750
T09SR26ES31NW	100-1000	sandy clay	Artped/Atrgar	4440
T09SR26ES34NE	100-1000	sandy	Arttri/Sticom	
T09SR27ES18SW	100-1000	Chugwater	Junost/Arttri	5200
T09SR27ES21SE	100-1000	sandy	Junost/Arttri	4750
T09SR27ES27NW	100-1000	sandy	Junost/Arttri	4600
T09SR27ES33SE	100-1000	Chugwater	Arttri/Sticom	4650
T09SR27ES33SW	100-1000	Chugwater	Atrgar/Artspi	4650
T09SR27ES34SW	100	sandy	Arttri/Atrcon	4500
T09SR28ES29NE	100	sandy	Arttri/Sticom	4400
T09SR28ES32NE	1-100	calc sandy	Junsco/Arttri	4200
Camissonia parvula				
T09SR26ES10NE	100	sandstone	Junost/Artarb	5250
T09SR26ES12SW	100-1000	sandy	Arttri/Sticom	5400
Camissonia scapoidea				
T07SR24ES19NW	100-1000	sandy clay	Chrnau/Monnut	4100
T07SR24ES19SW	100-1000	sandy clay	Yucgla/Agrspi	4100
T07SR24ES32NW	>1000	sandy clay	Chrnau/Agrspi	4200
T08SR24ES10NW	>1000	sandy clay	Chrnau/Agrspi	4700
T08SR24ES23NW	>1000	sandstone	Junost/Pinfle	4350
T09SR22ES09NE	100-1000	sandy clay	Arttri/Artarb	4050
T09SR22ES22SW	100-1000	sandy clay	Arttri/Artped	4350

Location	Size	Substrate	Vegetation	Elevation
Camissonia scapoidea (cont.)				
T09SR23ES05NW	100-1000	sandy clay	Arttri/Sarver	4250
T09SR23ES06NW	100-1000	sandy clay	Arttri/Artped	4250
T09SR23ES21NW	>1000	clay	Arttri/Artped	4350
T09SR25ES24SE	>1000	calc sandstone	Arttri/Artped	4700
T09SR26ES23SW	>1000	sandy clay	Arttri/Agrspi	4940
T09SR26ES27NE	>1000	calc sandstone	Junost/Artarb	4850
T09SR26ES27NE	>1000	sandy	Arttri/Sticom	4750
T09SR26ES27NW	>1000	clay	Monnut/Musdiv	4750
T09SR26ES27SE	>1000	stony sandy	Junost/Arttri	4750
T09SR26ES29NW	>1000	calc sandstone	Arttri/Artped	4700
T09SR26ES30NE	>1000	sandy clay	Atrgar/Artped	4650
T09SR26ES30NE	>1000	sandy	Arttri/Agrspi	4800
T09SR26ES31NE	>1000	sandy	Arttri/Atrgar	4500
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR26ES32NW	>1000	clay (stony)	Atrgar/Monnut	4650
T09SR26ES32SE	100-1000	sandstone	Junost	
T09SR26ES34NE	>1000	sandy	Arttri/Sticom	4650
T09SR26ES34NW	>1000	clay	Atrgar/Monnut	4550
T09SR27ES21SE	>1000	sandy clay	Junost/Arttri	4750
T09SR27ES21SW	100-1000	sandy silt	Junost/Arttri	4700
T09SR27ES27NW	>1000	calc sandstone	Junost/Gutsar	4600
T09SR27ES27NW	>1000	sandy	Junost/Arttri	4600
T09SR27ES28SE	>1000	sandy	Arttri/Sticom	4750
T09SR27ES30SW	100-1000	silty	Arttri/Agrspi	4900
T09SR27ES33NE	<100	sandy	Arttri/Sticom	4600
T09SR27ES33SW	100-1000	sandy clay	Atrcon/Chrnau	4600
T09SR27ES34NW	100-1000	sandy clay	Junost/Arttri	4600
T09SR27ES36SE	>1000	Chugwater	Chrnau/Phlmus	4400
T09SR28ES31NW	>1000	Chugwater	Arttri/Spoair	4250
Castilleja angustifolia				
T07SR23ES33SE	100-1000	sandy clay	Arttri/Agrspi	4000
T07SR23ES33SE	10-100	clay	Arttri/Agrspi	4250
T07SR24ES21SW	>1000	calc sandstone	Pinfle/Artarb	4650
T07SR25ES27NW	1-100	limestone	Artarb/Agrspi	5000
T07SR25ES27SW	100-1000	limestone	Pinfle/Artarb	5250
T08SR23ES04NW	10-100	sandy clay	Arttri/Agrspi	4080
T08SR24ES10NW	100-1000	silty (stony)	Arttri/Agrspi	4700
T09SR22ES09NE	<100	sandy clay	Arttri/Artarb	4050
T09SR23ES05NW	<100	sandy clay	Arttri/Artped	4350
T09SR23ES05NW	<100	sandy clay	Arttri/Sarver	4300

Location	Size	Substrate	Vegetation	Elevation
Castilleja angustifolia (cont.)				
T09SR23ES06NW	<100	sandy clay	Arttri/Artped	4250
T09SR23ES12NE	10-100	clay	Arttri/Artped	4460
T09SR23ES19NE	1-100	sand/clay	Arttri/Agrspi	4200
T09SR23ES20NE	<100	silty	Arttri/Sarver	4300
T09SR25ES24NE	1-100	silty	Arttri/Sarver	4550
T09SR25ES24SE	>1000	calc sandstone	Arttri/Artped	4700
T09SR25ES24SW	>1000	limestone	Arttri/Agrspi	4550
T09SR26ES10SW	<100	limestone	Junost/Artarb	5100
T09SR26ES30NE	100-1000	sandy	Arttri/Agrspi	4800
T09SR27ES01SE	<100	limestone	Junost/Artarb	6000
T09SR27ES03SE	100-1000	calc sandstone	Arttri/Artarb	5400
T09SR27ES03SW	>1000	calc sandstone	Junost/Artarb	5600
T09SR27ES03SW	1-100	calc sandstone	Junost	5600
T09SR27ES09NE	10-100	limestone	Junost/Artarb	5460
T09SR27ES12SW	100-1000	limestone	Junost/Artarb	5500
T09SR27ES12SW	100-1000	sandstone	Artarb/Agrspi	5400
T09SR27ES13SE	<100	sandy	Arttri/Sticom	5100
T09SR27ES21NE	1-100	limestone	Junost/Artarb	4800
T09SR27ES21SW	<100	sandy silt	Junost/Arttri	4700
T09SR27ES30SW	1-100	sandy	Artarb/Agrspi	4850
T09SR28ES34NW	<100	limestone	Junost/Artarb	4500
Cleome lutea				
T09SR27ES27NW	<100	sandy	Junost/Arttri	4600
Cryptantha cana				
T08SR25ES15NW	100-1000	limestone	Junost/Arttri	5000
T08SR25ES15SE	100-1000	limestone	Junost	5080
T09SR27ES13SE	100-1000	limestone	Cerlan/Agrspi	5200
T09SR27ES13SW	>1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES13SW	>1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES15SW	>1000	limestone	Agrspi/Phlmus	4900
T09SR27ES19NE	>1000	Chug-calc sand	Cerlan/Agrspi	5050
T09SR27ES24NE	>1000	limestone	Gutsar/Agrspi	4950
T09SR27ES24SE	100-1000	limestone	Gutsar/Agrspi	4750
T09SR27ES28NW	>1000	Chugwater	Cerlan/Agrspi	4800
T09SR27ES28SW	100-1000	Chugwater	Arttri/Agrspi	4800
T09SR27ES28SW	>1000	calc sandstone	Pinfle/Junost	4800
T09SR27ES29SE	1-100	Chugwater	Chrnau/Phlmus	4850
T09SR27ES29SE	>1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES29SW	>1000	Chugwater	Phlmus/Agrspi	4800

Location	Size	Substrate	Vegetation	Elevation
Cryptantha cana (cont.)				
T09SR27ES29SW	>1000	Chugwater	Arttri/Sticom	4750
T09SR27ES30NE	100-1000	Chugwater	Chrnau/Phlmus	4950
T09SR27ES32NW	100-1000	Chugwater	Chrnau/Phlmus	4800
T09SR27ES33NW	100-1000	Chugwater	Chrnau/Phlmus	4700
T09SR27ES33SW	>1000	Chugwater	Atrcon/Gutsar	4700
T09SR27ES36NW	>1000	calc sandstone	Cerlan/Agrspi	4400
T09SR28ES20SE	>1000	calc sandstone	Junost/Cerled	4500
T09SR28ES20SW	>1000	calc sandstone	Arttri/Sticom	4500
T09SR28ES28NW	>1000	limestone	Cerlan/Agrspi	4900
T09SR28ES29SE	100-1000	limestone	Junost/Cerled	4400
T09SR28ES31NE	>1000	Chugwater	Gutsar/Oryhym	4350
T09SR28ES31SW	1-100	Chugwater	Chrnau/Phlmus	4400
T09SR28ES31SW	100-1000	Chugwater	Chrnau/Phlmus	4300
T09SR28ES32SE	>1000	limestone	Gutsar/Agrspi	4150
T09SR28ES32SW	>1000	calc sandstone	Cerlan/Agrspi	4200
T09SR28ES33NE	>1000	limestone	Junost/Cerled	4680
T09SR28ES33NE	100-1000	limestone	Junost/Artarb	4680
T09SR28ES33SE	>1000	limestone	Junost/Cerled	4500
T09SR28ES33SE	100-1000	limestone	Junost/Cerled	4200
T09SR28ES34NW	100-1000	calc sandy	Junost	4500
T09SR28ES34NW	>1000	Chugwater	Junost/Artarb	4600
Cryptantha flavoculata				
T09SR27ES07NW	100-1000	limestone	Junost/Artarb	5550
T09SR27ES12NE	100-1000	limestone	Junost/Agrspi	5700
T09SR27ES12SW	>1000	limestone	Junost/Artarb	5500
T09SR27ES12SW	>1000	sandstone	Artarb/Agrspi	5400
T09SR27ES13NW	>1000	sandy	Arttri/Agrspi	5200
T09SR27ES13SE	<100	limestone	Cerlan/Agrspi	5200
T09SR27ES13SE	>1000	calc sandstone	Junost/Artarb	5000
T09SR27ES13SE	>1000	sandy	Junost/Arttri	5100
T09SR27ES13SE	100-1000	sandy	Arttri/Sticom	5200
T09SR27ES13SW	>1000	calc sandstone	Pinfle/Junost	5100
T09SR27ES15NW	100-1000	calc sandstone	Cerlan/Agrspi	5150
T09SR27ES19NE	100-1000	Chugwater	Junost/Agrspi	5050
T09SR27ES21NE	100-1000	limestone	Junost	4800
T09SR27ES24NE	1-100	sandy	Junost/Arttri	4900
T09SR27ES24NE	>1000	sandstone	Pinfle/Junost	4900
T09SR27ES24NE	>1000	Chugwater	Junost/Artarb	5000
T09SR27ES24SE	100-1000	limestone	Junost/Cerled	4700
T09SR27ES28SW	<100	calc sandstone	Pinfle/Junost	4800

Location	Size	Substrate	Vegetation	Elevation
Cryptantha flavoculata (cont.)				
T09SR28ES17SW	>1000	limestone	Junost/Agrspi	4900
T09SR28ES28NE	100-1000	limestone	Junost	5000
T09SR28ES29SE	100-1000	limestone	Junost/Cerled	4400
T09SR28ES29SE	1-100	calc sandy	Junost/Arttri	4350
T09SR28ES32NE	1-100	calc sandy	Junsco/Arttri	4200
T09SR28ES33NE	100-1000	limestone	Junost/Cerled	4680
T09SR28ES33NE	>1000	limestone	Junost/Artarb	4680
T09SR28ES33SE	>1000	limestone	Junost/Cerled	4500
T09SR28ES33SE	>1000	limestone	Junost/Cerled	4200
T09SR28ES34NW	>1000	Chugwater	Junost/Artarb	4500
T09SR28ES34NW	100-1000	limestone	Junost/Artarb	4500
T09SR28ES34NW	>1000	Chugwater	Junost/Artarb	4600
Cryptantha scoparia				
T09SR25ES24SW	>1000	limestone	Arttri/Agrspi	4550
Erigeron allocotus				
T08SR28ES21SW	100-1000	limestone	Phlhoo/Agrspi	7600
T08SR28ES28NW	>1000	limestone	Junost	7550
T08SR28ES28SW	10-100	limestone	Junost	7215
T08SR28ES29NE	100-1000	limestone	Phlhoo/Agrspi	7250
T08SR28ES33NW	100-1000	limestone	Junost	6900
T09SR27ES01SE	>1000	limestone	Junost/Artarb	6000
T09SR27ES12NW	>1000	limestone	Cerlan/Agrspi	5500
T09SR28ES06NW	100-1000	limestone	Phlhoo/Agrspi	6325
T09SR28ES06SW	100-1000	limestone	Psemen/Junost	6200
T09SR28ES09NW	>1000	limestone	Cerlan/Agrspi	6100
T09SR28ES09SE	>1000	limestone	Cerlan/Agrspi	6200
T09SR28ES17NW	100-1000	limestone	Artarb/Agrspi	5300
T09SR28ES18SE	100-1000	limestone	Junost	5200
T09SR28ES20SW	<100	limestone cliff		4500
T09SR28ES21SE	100-1000	limestone	Junost/Cerled	5100
T09SR28ES33NE	100-1000	limestone	Junost/Artarb	4680
T09SR28ES34SE	10-100	limestone	Junost	4600
Eriogonum lagopus				
T07SR24ES14SW	>1000	sandy clay	Arttri/Agrspi	4800
T07SR24ES15SE	>1000	sandy clay	Chrnau/Agrdas	4750
T07SR24ES19NW	>1000	sandy clay	Chrnau/Monnut	4100
T07SR24ES19NW	100-1000	sandstone	Pinfle/Artarb	4250
T07SR24ES19SW	>1000	sandy clay	Yucgla/Agrspi	4100

Location	Size	Substrate	Vegetation	Elevation
Eriogonum lagopus (cont.)				
T07SR24ES19SW	>1000	sandy clay	Arttri/Agrspi	4100
T07SR24ES21SW	>1000	Chugwater	Chrnau/Agrspi	4550
T07SR24ES32NW	>1000	clay	Chrnau/Atrsuc	4200
T07SR24ES32NW	>1000	sandy clay	Chrnau/Agrspi	4200
T07SR25ES27NW	100-1000	limestone	Artarb/Agrspi	5000
T08SR24ES10NW	>1000	sandy clay	Chrnau/Agrspi	4700
T08SR24ES10NW	100-1000	silty (stony)	Arttri/Agrspi	4700
T08SR24ES23NW	>1000	shale	Gutsar/Agrspi	4400
T09SR25ES06NE	100-1000	silty	Arttri/Agrspi	4450
T09SR26ES12SW	>1000	calc sandstone	Artarb/Agrspi	5400
T09SR26ES12SW	>1000	limestone	Agrspi/Phlmus	5400
T09SR26ES16NE	100-1000	sandy	Arttri/Agrspi	4990
T09SR26ES20SW	>1000	sandy clay	Arttri/Artped	4800
T09SR27ES09SE	100-1000	sandy	Junost/Artarb	5240
T09SR27ES13SW	>1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES15SW	100-1000	calc shale	Artarb/Agrspi	5050
T09SR27ES15SW	<100	limestone	Agrspi/Phlmus	4900
T09SR27ES19NE	>1000	Chugwater	Junost/Agrspi	5150
T09SR27ES25SE	100-1000	Chugwater	Chrnau/Phlmus	4400
T09SR27ES25SW	100-1000	Chugwater	Arttri/Sticom	4350
T09SR27ES25SW	>1000	sandy	Arttri/Sticom	4400
T09SR27ES28NW	>1000	Chugwater	Cerlan/Agrspi	4800
T09SR27ES29NW	100-1000	Chugwater	Junost/Gutsar	4850
T09SR27ES29SE	100-1000	limestone	Phlmus/Agrspi	4800
T09SR27ES29SE	>1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES29SW	100-1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES33SW	100-1000	Chugwater	Atrcon/Gutsar	4700
T09SR27ES36NW	100-1000	calc sandstone	Cerlan/Agrspi	4400
T09SR27ES36NW	100-1000	Chugwater	Junost/Chrnau	4400
T09SR28ES04SE	>1000	limestone	Gutsar/Agrspi	6500
T09SR28ES18SW	100-1000	sandstone	Junost	5200
T09SR28ES20SE	100-1000	calc sandstone	Junost/Cerled	4500
T09SR28ES28NW	>1000	limestone	Cerlan/Agrspi	4900
T09SR28ES31NE	>1000	Chugwater	Junost/Erilag	4200
T09SR28ES31NE	100-1000	Chugwater	Gutsar/Oryhym	4350
T09SR28ES31NW	>1000	Chugwater	Yucgla/Oryhym	4200
T09SR28ES31SW	100-1000	Chugwater	Chrnau/Phlmus	4400
T09SR28ES32NE	100-1000	limestone	Junost	4200
T09SR28ES32SE	100-1000	limestone	Gutsar/Agrspi	4150
T09SR28ES32SW	>1000	calc sandstone	Cerlan/Agrspi	4200
T09SR28ES33SE	>1000	Chugwater	Junost/Arttri	4500

Location	Size	Substrate	Vegetation	Elevation
Eriogonum lagopus (cont.)				
T09SR28ES33SE	100-1000	limestone	Junost/Cerled	4200
T09SR28ES33SW	100-1000	Chugwater	Junost/Chrnau	4150
T09SR28ES34NW	<100	Chugwater	Junost/Artarb	4500
Eriogonum salsuginosum				
T09SR26ES27NW	100-1000	clay	Monnut/Musdiv	4750
Gilia inconspicua				
T07SR24ES19NW	>1000	sandstone	Pinfle/Artarb	4250
T08SR24ES23NW	>1000	sandstone	Junost/Pinfle	4350
T09SR25ES25SW	>1000	sandy clay	Artped/Atrgar	4380
T09SR26ES09NE	>1000	sandy	Arttri/Sticom	5100
T09SR26ES09NE	>1000	sandy	Arttri/Sticom	5100
T09SR26ES10NE	100-1000	sandstone	Junost/Artarb	5250
T09SR26ES11SW	1-100	calc sandy	Junost/Artarb	5250
T09SR26ES12SW	>1000	sandy	Arttri/Sticom	5400
T09SR26ES15NW	>1000	sandy	Arttri/Agrspi	5750
T09SR26ES27NE	100-1000	sandy	Arttri/Sticom	4750
T09SR26ES29NW	>1000	calc sandstone	Arttri/Artped	4680
T09SR26ES30NE	100-1000	sandy clay	Atrgar/Artped	4650
T09SR26ES30NE	100-1000	sandy	Arttri/Agrspi	4800
T09SR26ES30SE	>1000	sandy	Arttri/Sticom	4550
T09SR26ES31NE	>1000	sandy	Arttri/Atrgar	4500
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR26ES32NW	>1000	sandy	Arttri/Bougra	4550
T09SR26ES32SE	>1000	sandstone	Junost	
T09SR26ES32SW	100-1000	sandy	Arttri/Bougra	4450
T09SR27ES13SE	100-1000	sandy	Junost/Arttri	5100
T09SR27ES25SW	>1000	Chugwater	Arttri/Sticom	4350
T09SR27ES27NW	<100	sandy	Junost/Arttri	4600
T09SR27ES34SW	<100	sandy	Arttri/Atrcon	4450
T09SR28ES20SW	100-1000	calc sandstone	Arttri/Sticom	4500
T09SR28ES34NW	100-1000	calc sandy	Junost/Arttri	4500
Gilia leptomeria				
T07SR24ES19NW	100-1000	sandstone	Pinfle/Artarb	4250
T08SR24ES15NW	<100	calc sandstone	Junost/Pinfle	4300
T08SR24ES15NW	>1000	sandstone	Arttri/Agrdas	4350
T08SR24ES23NW	>1000	sandstone	Junost/Pinfle	4350
T09SR25ES24SE	100-1000	calc sandstone	Arttri/Artped	4700
T09SR25ES24SW	>1000	limestone	Arttri/Agrspi	4550

Location	Size	Substrate	Vegetation	Elevation
Gilia leptomeria (cont.)				
T09SR26ES09NE	>1000	sandy	Arttri/Sticom	5100
T09SR26ES10NE	>1000	sandstone	Junost/Artarb	5250
T09SR26ES12SW	>1000	sandy	Arttri/Sticom	5400
T09SR26ES31NE	<100	sandy	Arttri/Atrgar	4500
T09SR27ES13SE	100-1000	sandy	Junost/Arttri	5100
T09SR27ES33NE	<100	sandy	Arttri/Sticom	4600
T09SR28ES17SW	100-1000	sandy	Arttri/Sticom	4900
Grayia spinosa				
T09SR26ES30NE	1-100	calc sandy	Arttri/Agrspi	4700
T09SR26ES30SE	<100	sandy	Arttri/Sticom	4550
T09SR26ES32SE	100-1000	sandstone	Junost/Arttri	4450
T09SR26ES32SW	100-1000	sandy	Arttri/Bougra	4450
T09SR26ES34NE	<100	sandy	Arttri/Agrspi	4650
T09SR27ES19SE	1-100	Chugwater	Arttri/Agrspi	4950
T09SR27ES28SE	<100	sandy	Arttri/Sticom	4750
T09SR27ES33NE	<100	sandy	Arttri/Sticom	4600
T09SR27ES34SW	100-1000	sandy	Arttri/Atrcon	4450
Hymenoxys torreyana				
T07SR25ES28NW	>1000	limestone	Cerlan/Agrspi	5100
T07SR25ES29NE	1-100	limestone	Junost/Artarb	4850
T08SR28ES21SW	>1000	limestone	Phlhoo/Agrspi	7600
T08SR28ES28NW	100-1000	limestone	Junost	7550
T08SR28ES28SW	100-1000	limestone	Junost	7215
T08SR28ES29NE	>1000	limestone	Phlhoo/Agrspi	7250
T08SR28ES33NW	100-1000	limestone	Junost	6900
T09SR25ES14NW	>1000	limestone	Artarb	6280
T09SR26ES03SE	<100	calc sandstone	Junost/Artarb	5500
T09SR27ES01SE	>1000	limestone	Junost/Artarb	6000
T09SR27ES08NW	100-1000	limestone	Junost/Arttri	5800
T09SR27ES12NW	>1000	limestone	Cerlan/Agrspi	5500
T09SR27ES15SW	<100	limestone	Agrspi/Phlmus	4900
T09SR27ES21NE	100-1000	limestone	Junost/Artarb	4800
T09SR27ES24SE	1-100	limestone	Gutsar/Agrspi	4750
T09SR28ES04SE	>1000	limestone	Gutsar/Agrspi	6500
T09SR28ES06SW	100-1000	limestone	Psemen/Junost	6200
T09SR28ES09NW	>1000	limestone	Cerlan/Agrspi	6100
T09SR28ES09SE	>1000	limestone	Cerlan/Agrspi	6200
T09SR28ES17NW	100-1000	limestone	Artarb/Agrspi	5300
T09SR28ES18SE	100-1000	limestone	Junost	5200

Location	Size	Substrate	Vegetation	Elevation
Hymenoxys torreyana (cont.)				
T09SR28ES33NE	>1000	limestone	Junost/Cerled	4680
T09SR28ES33NE	100-1000	limestone	Junost/Cerled	4680
T09SR28ES33SE	<100	limestone	Junost/Cerled	4500
T09SR28ES33SE	100-1000	limestone	Junost/Cerled	4200
Ipomopsis pumila				
T09SR23ES05NW	<100	sandy clay	Arttri/Sarver	4250
T09SR25ES24SE	100-1000	calc sandstone	Arttri/Artped	4700
T09SR26ES15NW	100-1000	sandy	Arttri/Agrspi	5750
T09SR26ES16NW	>1000	sandy	Arttri/Agrspi	4940
T09SR26ES20SW	100-1000	sandy clay	Arttri/Artped	4800
T09SR26ES27NE	100-1000	sandy	Arttri/Sticom	4750
T09SR26ES27SE	>1000	stony sandy	Junost/Arttri	4750
T09SR26ES30SE	>1000	sandy	Arttri/Sticom	4550
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR26ES32NW	>1000	sandy	Arttri/Bougra	4550
T09SR26ES32NW	>1000	clay (stony)	Atrgar/Monnut	4650
T09SR26ES32SE	>1000	sandstone	Junost/Arttri	4450
T09SR26ES32SW	>1000	sandy	Arttri/Bougra	4450
T09SR26ES34NE	>1000	sandy	Arttri/Sticom	4650
T09SR26ES34NE	100-1000	sandy	Arttri/Agrspi	4650
T09SR27ES13NW	100-1000	sandy	Arttri/Agrspi	5200
T09SR27ES13SE	>1000	sandy	Arttri/Sticom	5100
T09SR27ES25SW	>1000	Chugwater	Arttri/Sticom	4350
T09SR27ES25SW	100-1000	sandy	Arttri/Sticom	4400
T09SR27ES28SE	100-1000	sandy	Arttri/Sticom	4750
T09SR27ES29SW	>1000	Chugwater	Arttri/Sticom	4750
T09SR27ES29SW	>1000	sandy	Arttri/Sticom	4800
T09SR27ES32NE	>1000	Chugwater	Atrgar/Artspi	4700
T09SR27ES33NE	100-1000	sandy	Arttri/Sticom	4600
T09SR27ES33SE	100-1000	Chugwater	Arttri/Sticom	4650
T09SR27ES33SW	100-1000	Chugwater	Atrgar/Artspi	4650
T09SR27ES34NW	100-1000	sandy clay	Junost/Arttri	4600
T09SR27ES34SW	>1000	sandy	Arttri/Atrcon	4450
T09SR28ES17SW	<100	sandy	Arttri/Sticom	4900
T09SR28ES17SW	100-1000	sandy	Arttri/Bougra	4900
T09SR28ES20SW	100-1000	calc sandstone	Arttri/Sticom	4500
T09SR28ES29NE	100-1000	sandy	Arttri/Sticom	4400
T09SR28ES29SE	100-1000	sandy	Arttri/Sticom	4300
T09SR28ES31NW	>1000	Chugwater	Arttri/Spoair	4250
T09SR28ES31NW	>1000	sandy	Arttri/Sticom	4200

Location	Size	Substrate	Vegetation	Elevation
Ipomopsis pumila (cont.)				
T09SR28ES33NE	100-1000	limestone	Junost/Artarb	4680
Leptodactylon caespitosum				
T09SR27ES19NE	<100	Chugwater	Junost/Phlmus	5150
T09SR27ES25SE	30-50	Chugwater	Chrnau/Phlmus	4400
T09SR27ES28SW	<100	calc sandstone	Pinfle/Junost	4800
T09SR27ES29SE	10-20	Chugwater	Chrnau/Phlmus	8850
T09SR27ES29SE	100-1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES29SW	<100	Chugwater	Phlmus/Agrspi	4800
T09SR27ES29SW	<100	Chugwater	Chrnau/Phlmus	4750
T09SR27ES32NW	1-100	Chugwater	Chrnau/Phlmus	4800
T09SR27ES33NW	10	Chugwater	Chrnau/Phlmus	4700
T09SR27ES33SW	100-1000	Chugwater	Atrcon/Gutsar	4700
T09SR27ES36SE	>1000	Chugwater	Chrnau/Phlmus	4400
T09SR28ES31NE	100-1000	Chugwater	Gutsar/Oryhym	4350
T09SR28ES31SW	100-1000	Chugwater	Chrnau/Phlmus	4400
T09SR28ES31SW	100-1000	Chugwater	Chrnau/Phlmus	4300
Malacothrix torreyi				
T09SR25ES24SE	100-1000	calc sandstone	Arttri/Artped	4700
T09SR26ES31NE	<100	sandy	Arttri/Atrgar	4500
T09SR26ES32SW	<100	sandy	Arttri/Bougra	4450
T09SR27ES29SW	<100	Chugwater	Arttri/Sticom	4750
Mentzelia pumila				
T09SR22ES09NE	<100	sandy clay	Arttri/Artarb	4050
T09SR27ES15SW	100-1000	limestone	Agrspi/Phlmus	4900
T09SR27ES19NE	<100	Chugwater	Junost/Agrspi	5150
T09SR27ES19NE	<100	Chug-calc sand	Cerlan/Agrspi	5050
T09SR27ES27NW	<100	sandy	Junost/Arttri	4600
T09SR27ES28SW	<100	calc sandstone	Pinfle/Junost	4800
T09SR27ES29SE	<100	Chugwater	Phlmus/Agrspi	4800
T09SR27ES33SW	100-1000	Chugwater	Atrcon/Gutsar	4700
T09SR27ES36NW	<100	calc sandstone	Cerlan Agrspi	4400
T09SR28ES31NE	<100	Chugwater	Junost/Erilag	4200
T09SR28ES31NE	<100	Chugwater	Gutsar/Oryhym	4350
Nama densa				
T09SR26ES09NE	100-1000	sandy	Arttri/Sticom	5100

Location	Size	Substrate	Vegetation	Elevation
Penstemon laricifolius				
T07SR24ES19NW	>1000	sandstone	Pinfle/Junsco	4080
T07SR24ES21SW	>1000	calc sandstone	Pinfle/Artarb	4650
T07SR25ES27NW	>1000	limestone	Artarb/Agrspi	5000
T07SR25ES27SW	100-1000	limestone	Pinfle/Artarb	5250
T08SR25ES14NW	>1000	limestone	Artarb	5060
T08SR25ES15SW	>1000	calc sandstone	Pinfle/Junost	4900
T09SR26ES03SE	>1000	calc sandstone	Junost/Artarb	5500
T09SR26ES09NE	<100	calc sandstone	Pinfle/Junost	5150
T09SR26ES12SW	>1000	calc sandstone	Artarb/Agrspi	5400
T09SR27ES01SE	>1000	limestone	Junost/Artarb	6000
T09SR27ES03SW	>1000	calc sandstone	Junost/Artarb	5600
T09SR27ES12NW	>1000	limestone	Cerlan/Agrspi	5500
T09SR27ES12SW	>1000	limestone	Junost/Artarb	5500
T09SR27ES13SE	>1000	limestone	Cerlan/Agrspi	5200
T09SR27ES13SE	100-1000	sandy	Junost/Arttri	5100
T09SR27ES13SE	100-1000	sandy	Arttri/Sticom	5200
T09SR27ES13SW	>1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES18NE	>1000	limestone	Junost/Arttri	5420
T09SR27ES24NE	100-1000	sandstone	Pinfle/Junost	4900
T09SR28ES07NW	>1000	limestone	Junost	6000
T09SR28ES17NW	<100	limestone	Artarb/Agrspi	5300
T09SR28ES17SW	100-1000	limestone	Junost/Agrspi	4900
T09SR28ES18SE	100-1000	limestone	Junost	5200
T09SR28ES20SE	100-1000	calc sandstone	Junost	
T09SR28ES20SW	100-1000	calc sandstone	Arttri/Sticom	4500
T09SR28ES20SW	<100	limestone cliff		4500
Phacelia ivesiana				
T07SR24ES19NW	100-1000	sandstone	Pinfle/Artarb	4250
T08SR24ES15NW	>1000	calc sandstone	Junost/Pinfle	4300
T08SR24ES15NW	>1000	sandstone	Arttri/Agrdas	4350
T08SR24ES23NW	>1000	sandstone	Junost/Pinfle	4350
T08SR25ES14NW	>1000	limestone	Artarb	5060
T08SR25ES15SW	>1000	calc sandstone	Pinfle/Junost	4900
T09SR26ES09NE	>1000	sandy	Arttri/Sticom	5100
T09SR26ES09NE	>1000	calc sandstone	Pinfle/Junost	5150
T09SR26ES10NE	>1000	sandstone	Junost/Artarb	5250
T09SR26ES11SE	>1000	calc sandy	Junost/Artarb	5300
T09SR26ES11SW	>1000	calc sandy	Junost/Artarb	5250
T09SR26ES12SW	>1000	sandy	Arttri/Sticom	5400
T09SR26ES15NW	>1000	sandy	Arttri/Agrspi	5750

Location	Size	Substrate	Vegetation	Elevation
Phacelia ivesiana (cont.)				
T09SR26ES16NW	100-1000	sandy	Arttri/Agrspi	4940
T09SR26ES16SW	>1000	calc sandy	Junost/Arttri	4900
T09SR26ES23SW	100-1000	sandy clay	Arttri/Agrspi	4940
T09SR26ES27NE	>1000	calc sandstone	Junost/Artarb	4850
T09SR26ES27NE	>1000	sandy	Arttri/Sticom	4750
T09SR26ES30SE	>1000	sandy	Arttri/Sticom	4550
T09SR26ES31NE	>1000	sandy	Arttri/Atrgar	4500
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR26ES32NW	>1000	sandy	Arttri/Bougra	4550
T09SR26ES32SE	>1000	sandstone	Junost/Arttri	4450
T09SR26ES32SW	>1000	sandy	Arttri/Bougra	4450
T09SR26ES34NE	>1000	sandy	Arttri/Sticom	4650
T09SR26ES34NE	100-1000	sandy	Arttri/Agrspi	4650
T09SR27ES12NE	100-1000	limestone	Junost/Agrspi	5700
T09SR27ES13SE	>1000	sandy	Junost/Arttri	5100
T09SR27ES13SW	100-1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES13SW	100-1000	calc sandstone	Pinfle/Junost	5100
T09SR27ES18SW	100-1000	Chugwater	Junost/Arttri	5200
T09SR27ES19NE	100-1000	Chugwater	Junost/Agrspi	5050
T09SR27ES24NE	100-1000	sandy	Junost/Arttri	4900
T09SR27ES27NW	100-1000	sandy	Junost/Arttri	4600
T09SR27ES28SW	1-100	Chugwater	Arttri/Agrspi	4800
T09SR27ES32NE	100-1000	Chugwater	Atrgar/Artspi	4700
T09SR28ES20SW	100-1000	calc sandstone	Arttri/Sticom	4500
T09SR28ES29NE	100-1000	sandy	Arttri/Sticom	4400
T09SR28ES29SE	100-1000	calc sandy	Junost/Arttri	4350
T09SR28ES29SE	>1000	sandy	Arttri/Sticom	4300
T09SR28ES31NW	>1000	sandy	Arttri/Sticom	4200
Physaria acutifolia				
T07SR24ES19NW	<100	sandy clay	Chrnau/Monnut	4100
T07SR24ES19SW	100-1000	sandy clay	Yucgla/Agrspi	4100
T07SR24ES21SW	100-1000	Chugwater	Chrnau/Agrspi	4550
T08SR23ES31NE	100-1000	sandstone	Chrnau/Agrspi	4100
T09SR22ES09NE	100-1000	sandy clay	Arttri/Artarb	4050
T09SR22ES22SW	>1000	sandy clay	Arttri/Artped	4350
T09SR23ES06NW	100-1000	sandy clay	Arttri/Artped	4250
T09SR26ES11SE	100-1000	calc sandy	Junost/Artarb	5300
T09SR26ES24SE	100-1000	calc sandy	Junost/Artarb	5000
T09SR27ES18SW	<100	Chugwater	Junost/Arttri	5200
T09SR27ES21NE	1-100	limestone	Junost/Artarb	4800

Location	Size	Substrate	Vegetation	Elevation
Physaria acutifolia (cont.)				
T09SR27ES24NE	1-100	sandy	Junost/Arttri	4900
T09SR27ES24NE	100-1000	Chugwater	Junost/Artarb	5000
T09SR27ES28SE	<100	sandy	Arttri/Sticom	4750
T09SR27ES29NW	<100	Chugwater	Junost/Gutsar	4850
T09SR27ES29SE	1-100	Chugwater	Chrnau/Phlmus	8850
T09SR27ES29SE	100-1000	limestone	Phlmus/Agrspi	4800
T09SR27ES29SW	<100	Chugwater	Phlmus/Agrspi	4800
T09SR27ES32NW	1-100	Chugwater	Chrnau/Phlmus	4800
T09SR27ES33SW	<100	Chugwater	Atrcon/Gutsar	4700
T09SR28ES17NW	100-1000	limestone	Junost/Cerled	5250
T09SR28ES29SE	1-100	limestone	Junost/Cerled	4400
T09SR28ES31NE	<100	Chugwater	Junost/Erilag	4200
T09SR28ES31NE	<100	Chugwater	Gutsar/Oryhym	4350
T09SR28ES32NE	1-100	calc sandy	Junsco/Arttri	4200
T09SR28ES34NW	<100	Chugwater	Junost/Artarb	4500
T09SR28ES34NW	1-100	calc sandy	Junost/Arttri	4500
Platyschkuhria integrifolia				
T07SR23ES25NW	>1000	silty	Arttri/Artped	3900
T07SR23ES33SE	>1000	sandy clay	Arttri/Agrspi	3900
T07SR23ES33SE	>1000	clay	Arttri/Agrspi	4250
T07SR24ES14SW	>1000	sandy clay	Arttri/Agrspi	4800
T07SR24ES19NW	>1000	sandy clay	Chrnau/Monnut	4100
T07SR24ES19SW	100-1000	sandy clay	Arttri/Agrspi	4100
T07SR24ES30NE	>1000	clay	Arttri/Agrsmi	4100
T07SR24ES30NE	>1000	sandy clay	Arttri/Artped	4050
T07SR24ES32NW	>1000	clay	Chrnau/Atrdio	4200
T07SR24ES32NW	>1000	sandy clay	Chrnau/Agrspi	4200
T08SR23ES03SW	>1000	clay	Arttri/Agrspi	4000
T08SR23ES04NE	>1000	clay	Arttri/Agrspi	4120
T08SR23ES04NW	>1000	sandy clay	Arttri/Agrspi	4080
T08SR23ES31NE	>1000	sandstone	Chrnau/Agrspi	4100
T08SR24ES23NW	>1000	shale	Gutsar/Agrspi	4400
T08SR24ES29SW	>1000	clay	Arttri/Agrspi	4400
T08SR24ES32NW	>1000	clay	Arttri/Agrspi	4200
T09SR22ES09NE	>1000	sandy clay	Arttri/Artarb	4050
T09SR22ES22SW	>1000	sandy clay	Arttri/Artped	4350
T09SR23ES01SE	>1000	clay	Arttri/Agrspi	4460
T09SR23ES01SW	>1000	clay	Arttri/Agrspi	4400
T09SR23ES02NE	>1000	clay	Arttri/Artped	4360

Location	Size	Substrate	Vegetation	Elevation
Platyschkuhria integrifolia (cont.)				
T09SR23ES02NE	>1000	clay	Arttri/Agrspi	4360
T09SR23ES05NW	>1000	sandy clay	Arttri/agrdas	4250
T09SR23ES05NW	>1000	sandy clay	Arttri/Artped	4350
T09SR23ES05NW	>1000	sandy clay	Arttri/Sarver	4250
T09SR23ES06NE	>1000	sandy clay	Arttri/Agrspi	4200
T09SR23ES06NW	>1000	sandy clay	Arttri/Artped	4250
T09SR23ES12NW	>1000	clay	Arttri/Agrspi	4800
T09SR23ES12SW	>1000	clay	Arttri/Agrspi	4820
T09SR23ES13NW	>1000	clay	Arttri/Agrspi	4700
T09SR23ES13SW	>1000	clay	Arttri/Agrspi	5060
T09SR23ES21NW	>1000	clay	Arttri/Artped	4350
T09SR23ES24NE	>1000	clay	Arttri/Agrspi	5290
T09SR25ES06NE	>1000	silty	Arttri/Agrspi	4450
T09SR25ES24NE	100-1000	silty	Arttri/Sarver	4550
T09SR25ES24SE	>1000	calc sandstone	Arttri/Artped	4700
T09SR25ES24SW	>1000	limestone	Arttri/Agrspi	4550
T09SR25ES25SW	>1000	clay	Artped/Atrgar	4380
T09SR26ES16NE	>1000	sandy	Arttri/Agrspi	4990
T09SR26ES23NE	100-1000	silty	Artped/Agrspi	5000
T09SR26ES23NW	>1000	sandy clay	Arttri/Agrspi	5000
T09SR26ES26SW	>1000	stony silt	Arttri/Agrspi	4800
T09SR26ES27NE	>1000	stony clay	Arttri/Artped	4750
T09SR26ES27NW	>1000	clay	Monnut/Musdiv	4750
T09SR26ES27SE	>1000	stony sandy	Junost/Arttri	4750
T09SR26ES29NW	>1000	calc sandstone	Arttri/Artped	4700
T09SR26ES30NE	100-1000	sandy clay	Atrgar/Artped	4650
T09SR26ES30NE	>1000	sandy clay	Arttri/Bougra	4700
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR26ES31NW	>1000	sandy clay	Artped/Atrgar	4440
T09SR26ES32NW	>1000	clay (stony)	Atrgar/Monnut	4650
T09SR26ES34NE	>1000	sandy	Arttri/Sticom	4650
T09SR26ES34NW	>1000	clay	Atrgar/Monnut	4550
T09SR27ES21SW	100-1000	sandy silt	Junost/Arttri	4700
T09SR27ES27NW	>1000	silty clay	Atrcon/Oryhym	4500
T09SR27ES28SE	100-1000	sandy	Arttri/Sticom	4750
T09SR27ES30SW	>1000	silty clay	Artped/Atrgar	4950
T09SR27ES33SW	>1000	sandy clay	Atrcon/Chrnau	4600
T09SR27ES34NW	100-1000	sandy clay	Junost/Arttri	4600
T09SR27ES34SW	100-1000	sandy	Arttri/Atrcon	4450
T09SR27ES36NW	100-1000	Chugwater	Junost/Chrnau	4400
T09SR28ES18SW	10-100	sandstone	Junost	5200

Location	Size	Substrate	Vegetation	Elevation
Platyschkuhria integrifolia (cont.)				
T09SR28ES31NE	100-1000	Chugwater	Gutsar/Oryhym	4350
T09SR28ES31NW	100-1000	Chugwater	Yucgla/Oryhym	4200
T09SR28ES34NW	>1000	Chugwater	Junost/Artarb	4600
Sphaeromeria capitata				
T07SR24ES21SW	100-1000	calc sandstone	Pinfle/Artarb	4650
T07SR25ES28NW	>1000	limestone	Cerlan/Agrspi	5100
T08SR25ES10SE	100-1000	calc sandstone	Junost	5200
T08SR25ES14NW	100-1000	limestone	Artarb	6325
T08SR25ES15SE	100-1000	limestone	Junost	5080
T08SR25ES15SW	100-1000	calc sandstone	Pinfle/Junost	4900
T08SR26ES32SW	1-100	limestone	Junost/Arttri	5180
T09SR26ES11SE	1-100	calc sandy	Junost/Artarb	5300
T09SR28ES04SE	>1000	limestone	Gutsar/Agrspi	6500
T09SR28ES09NW	>1000	limestone	Cerlan/Agrspi	6100
T09SR28ES09SE	>1000	limestone	Cerlan/Agrspi	6200
T09SR28ES28NE	100-1000	limestone	Junost	5000
T09SR28ES28NW	100-1000	limestone	Cerlan/Agrspi	4900
T09SR28ES33NE	<100	limestone	Junost/Cerled	4680
T09SR28ES33SE	100-1000	limestone	Junost/Cerled	4500
T09SR28ES33SE	100-1000	limestone	Junost/Cerled	4200
T09SR28ES34NW	100-1000	limestone	Gutsar/Agrspi	4600
Stanleya tomentosa				
T07SR25ES28NW	1-100	limestone	Cerlan/Agrspi	5100
T07SR25ES29NE	1-100	limestone	Junost/Artarb	4850
T08SR24ES32NW	10-100	sandstone	Junost/Arttri	4200
T08SR25ES15SE	<100	limestone	Junost	5080
T09SR26ES02SW	100-1000	limestone	Junost/Agrspi	5500
T09SR26ES02SW	100-1000	calc sandstone	Cerlan/Agrspi	5550
T09SR26ES03SE	<100	calc sandstone	Junost/Artarb	5500
T09SR26ES04SE	1-100	calc sandy	Junost/Gutsar	5250
T09SR26ES04SE	<100	calc sandy	Junost/Gutsar	5250
T09SR26ES09NE	<100	calc sandstone	Pinfle/Junost	5150
T09SR26ES10NE	<100	calc sandstone	Junost/Artarb	5350
T09SR26ES10SW	<10	limestone	Junost/Artarb	5100
T09SR26ES11SE	1-100	calc sandy	Junost/Artarb	5300
T09SR27ES07NW	1-100	limestone	Junost/Artarb	5550
T09SR27ES07SW	1-100	limestone	Artarb/Agrspi	5500
T09SR27ES08SW	10-100	limestone	Junost/Arttri	5780
T09SR27ES09NE	<10	limestone	Junost/Artarb	5460

Location	Size	Substrate	Vegetation	Elevation
Stanleya tomentosa (cont.)				
T09SR27ES13SE	100-1000	calc sandstone	Junost/Artarb	5000
T09SR27ES13SW	100-1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES13SW	<100	calc sandstone	Pinfle/Junost	5100
T09SR27ES21NE	<100	limestone	Junost/Artarb	4800
T09SR27ES24NE	100-1000	sandstone	Pinfle/Junost	4900
T09SR27ES24SE	1-100	limestone	Junost/Cerled	
T09SR27ES28SW	<100	calc sandstone	Pinfle/Junost	4800
T09SR27ES28SW	<10	Chugwater	Arttri/Agrspi	4800
T09SR28ES07NW	10-100	limestone	Junost	6000
T09SR28ES17NW	<100	limestone	Junost/Cerled	5250
T09SR28ES18SE	10-100	limestone	Junost	5200
T09SR28ES21SE	100-1000	limestone	Junost/Cerled	5100
T09SR28ES28NE	<100	limestone	Junost	5000
T09SR28ES28NW	100-1000	limestone	Cerlan/Agrspi	4900
T09SR28ES34NW	100-1000	Chugwater	Junost/Artarb	4500
T09SR28ES34NW	<10	calc sandy	Junost	4500
Streptanthella longirostris				
T09SR26ES09NE	>1000	sandy	Arttri/Sticom	5100
T09SR26ES09NE	100-1000	calc sandstone	Pinfle/Junost	5150
T09SR26ES10NE	>1000	sandstone	Junost/Artarb	5250
T09SR26ES11SE	100-1000	calc sandy	Junost/Artarb	5300
T09SR26ES12SW	>1000	sandy	Arttri/Sticom	5400
T09SR26ES32NW	100-1000	sandy	Arttri/Bougra	4550
T09SR26ES32SE	>1000	sandstone	Junost	
T09SR27ES09SE	10-100	sandy	Junost/Artarb	5240
T09SR27ES13SE	100-1000	sandy	Junost/Arttri	5100
T09SR27ES13SW	100-1000	calc sandstone	Pinfle/Junost	5100
T09SR27ES21SE	<100	sandy	Arttri/Sticom	4750
T09SR27ES21SE	10-100	sandy	Junost/Arttri	4750
T09SR27ES25SW	>1000	Chugwater	Arttri/Sticom	4350
T09SR27ES25SW	10-100	sandy	Arttri/Sticom	4400
T09SR27ES27NW	<100	sandy	Junost/Arttri	4600
T09SR28ES20SE	<100	calc sandstone	Junost/Cerled	4500
T09SR28ES29SE	1-100	calc sandy	Junost/Arttri	4350
T09SR28ES29SE	100-1000	sandy	Arttri/Sticom	4300
T09SR28ES31NW	>1000	sandy	Arttri/Sticom	4200
T09SR28ES32NE	1-100	calc sandy	Junsco/Arttri	4200

Location	Size	Substrate	Vegetation	Elevation
Townsendia incana				
T09SR26ES12SW	<100	sandy	Arttri/Sticom	5400
T09SR27ES12NE	<100	limestone	Junost/Agrspi	5700
T09SR27ES12SW	>1000	sandstone	Artarb/Agrspi	5400
T09SR27ES13NW	>1000	sandy	Arttri/Agrspi	5200
T09SR27ES13SE	100-1000	sandy	Arttri/Sticom	5100
T09SR27ES13SE	100-1000	calc sandstone	Junost/Artarb	5000
T09SR27ES13SE	>1000	sandy	Junost/Arttri	5100
T09SR27ES13SE	100-1000	calc sandstone	Arttri	5160
T09SR27ES13SW	<100	calc sandstone	Pinfle/Junost	5100
T09SR27ES15NW	<100	calc sandstone	Cerlan/Agrspi	5150
T09SR27ES18SE	<100	Chugwater	Junost/Agrspi	5200
T09SR27ES18SE	100-1000	Chugwater	Junost/Agrspi	5150
T09SR27ES19NE	<100	Chugwater	Junost/Agrspi	5050
T09SR27ES19NE	<100	Chugwater	Arttri/Agrspi	5050
T09SR27ES21NE	<100	sandy	Arttri/Sticom	4800
T09SR27ES21SE	<100	sandy	Arttri/Sticom	4750
T09SR27ES21SW	100-1000	sandy silt	Junost/Arttri	4700
T09SR27ES28SE	100-1000	sandy	Arttri/Sticom	4750
T09SR27ES28SW	<100	Chugwater	Arttri/Agrspi	4800
T09SR27ES28SW	<100	calc sandstone	Pinfle/Junost	4800
T09SR27ES28SW	100-1000	calc sandstone	Pinfle/Junost	4800
T09SR27ES28SW	>1000	Chugwater	Arttri/Agrspi	4800
T09SR27ES29SW	100-1000	Chugwater	Phlmus/Agrspi	4800
T09SR27ES33SE	100-1000	Chugwater	Arttri/Sticom	4650
T09SR28ES17SW	100-1000	sandy	Arttri/Sticom	4900
T09SR28ES20SE	100-1000	calc sandstone	Junost/Cerled	4500
T09SR28ES20SW	>1000	calc sandstone	Arttri/Sticom	4500
T09SR28ES29NE	>1000	sandy	Arttri/Sticom	4400
T09SR28ES31NW	<100	Chugwater	Arttri/Spoair	4250
Townsendia spathulata				
T07SR25ES28NW	1-100	limestone	Cerlan/Agrspi	5100
T08SR28ES21SW	<100	limestone	Phlhoo/Agrspi	7600
T08SR28ES33NW	>1000	limestone	Junost	6900
T09SR25ES13SE	1-100	calc stony	Gutsar/Agrspi	4700
T09SR26ES02SW	<100	calc sandstone	Cerlan/Agrspi	5550
T09SR26ES12SW	100-1000	limestone	Agrspi/Phlmus	5400
T09SR26ES29NW	10-100	calc sandstone	Arttri/Artped	4700
T09SR27ES01SE	<100	limestone	Junost/Artarb	6000
T09SR27ES07SW	100-1000	limestone	Artarb/Agrspi	5500
T09SR27ES10SE	100-1000	calc sandstone	Cerlan/Agrspi	5300

Location	Size	Substrate	Vegetation	Elevation
Townsendia spathulata (cont.)				
T09SR27ES12NW	100-1000	limestone	Cerlan/Agrspi	5500
T09SR27ES13SE	100-1000	limestone	Cerlan/Agrspi	5200
T09SR27ES13SE	>1000	calc sandstone	Pinfle/Junost	5200
T09SR27ES13SW	100-1000	calc sandstone	Cerlan/Agrspi	5200
T09SR27ES15SW	100-1000	limestone	Agrspi/Phlmus	4900
T09SR27ES19NE	<100	Chug-calc sand	Cerlan/Agrspi	5050
T09SR27ES29SE	100-1000	limestone	Phlmus/Agrspi	4800
T09SR27ES36NW	<100	calc sandstone	Cerlan Agrspi	4400
T09SR28ES04SE	100-1000	limestone	Gutsar/Agrspi	6500
T09SR28ES09NW	100-1000	limestone	Cerlan/Agrspi	6100
T09SR28ES09SE	>1000	limestone	Cerlan/Agrspi	6200
T09SR28ES18SE	>1000	limestone	Junost	5200
T09SR28ES21SE	100-1000	limestone	Junost/Cerled	5100
T09SR28ES28NE	100-1000	limestone	Junost	5000
T09SR28ES28NW	100-1000	limestone	Cerlan/Agrspi	4900
T09SR28ES32SW	100-1000	calc sandstone	Cerlan/Agrspi	4200
T09SR28ES33NE	>1000	limestone	Junost/Cerled	4680
T09SR28ES33NE	>1000	limestone	Junost/Artarb	4680
T09SR28ES33SW	<10	Chugwater	Junost/Chrnau	4150
T09SR28ES34NW	<100	limestone	Gutsar/Agrspi	4600
Wyethia scabra				
T09SR26ES24SE	1-100	calc sandy	Junost/Artarb	5000
T09SR27ES15SW	<100	calc shale	Artarb/Agrspi	5050
T09SR27ES19NE	<100	Chugwater	Junost/Agrspi	5150
T09SR27ES19NE	100-1000	Chugwater	Junost/Phlmus	5150
T09SR27ES24SE	1-100	limestone	Gutsar/Agrspi	4750
T09SR27ES25SE	1-100	Chugwater	Chrnau/Phlmus	4400
T09SR27ES27NW	<100	silty clay	Atrcon/Oryhym	4500
T09SR27ES27NW	>1000	calc sandstone	Junost/Gutsar	4600
T09SR27ES28NW	<100	Chugwater	Cerlan/Agrspi	4800
T09SR27ES28SW	1-100	Chugwater	Arttri/Agrspi	4800
T09SR27ES29NW	<100	Chugwater	Junost/Gutsar	4850
T09SR27ES29SE	1-100	Chugwater	Chrnau/Phlmus	8850
T09SR27ES29SE	<100	Chugwater	Phlmus/Agrspi	4800
T09SR27ES30NE	1-100	Chugwater	Chrnau/Phlmus	4950
T09SR27ES30SW	1-100	sandy	Artarb/Agrspi	4850
T09SR27ES32NW	1-100	Chugwater	Chrnau/Phlmus	4800
T09SR27ES33SW	<100	Chugwater	Atrcon/Gutsar	4700
T09SR27ES36NW	<100	Chugwater	Junost/Chrnau	4400
T09SR28ES18SW	10-100	sandstone	Junost	5200

Location	Size	Substrate	Vegetation	Elevation
Wyethia scabra (cont.)				
T09SR28ES31NE	100-1000	Chugwater	Junost/Erilag	4200
T09SR28ES31NE	100-1000	Chugwater	Gutsar/Oryhym	4350
T09SR28ES31NW	100-1000	Chugwater	Yucgla/Oryhym	4200
T09SR28ES31SW	1-100	Chugwater	Chrnau/Phlmus	4300
T09SR28ES33SE	<100	limestone	Junost/Cerled	4500
T09SR28ES33SE	>1000	limestone	Junost/Cerled	4200
T09SR28ES33SW	1-100	Chugwater	Junost/Chrnau	4150
Xylorhiza glabriuscula				
T07SR23ES25NW	100-1000	silty	Arttri/Artped	3900
T07SR24ES19SW	100-1000	sandy clay	Arttri/Agrspi	4100
T07SR24ES32NW	100-1000	sandy clay	Chrnau/Agrspi	4200
T08SR23ES04NW	100-1000	sandy clay	Arttri/Agrspi	4080
T09SR22ES09NE	<100	sandy clay	Arttri/Artarb	4050
T09SR22ES22NW	<100	sandy clay	Arttri/Artped	4150
T09SR22ES22SW	<100	sandy clay	Arttri/Artped	4350
T09SR23ES01SE	100-1000	clay	Arttri/Agrspi	4460
T09SR23ES01SW	100-1000	clay	Arttri/Agrspi	4400
T09SR23ES02NE	100-1000	clay	Arttri/Artped	4360
T09SR23ES05NW	100-1000	sandy clay	Arttri/Artped	4350
T09SR23ES06NE	<100	sandy clay	Arttri/Agrspi	4200
T09SR23ES12NE	100-1000	clay	Arttri/Artped	4460
T09SR23ES12NW	>1000	clay	Arttri/Agrspi	4800
T09SR23ES12SW	100-1000	clay	Arttri/Agrspi	4820
T09SR23ES12SW	100-1000	clay	Arttri/Agrspi	4820
T09SR23ES13NW	100-1000	clay	Arttri/Agrspi	4700
T09SR23ES13SW	10-100	clay	Arttri/Agrspi	5060
T09SR23ES19NE	100-1000	clay	Chrnau/Agrspi	4200
T09SR23ES21NW	>1000	clay	Arttri/Artped	4350
T09SR23ES24NE	100-1000	clay	Arttri/Agrspi	5290
T09SR23ES25SW	100-1000	clay	Arttri/Agrspi	5050
T09SR25ES05SW	100-1000	sandy clay	Artped/Atrgar	4500
T09SR26ES23NE	100-1000	silty	Artped/Agrspi	5000
T09SR26ES23NW	0-100	sandy clay	Arttri/Agrspi	5000
T09SR26ES27NE	>1000	stony clay	Arttri/Artped	4750
T09SR26ES30NE	100-1000	sandy clay	Atrgar/Artped	4650

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>245 1  Distribution of vascular plant species of special concern and limited
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Peter Lesica and Peter L. Achuff ; prepared for USDI Bureau of Land Management
Montana State Office.
>260    Helena, Mont. : Montana Natural Heritage Program [1992].
>300    105 leaves : ill., maps ; 28 cm.
>500    Cover title
>500    "January 1992"
>504    Includes bibliographical references (leaves 37-38).
>650  0 Botany--Montana--Pryor Mountains.
>650  0 Botany--Montana--Carbon County.
>650  0 Rare Plants--Montana--Pryor Mountains.
>650  0 Rare Plants--Montana--Carbon County.
>700 10 Achuff, P.L.
>710 10 United States. Bureau of Land Management. Montana State Office.
>710 20 Montana Natural Heritage Program.
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